Chapter 7 Metamorphic rocks Kinlochleven Recumbent Anticline

J. Glen Coe and the Devil's Staircase [NN 216 574] North to Stob Coire Easain

Introduction

The southern boundary of the district to be considered runs roughly up Glen Coe to Loch Achtriochtan, and then follows the edge of the Cauldron-Subsidence of Glen Coe to a little past the Devil's Staircase [NN 216 574]. The eastern boundary coincides with the eastern limit of the Eilde Flag outcrop between the Devil's Staircase [NN 216 574] and Loch-Eilde Beag; and beyond this is furnished by the eastern margin of Sheet 53 (Geol.). The north-western boundary is determined approximately by the north-western limit of the Glen Coe Quartzite outcrop from Mam na Gualainn [NN 116 625], overlooking Loch Leven, to the north-east corner of Sheet 53, where stands Stob Coire Easain (3545 ft), one of two mountains bearing this name. As always, there is a certain laxity of definition, for reference will be made to bordering Leven Schists and also to the isolated outcrop of Glen Coe Quartzite at Tom Meadhoin [NN 085 624] west of Mam na Gualainn [NN 116 625].

In this extensive area the following stratigraphical succession has been established — the numbers accord with the convention adopted in previous chapters:

(7) Leven Schists (youngest)

(8) Glen Coe Quartzite

(9) Binnein Schists

(10) Dinnein Quartzite

(11) Eilde Schists

(12) Eilde Quartzite

(13) Eilde Flags (oldest)

The name-localities with their national grid references are: Loch Leven [NN 090 595]; Pap of Glen Coe [NN 125 595] [NN 125 595]; Binnean Mòr [NN 213 663]; Loch-Eilde Mòr [NN 230 638]; Sgùrr Eilde Mòr [NN 232 654] (Figure 12).

It has already been explained in chapter 2 how this succession was first established on lithological grounds by R. G. Carruthers, and how later it was confirmed through attention to current-bedding by T. Vogt, S. Buckstaff, O. N. Rove, T. L. Tanton and others. Briefly, so far as Lochlevenside is concerned, the lithological argument is as follows, in two main steps:

1. The pale, greenish-grey, spangled Leven Schists cannot be correlated with the dark, grey, non-spangled Binnein Schists; thus the Glen Coe Quartzite has two stratigraphical partners, neither of which corresponds with the Eilde Flags; therefore the Glen Coe Quartzite must be distinct from the Eilde Quartzite (though both are felspathic and closely similar).
2. The Binnein Quartzite is purer than the Glen Coe and Eilde Quartzites and must therefore be a distinct horizon; accordingly there are three quartzites in the succession, and the Binnein Schists, separating Glen Coe Quartzite from Binnein Quartzite, must be different from the Eilde Schists, separating Binnein Quartzite from Eilde Quartzite (though Binnein Schists and Eilde Schists are closely similar).

As for current-bedding, which is wonderfully preserved in spite of structural complexities, the argument is as follows: Glen Coe Quartzite is seen to be older than Leven Schists and younger than Binnein Schists; Binnein Quartzite is seen to be

older than Binnein Schists and younger than Eilde Schists; Eilde Quartzite is seen to be older than Eilde Schists and is followed by Eilde Flags. The readings of current-bedding upon which these statements are based have all been taken from banded transition zones linking the quartzite and the schist concerned. The clarity of the evidence is illustrated in the drawings reproduced in (Figure 13), which can be verified in essence by any one who goes to see — that is, the figured or a comparable exposure is sure to be found at the various localities indicated. Anyone making a special study of the succession is advised to consult the writer's 1934 account which is in some particulars more detailed.

Structurally the district is of extreme interest. Its rocks lie wholly beneath the Ballachulish Slide, and are involved in a great recumbent anticline, the Kinlochleven Anticline, which intervenes between the Recumbent Synclines of Appin and Ballachulish. The north-westward close of this anticline, so far as Glen Coe Quartzite is concerned, is seen in the Tom Meadhoin Antiform of (Figure 8), (Figure 9), pp. 50, 51 and Section AA, Sheet 53. The close is here rising. The same north-westward close, so far as Eilde Quartzite is concerned, is seen in the Stob Coirena h-Eirghe [NN 161 642] and Garbh Bheinn Synform, north and south of Loch Leven. The close is here falling ((Figure 14), C,D; Section AA, Sheet 53).

The north-westerly rise of the axial plane of the Kinlochleven Recumbent Anticline at Tom Meadhoin [NN 085 624] and the north-westerly fall of the same in Stob Coirena h-Eirghe [NN 161 642] and Garbh Bheinn are determined by the secondary synform of Stob Bàn (p. 47), responsible for the intervening outcrop of Ballachulish Core at Callert. Where, at Tom Meadhoin [NN 085 624], the local core (Glen Coe Quartzite) of the Kinlochleven Recumbent Anticline rises to the surface to present itself as an antiform, this antiform is also an anticline in the sense that its Glen Coe Quartzite core is older than enveloping Leven Schists — a matter easily proved by attention to current-bedding. Where, at Garbh Bheinn, the local core (Eilde Quartzite) of the Kinlochleven Recumbent Anticline falls to the surface to present itself as a synform, this synform is an anticline in the sense that its Eilde Quartzite core is older than enveloping Eilde Schists — a matter again demonstrable by current-bedding.

Along Loch Leven all the outcrops from Glencoe House to Caolasnacon (Figure 15) belong to the upper normal limb of the Kinlochleven Recumbent Anticline, and, apart from local complications, are shown by current-bedding to be right-way-up ((Figure 13)a); while all the outcrops east of Caolasnacon, to at least two miles east of the head of the loch, belong either to the close, or in much greater part, to the lower, inverted limb of the Kinlochleven Recumbent Anticline, and are shown by current-bedding, again apart from local complications, to be upside down ((Figure 13)c-e, g-i). This Kinlochleven Inversion, extending for at least four miles across strike, is more easily appreciated than any other example of the kind elsewhere in the world; and it is particularly obvious in the coastal strip reaching for half a mile west of the head of Loch Leven towards Allt Nathraich. In fact extensive inversion here can actually be demonstrated to a non-geologist, once the latter has learnt to appreciate the significance of current-bedding. Everything is convenient. A motorist can safely park his car in a discarded bend of the now straightened main road a little east of the entrance to a private drive leading up to Mamore Lodge [NN 186 630]. He can then descend by a path (shown in (Figure 15), east, near the dip 15i) leading to a boathouse on the lochside. Almost every exposure of quartzite that he sees is current-bedded; and invariably the current-bedding is inverted ((Figure 13)c).

Another point of special interest is the manner in which outcrops tend to swing from south-west to south-east as they approach the great pitch-depression of Glen Creran (p. 23). Along most of Loch Leven the deflection is fairly closely associated with the course of the loch. A shatter-belt runs along Loch Leven, Loch-Eilde Mòr and Loch-Eilde Beag, but is more likely to have been located by the twist than to have caused it. The manner in which the south-west strike reasserts itself in Meall Mòr, south of the entrance to Glen Coe, suggests that the complication belongs to what may be called the schist tectonics of the district. Two miles south of Kinlochleven the main swerve of strike roughly follows the course of the Boundary-Fault of the Cauldron-Subsidence by Coire Mhorair (Figure 24), Stob Mhic Mhartuin [NN 207 575] (Figure 26) and Stob Beinn a'Chridaiste (Figure 28). Here undoubtedly the abruptness of the change of strike has been accentuated by the faulting, but it would be hazardous to suggest that the twist in essence has been caused by the Cauldron-Subsidence.

We have said above that the Kinlochleven Recumbent Anticline intervenes between the Recumbent Synclines of Ballachulish and Appin. It seems to be accompanied in this position by another recumbent anticline at a slightly lower level (Bailey 1934a, p. 507). This lower fold has been called the Stob Recumbent Anticline after an eastern Stob Coire

Easain (nat. grid [NN 308 731]) in Sheet 54(Geol.). It will be discussed later under the heading *Problem at Blackwater Reservoir [NN 250 605],* p. 108.

Stratigraphy from Leven Schists to Eilde Flags

Leven Schists (7)

The Leven Schists (7) are in the main a great mass of pale greenish-grey, pelitic mica-schist, with porphyroblasts and patches of biotite and innumerable fine white or yellowish stripes (one-sixteenth to one-eighth inch thick) of fairly quartzose material. Apart from this persistent lamination, most of the group is extremely homogeneous, and ribs of quartz-granulite and quartzite are restricted to a narrow transitional banded zone bordering the Glen Coe Quartzite. Here some quartzose ribs are slightly calcareous, while dark carbonaceous pelitic seams are common, often interlaminated with yellowish quartzose material.

The constancy of the Leven Schists adjoining the Mam na Gualainn (nat. grid [NN 116 626]) to Stob Coire Easain (nat. grid [NN 234 727]) outcrop of Glen Coe Quartzite north of Loch Leven is to some extent discounted by the marked change of facies that has been described in chapter 6 south-west of the Ballachulish Pluton. Still, if the mica-schist outcrops that occur east of this Glen Coe Quartzite outcrop were really repetitions of the Leven Schists, one would expect them somewhere to show the pale green porphyroblastic, laminated type — but they do not.

Garnet is usually quite inconspicuous near Loch Leven, but increases towards Glen Nevis.

Glen Coe Quartzite (8)

The Glen Coe Quartzite (8), seen in (Plate 2), 2, (Plate 5) and (Plate 13), 2, is fine-grained. In the Pap of Glen Coe [NN 125 595] and Mam na Gualainn [NN 116 625], either side of Loch Leven, it is markedly 'felspathic and often grey-weathering. On Tom Meadhoin [NN 085 624] to the west and beyond the Lairigmòr valley to the north it is comparatively pure and white. Towards Stob Coire Easain, while maintaining this pure character, it carries occasional small ferriferous spots.

In Tom Meadhoin [NN 085 624] and at intervals along the western border of the main outcrop current-bedding shows that the Glen Coe Quartzite is older than the Leven Schists — in conformity with the evidence already given that the Appin Quartzite is older than the Appin Limestone. The shore road (shown in (Figure 15), but not in Sheet 53) south of Loch Leven traverses the foot of the Pap of Glen Coe [NN 125 595] and exposes abundant current-bedding (often associated with slumping) right across the outcrop of the quartzite. This consistently youngs south-westwards, that is towards the Leven Schists. About 7000 feet of quartzite are seen in the traverse, which makes one suspect reduplication by sliding.

It is rather hard to find current-bedding just adjacent to the Binnein Schist, for bedding here tends to be regular. Still, definite examples occur at the eastern side of the entrance to a large road-metal quarry at Rudha Cladaich [NN 122 610] north of Loch Leven ((Figure 13)a and (Figure 15), west); and others are seen almost immediately to the east in a cutting of the main road. Here the current-bedded quartzite carries interbedded mica-schists and merges with the Binnein Schist alongside. Some of the marginal quartzose bands at Rudha Cladaich [NN 122 610] are distinctly gritty in the sense of containing large elastic grains, a most unusual feature in the Glen Coe, Binnein or Eilde Quartzites. These gritty bands extend to the south side of the loch and characterise a zone some 50 feet thick, which is traceable all told for more than two miles along outcrop. Localities south of the loch, from a third of a mile to a mile inland measured along strike, show occasional current-bedding which invariably youngs south-westwards away from the Binnein Schist. See also (Figure 13)b.

Binnein Schists (9)

The Binnein Schists (9) are dark grey mica-schists with evenly disseminated biotite and with occasional or frequent ribs of quartzose granulite. These ribs are particularly numerous near outcrops of quartzite (both Glen Coe and Binnein). They there form part of banded transition zones containing some calcareous beds and dark carbonaceous seams, such as occur in the banded transition zone that connects the Leven Schists with the Glen Coe Quartzite. Garnet is seldom

conspicuous near Loch Leven, but increases north-eastwards through Glen Nevis.

Before the value of current-bedding was appreciated Carruthers distinguished the Binnein from the Leven Schists, not only by difference of character in bulk, but also by difference of marginal relationship with Glen Coe Quartzite. Thus along the Water of Nevis he compared the Glen Coe — Leven contact at its furthest-west point (in the north bank, W.S.W. of Upper Steall [NN 187 688], (Figure 16)) with the Glen Coe — Binnein contact 14 miles further east, downstream from the junction with Allt Coire na Gabhalach [NN 202 680]; and again the same two contacts in the great cliff of Sem a' Bhuic a mile further north. In both cases he found the passage from solid quartzite to banded mica-schist relatively abrupt at the Binnein Schist margin. In a country much complicated by slides the significance of this contrast is, of course, difficult to assess.

The Binnein Schists have a main outcrop and four subsidiary ones. The main outcrop borders the Glen Coe Quartzite on its eastern, generally south-eastern, side for 13 miles from Allt a' Chaolais, (nat. grid [NN 156 596]), south of Loch Leven, to the map margin, east of Stob Coire Easain. South of Loch Leven, and for a short distance to the north, it lies between outcrops of Glen Coe and Binnein Quartzites. Northwards, as we shall presently see, Binnein Quartzite temporarily fails, and for the next nine miles, to Glen Nevis and back again to near Binnean Mòr, Binnein Schists almost always come directly into contact with Eilde Schists. The junction of these two similar schist groups is indicated approximately on Sheet 53 by a broken heavy line. It very likely is a slide, but may be no more than a stratigraphical hiatus. From the neighbourhood of Binnean Mòr north-east to the map margin, Binnein Quartzite reappears in force, to serve once more as south-east boundary to the main Binnein Schist outcrop. This latter, north of upper Glen Nevis, is about a mile wide.

The four subsidiary outcrops of Binnein Schist lie almost entirely within the main outcrop of Binnein Quartzite, upon which Kinlochleven stands. The Binnein Quartzite here belongs to the reversed limb of the Kinlochleven Anticline and all four outcrops of Binnein Schist rise into it as demonstrable antiforms. Further detail is reserved for the description of structural details in the Kinlochleven, Binnean Mòr and Binnein Beag districts. At present we need do little more than locate the four outcrops on the map.

The first and most westerly outcrop is the only one to cross Loch Leven. It has been followed for three miles from the Fault-Intrusion of Glen Coe (nat. grid [NN 175 593]) by way of Allt Nathrach [NN 160 631], north of the loch, to terminate as a broken antiform west of Sgòr an Fhuarain [NN 177 637] (nat. grid [NN 176 638]).

The second (see Kinlochleven Antiform, p. 104) is only ¾ mile long and is mostly exposed in the precipitous face overlooking Kinlochleven from the south (nat. grid [NN 186 611]). The Binnein Schist here passes under Binnein Quartzite at about 1500 feet above sea level; whereas at the roadside north of the River Leven (nat. grid [NN 187 623]) it disappears under the same formation at about 50 feet.

The third is quite small, an obvious antiformal exposure above the Lairigmar track south-west of Sgòr an Fhuarain [NN 177 637] (nat. grid [NN 173 632]).

The fourth reaches 2.5 miles from Sgòr an Fhuarain [NN 177 637] (nat. grid [NN 183 635]) to Binnean Mòr (nat. grid [NN 207 664]). For half a mile it is bounded on the north-west by Eilde Schist through local failure of Binnein Quartzite.

Binnein Quartzite (10)

The Binnein Quartzite (10) is always remarkably pure, and almost always white-weathering. In the Kinlochleven neighbourhood ferriferous spots are a marked feature, but they are local and do not extend far into Garbh Bheinn on the south. They reappear, however, to a trifling extent in the detached outcrop at Caolasnacon (Figure 15). The Binnein Quartzite can readily be distinguished from the Glen Coe Quartzite where the latter is felspathic, as in the Pap of Glen Coe [NN 125 595] and Mam na Gualainn [NN 116 625]; but the difference of character is doubtful north of the Lairigmòr valley, since here the Glen Coe Quartzite becomes purer and whiter.

The Binnein Quartzite has a two-mile-long outcrop extending along Allt Gleann a' Chaolais [NN 145 605] to terminate a little north of Loch Leven, as mentioned above. This outcrop will be termed in the sequel the Caolasnacon outcrop (Figure 15). It lies west of the Garbh Bheinn Synform that holds in its axial belt the Eilde Quartzite outcrop of Garbh

Bheinn, Stob Coirena h-Eirghe [NN 161 642], Am Bodach and An Garbhanach [NN 187 665]. To the east of this synform the Binnein Quartzite rises again to the surface in a complex group of antiforms responsible for the white quartzite country of Kinlochleven, Sgòr an Fhuarain [NN 177 637], Binnean Mòr, Binnein Beag [NN 222 677] and Meall a' Bhiùirich [NN 253 706]. The Binnein Quartzite of this complex antiformal country serves as envelope to the four subsidiary outcrops of Binnein Schist that we have listed above.

It so happens that the roadside-lochside strip reaching across the axial belt of the Garbh Bheinn Synform, from half a mile west to a mile and a half east of Caolasnacon (Figure 15), gives particularly convincing evidence regarding the age relations of Binnein Schists, Binnein Quartzite, Eilde Schists and Eilde Quartzite. Consideration of this will follow immediately upon the brief statement given below regarding the characters and outcrops of the Eilde Schists, Eilde Quartzite and Eilde Flags.

Eilde Schists (11)

The Eilde Schists (11) are indistinguishable lithologically from the Binnein Schists. They have two outcrops; one surrounds the Eilde Quartzite outcrop of the Garbh Bheinn Synform, the other, west of the Binnean Mòr group of anti-forms, runs from the Fault-Intrusion of Glen Coe north-east to cross the River Leven above Kinlochleven, then swings flatly from Meall an Doire Dharaich [NN 203 624] past Mamore Lodge [NN 186 630] to steepen up and continue north-east to Meall a' Bhiùirich [NN 253 706].

Eilde Quartzite (12)

The Eilde Quartzite (12) is a felspathic quartzite indistinguishable lithologically from the Glen Coe Quartzite as seen in the Pap of Glen Coe [NN 125 595]. Like the Eilde Schists it has two outcrops: the synformal one mentioned above from Garbh Bheinn to An Garbhanach [NN 187 665]; and another sufficiently localised on Sheet 53 if we say that is passes by the outflow of Loch-Eilde Mòr

Eilde Flags (13)

The Eilde Flags (13) are micaceous quartzo-felspathic flags with very conspicuous bedding.. Lithologically they are of what Scots geologists commonly call the psammitic Moine type. Recognisable detrital grains are very rare in the group as a whole, but W. B. Wright recognised a gritty quartzose group with large grains of quartz and felspar near the margin of the flags on both sides of the River Leven east of Allt na h' Eilde. The Eilde Flags have a single two-mile-wide outcrop extending in a general north-east direction through Loch-Eilde Mòr and Loch-Eilde Beag.

Stratigraphical detail: West and East of Caolasnacon (Figure 15)

Asmentioned above exposures on the two sides of Caolasnacon farm establish the age relations of Binnein Schists, Binnein Quartzite, Eilde Schists and Eilde Quartzite. The Binnein Schist margin of the Caolasnacon outcrop of Binnein Quartzite is exposed on the hillside above the road half a mile west of the farm ((Figure 15), west). Bare rock leads up to the junction. At some distance from the schists the quartzite is massive and white, with frequent current-bedding always younging towards the Binnein Schist. Nearer the junction, the quartzite becomes grey-white and transitional to the banded edge of the Binnein Schists. In this position one good example of current-bedding may be noted. It too youngs towards the Binnein Schists.

On the nearby south shore of Loch Leven, Binnein Quartzite again shows current-bedding, always younging towards the Binnein Schists, but no examples were found in what could be claimed as passage beds.

The other, eastern margin of the Caolasnacon [NN 138 607] outcrop of Binnein Quartzite is against Eilde Schist, and supplies abundant clear evidence that the quartzite youngs away from this schist. The best exposures are close to the road a little east and west of a bridge 300 yards east of Caolasnacon ((Figure 15), east). Here current-bedding can be found in pure quartzite right up to the margin of the mica-schist, and also in a bed of quartzite interstratified with this mica-schist. In all cases the verdict is the same. The Binnein Quartzite youngs away from the Eilde Schist.

Thus the Binnein Quartzite at Caolasnacon [NN 138 607] has two stratigraphical sides. It is older than the Binnein Schists to the south-west and younger than the Eilde Schists to the north-east.

The Eilde Schists of the Caolasnacon outcrop are present in bulk making a prominent ridge overlooking Allt Gleann a' Chaolais [NN 145 605] above the bridge just mentioned. The road crosses them as shown in (Figure 15), east, and half a mile from the farm reaches quartzite once again; but this is Eilde Quartzite, older than the Eilde Schists.

Current-bedding is common in this Eilde Quartzite along and near the road, and it is everywhere inverted ((Figure 13)g, h; (Figure 15), east). Special attention may be directed to an exposure at the actual western margin of the quartzite in the artificially deflected course of Allt Gleann a' Chaolais [NN 145 605] (shown in (Figure 15)). Current-bedding is here perfectly displayed in quartzite bands forming part of a transition zone leading south-west to Eilde Schists. Its attitude is exactly the same as in neighbouring massive quartzite free from mica-schist intercalations; and it shows definitely that the Eilde Quartzite youngs towards the Eilde Schists.

Thus the Eilde Schists at Caolasnacon have two stratigraphical sides. They are older than the Binnein Quartzite to the south-west and younger than the Eilde Quartzite to the north-east. What follows supplies confirmation.

The Eilde Quartzite outcrop which has now been reached can be seen on the slopes of Garbh Bheinn (south of (Figure 15)) to be disposed in a synform pitching rather steeply to the north-west; and wherever current-bedding has been observed it is inverted. This Garbh Bheinn Synform is, as we have pointed out, the falling close of the Kinlochleven Recumbent Anticline. Its downward close is exposed in the outcrops of many individual beds. It is asymmetric, with steeper dips (60° to 80°) on its south-western side and gentler dips (25° to 40°) on its north-eastern side. It is asymmetric also in having a greater thickness of quartzite in the steep south-western limb than in the gently inclined north-eastern limb. This is almost certainly due to sliding.

Eilde Schists reappear from under the Eilde Quartzite of the Garbh Bheinn Synform, 11 miles E.N.E. of Caolasnacon. Current-bedding ((Figure 13)h) has been found near, but not immediately at, the junction. It is inverted as noted above.

Across this second or eastern outcrop of Eilde Schists, Binnein Quartzite is reached once more, and is of the same type as at Caolasnacon [NN 138 607]. It also shows the same age-relations to the Eilde Schists, for abundant current-bedding youngs away from the adjacent schist (Figure 13)e, f. Moreover, the junction is almost certainly a transition. The age-relations are exhibited, not only at the main contact, but also at a little dome of inverted Binnein Quartzite indicated by a note in (Figure 15), east.

Before the main outcrop of Binnein Quartzite is passed one enters into complications due to slides (p. 106).

Tectonic detail: Glen Coe Quartzite

Up to now the broad structural features of the district have been sketched with only sufficient detail to make the stratigraphical succession intelligible. Brief accounts follow, which concentrate on structural features grouped under convenient headings.

The close of the Kinlochleven Recumbent Anticline as exhibited in the Tom Meadhoin Antiform is sufficiently illustrated in (Figure 8), (Figure 9).

The great thickness of Glen Coe Quartzite in the Pap of Glen Coe [NN 125 595], 7000 feet all younging south-west, has already been given as reason to suspect reduplication by slides. In Mam na Gualainn [NN 116 625], across Loch Leven, the quartzite is divided into two by what looks like an isoclinal upfold of Leven Schist — but the locality has not been searched for current-bedding, and there may be undetected sliding. The apparent upfold pitches south-west.

Emerging towards the north-east at lower structural levels we find a whole succession of conspicuous, albeit minor, folds, sometimes much modified by slides. The first noteworthy example is a handsome recumbent anticline seen on the north face of Stob Bàn. It is cored by Binnein Schist and closes to the northwest.

Then, in Sgùrr a' Mhaill, a steep synform appears followed by an antiform (Plate 5). As the succession youngs in (Plate 5) from left to right (cf: (Figure 12), (Figure 13)b) the synform is obviously cored by older rocks, and so in a sense is an anticline; and *vice versa* with the antiform.

Across Allt Coire Mhaill [NN 181 680], on the slopes of An Garbhanach [NN 187 665] leading down to the Steall [NN 177 685] reach of Glen Nevis, the Glen Coe Quartzite is folded to and fro (and even more strikingly slid) along with its bordering Leven and Binnein Schists (Figure 16). The result, though on a quite moderate scale, is definitely spectacular as may be gathered from (Figure 12) which is based on photographs. The map, (Figure 16), follows in most particulars the original six-inch survey by the writer in 1907; but it is modified to an important extent by insertion of slides and certain other features borrowed from a new six-inch map published by G.S. Johnstone (1955). The two maps have not been compared by the writer in the field, so that certain unimportant additional changes may prove desirable. It may perhaps be recalled that the writer had already alluded to "a number of obvious minor slides, which occur in connection with recumbent folds of the Glen Coe Quartzite on the southern side of Glen Nevis" (1934a, p. 488, footnote); but he had never time, since realising the value of current-bedding, to re-examine the exposures. Johnstone undertook this task and was rewarded by finding the Glen Coe Quartzite to be right-way-up practically everywhere from the latitude of Upper Steall [NN 187 688] ruin in (Figure 16) southward until the upper limb of the little recumbent syncline of Coire Càth a' Chaoruinn [NN 186 678] is reached. This firmly establishes the three slides he has traced. (He himself does not join the middle with the lower slide as is shown in (Figure 16), but this is a trifle.) It also shows that all three slides are thrusts, in the sense that they cut out hypothetical reversed limbs. The uppermost of them is well exposed at the base of Steall [NN 177 685] waterfall, where it serves as an obviously transgressive boundary between uninverted Glen Coe Quartzite (8) and underlying Leven Schist (7), younger, of course, than itself.

When northwards the River Nevis [NN 200 680] is reached, to and fro folding sets in again. The folds are of no great extent, and the pitch continues steeply towards the south. This involves the quartzite in a compressed zig-zag outcrop. After two such folds are passed, what we may call the Sgùrr a' Bhuic Antiform rises to the surface with a core of Binnein Schist. This is crossed by the north margin of (Figure 16), and is at first considerably obscured by landslip. Glen Coe Quartzite on the north-west side of the schist core continues the main outcrop; while, on the south-east side, it extends into what must be a sharp synform. Quite probably the upper reversed limb of this synform may be replaced by a thrust, but the locality has not been searched for current-bedding. The steep pitch that brings the Sgùrr a' Bhuic Antiform into view soon moderates. Accordingly the Binnein Schist of the anti-formal core outcrops for a couple of miles in a north-east direction.

Then, at Sgùrr Choinnich Mòr, from beneath this Binnein Schist, Glen Coe Quartzite rises in accord with the usual southerly pitch. This tectonically low-level portion of the quartzite is itself very strikingly folded to and fro, in folds that always pitch more or less to the south-west. An observer who climbs the quartzite ridge where it leaves Sheet 53 (6 miles S.S.E. of Spean Bridge [NN 222 817] railway station), will see, looking back towards Stob Coire Easain, three minor, but very attractive, recumbent folds, superimposed.

Tectonic detail: Garbh Bheinn Synform and associated slides

We must briefly recapitulate some of the structural findings set out in our stratigraphical account of the Caolasnacon neighbourhood [NN 138 607], south of Loch Leven (p. 98): the heart of the Garbh Bheinn Synform, a mile E.N.E. of Caolasnacon ((Figure 15), east), is occupied by Eilde Quartzite, of which the synformal disposition is self-evident; this quartzite is everywhere upside down; there is probably unlocated sliding in the north-east limb of the synform, for the quartzite is manifestly thinner here than in the south-west limb; Eilde Schist emerges from under the Eilde Quartzite both on the north-east and south-west, and in the latter position is connected with the quartzite by obvious stratigraphical transition. On both sides again the Eilde Schist is followed by Binnein Quartzite younging away from it.

Across the loch to the north complications are indicated on Sheet 53 by three heavy black lines, two of them broken. These are indexed as slides. Let us consider them from west to east.

The first heavy line, west of the Caolasnacon narrows, is inserted to indicate the observed failure of the western (Caolasnacon) outcrop of Binnein Quartzite shortly after crossing the loch. From here onwards for half a dozen miles to

the north-east, Binnein Schist comes directly into contact with Eilde Schist. Though indexed as a slide, the hiatus mapped may quite possibly be an original strati-graphical feature. What is certain is that the Caolasnacon outcrop of Binnein Quartzite belongs to a stratigraphical intercalation. In the first edition of this memoir it was wrongly thought that since this Caolasnacon outcrop stopped north of Loch Leven it functioned as the core of an antiform passing under flanking mica-schists, both of them of Binnein Schist age. This is impossible because current-bedding shows that the quartzite, so long as it is present, youngs away from the eastern mica-schist (Eilde of (Figure 15)) and towards the western (Binnein). The old view also held that the quartzites exteriorly flanking the micaschists formerly met overhead, both of them of Glen Coe age. This too is contradicted by current-bedding: the Eilde Quartzite of Garbh Bheinn and Stob Coire na h' Eirghe is seen to be older than the mica-schist (Eilde) bounding it on the west; while the Glen Coe Quartzite of the Pap of Glen Coe [NN 125 595] and Mam na Gualainn [NN 116 625] is seen to be younger than the mica-schist (Binnein) bounding it on the east.

Sheet 53 and (Figure 16) show an outcrop of Binnein Quartzite exposed in the valley of Allt Coire na Gabhalach [NN 202 680] near its junction with Glen Nevis. The thickness of this quartzite need only be small, for the general dip follows roughly the slope of the ground. Shearing is intense, and no indication of current-bedding has been found. It is, however, almost certain that the quartzite lies at a considerably lower structural level than that occupied by the Eilde Quartzite outcrop terminating in An Garbhanach [NN 187 665] (cf. (Figure 12)): and it seems likely that it is a local patch on the line that has been hypothetically drawn to separate Binnein and Eilde Schists. A mile to the south-south-west this line is located beyond question by reappearance of Binnein Quartzite as explained on p. 108.

The second heavy line represents an indubitable slide, "shown by discordance" as noted in (Figure 15). It is a scenic feature, serving as upper limit to an outcrop of Eilde Schist which divides the Stob Coire na h' Eirghe [NN 161 642] outcrop of Eilde Quartzite into two unequal parts before reaching Loch Leven. The part below this Eilde Schist corresponds with the Garbh Bheinn outcrop across the loch. The part above, that is to the north-west, is thrown into a conspicuous isoclinal fold closing downwards towards the loch, beyond which it does not reappear. The lower limb of this synformal fold is seen in the landscape to be almost entirely cut out by the slide under consideration.

The third heavy line, continuing north-eastwards from Loch Leven to An Garbhanach [NN 187 665], also represents a slide, but one that had to await examination of current-bedding for its detection. In (Figure 15) it is noted as a "slide because Eilde Quartzite youngs away from Eilde Schist". The stratigraphical correlations involved in this note are taken from the previous Section on Stratigraphical Detail: West and. East of Caolasnacon. The younging evidence is admittedly scanty, but (1) at the top of the steep slope leading down to Allt Nathrach [NN 160 631], (2) in Allt Nathrach [NN 160 631] itself and (3) on the arete north-east of the cairn on Am Bodach current-bedding was observed in Eilde Quartzite close to, or fairly close to, its junction with Eilde Schist; and in all three localities the current-bedding of the quartzite younged away from the schist.

We now pass on to show that marginal sliding along this line is reassuringly demonstrable on strictly local evidence east of An Garbhanach [NN 187 665], irrespective of stratigraphical correlations. A deer-stalkers' path crosses An Garbhanach [NN 187 665] roughly from north to south, passing obliquely over the whole width of the outcrop of what is interpreted as Eilde Quartzite. All the way the quartzite is steep, with abundant exposures of current-bedding. This latter youngs consistently north-westwards ((Figure 13)i), until within a few yards of the mica-schist that follows to the south-east. Here at last the current-bedding youngs unmistakably south-eastwards ((Figure 13)j). It is impossible for a formation to behave in this fashion without the help of a slide on one side or other of the exceptional evidence. The most obvious explanation, according also with that derived from consideration of Garbh Bheinn, is as follows: at An Garbhanach [NN 187 665] Eilde Quartzite is disposed in a fold between two outcrops of Eilde Schist, younger than itself; and in the south-east limb of this fold it has been almost, though not quite, cut out by sliding.

Tectonic detail: Kinlochleven

The main object of this and the two following discussions is to furnish details concerning the antiformal belt of Binnein Quartzite which outcrops from the Cauldron-Subsidence of Glen Coe through Kinlochleven, Binnean Mòr and Binnein Beag [NN 222 677] to reach the map margin at Meall a' Bhiùirich [NN 253 706]. These localities can be found on Sheet 53. On (Figure 15) the belt, in two main outcrops, extends from the head of Loch Leven to past Eilean nam Ban [NN 159

619].

Immediately south of Kinlochleven, what may be called the Kinlochleven Antiform carries Binnein Schists steeply up for 1500 feet into overlying Binnein Quartzite. The upfold is sectioned in an abrupt hill-face which has an average slope of 45°, so that structural relations are exposed to perfection. In fact in many conditions of lighting they can easily be followed by an observer standing below on the road, for instance at the Kinlochleven bus garage. The quartzite of the arch pitches strongly south-eastwards to pass under Eilde Schists, which, close at hand, as Sheet 53 shows, furnish the core of a complementary synform. This latter is well displayed west of the antiform on the hill-face visible from the town. At the top of the hill it is an open obvious synform affecting successive beds of the quartzite. Lower down it becomes steeply isoclinal.

To get a complete picture of the structure east of the Kinlochleven Antiform, permission has to be obtained to examine the light-railway cutting inside the Aluminium Factory [NN 190 618] grounds. A pipe-line, which lies outside the grounds on the east should next be visited.

In the railway cutting the quartzite of the east limb of the Kinlochleven Antiform is bent up in an open synform, which in turn is followed by an open antiform easily recognised on the hillside. Both these folds pitch somewhat steeply southwards. Beyond to the east there is no more folding, and the Binnein Quartzite of the east limb of the last-mentioned antiform continues to dip steeply, as seen to perfection along the pipe-line, until it passes under Eilde Schist. Everywhere, in the railway cutting and along the hillside and pipe-line, abundant current-bedding shows that the Binnein Quartzite, though it overlies Binnein Schists and underlies Eilde Schists, is older than the former and younger than the latter. The succession has been overturned in the great Kinlochleven Inversion. It may be added that just beyond the Eilde Schists outcrop, Eilde Quartzite, exposed in an alternative channel of the River Leven south of the main gorge, shows occasional current-bedding. This, in keeping with the rest of the evidence, youngs consistently towards the Eilde Schists and away from the Eilde Flags.

The south-westerly or southerly pitch, characteristic of the Kinlochleven Antiform and its flanking folds south of the town, gives place, in ground mapped by W. B. Wright across the River Leven, to north-easterly pitch. One result is that the outcrop of the Binnein Schist core of the Kinlochleven Antiform extends only a short distance beyond the River Leven. (It just reaches the head of Loch Leven in (Figure 15), east.) Its northern margin is exposed in the main road close to Allt Coire na Bà [NN 190 640] (east of (Figure 15)). Here Binnein Schist passes northwards under Binnein Quartzite, of course upside down. We have already selected the quartzite exposures leading westwards from this point to the first reappearance of Binnein Schists, a quarter of a mile short of the Allt Nathrach [NN 160 631] bridge, as furnishing type examples of inverted current-bedding (p. 95).

In harmony, the hillside north of the termination of the exposed Binnein Schist core of the Kinlochleven Antiform shows Binnein Quartzite in a series of minor folds pitching gently north-eastwards under Eilde Schists. This impressive low-angled inversion continues across strike for a mile and a quarter, and is a prominent feature of Sheet 53. Eastwards, a quarter of a mile before reaching Meall an Doire Dharaich [NN 203 624], the quartzite — schist junction bends down steeply to cross first the River Leven and then the pipe-line of which we have already spoken. The sharp downward bend of the quartzite is a prominent scenic feature. It is due to a modified continuation of the antiform seen a little east of the Kinlochleven Antiform south of the river.

Westwards, between Mamore Lodge [NN 186 630] and Sgòr an Fhuarain [NN 177 637], the low-angled inversion of Eilde Schist over Binnein Quartzite again comes to an end, but in this case in a sharp upturn, which is due to a modified continuation of the synform immediately west of the Kinlochleven Antiform south of the river. The result of the flat zone, bounded to the east by a downturn and to the west by an upturn, is to give the Eilde Schist a markedly zig-zag outcrop. Sheet 53 shows that the Eilde Quartzite outcrop follows the same pattern, incidentally demonstrating inversion to the extent of a mile and a half, which of course is only part of the total Kinlochleven Inversion responsible for the detached outcrop of Eilde Quartzite running through Garbh Bheinn and Am Bodach.

The next exposure of Binnein Schists to be noted is shown on Sheet 53 three-quarters of a mile north of the head of Loch Leven, just north of General Wade's Military Road south-west of Sgòr an Fhuarain [NN 177 637] (nat. grid [NN 173 632]).

Its antiformal character is obvious as also is the inverted current-bedding of its Binnein Quartzite envelope.

Beyond this we reach the largest of the Binnein Schist outcrops that are associated internally with the complex Kinlochleven spread of Binnein Quartzite. In (Figure 15) it is shown crossing Loch Leven at Allt Nathrach [NN 160 631]. Approached from the east it presents no difficulty. Let us start on the south side of the loch.

Here the outcrop of Binnein Schist under consideration lies 600 yards W. of that belonging to the core of the Kinlochleven Antiform; and, as we have already noted, the intervening Binnein Quartzite is disposed in a clearly recognisable synform. Accordingly we may be sure that the schists of the two outcrops meet a short distance underground. In keeping with this our present outcrop, as shown in (Figure 15), is reduced to half its inland width just before reaching the loch by north-westerly pitch.

North of the loch the continuation of our Binnein Schist outcrop emerges at the shore from under Binnein Quartzite, the latter characterised by inverted current- bedding ((Figure 13)d). Inland the same junction is particularly well exposed beyond an unrewarding precipitous wooded slope, and shows to perfection a banded transition zone with abundant current-bedding always younging from Binnein Quartzite to Binnein Schist.

Further still, on the west slope of Sgòr an Fhuarain [NN 177 637], the Binnein Schist outcrop terminates, and Binnein Quartzite is seen folding over it antiformally.

Here simplicity ends. Much of the Binnein Quartzite outcrop to the west has been complicated by slides, only one of which is shown on Sheet 53. In (Figure 15) an additional one is indicated; and there may be several.

The more westerly of the two, so far as the ground south of the loch is concerned, has only recently been discovered by W. G. Hardie (1955). South of (Figure 15) he traced it for half a mile as a transgressive boundary between Binnein Quartzite and Eilde Schist, responsible for quick south-eastward reduction of the former's outcrop almost to nothing. (No one has recently re-examined this outcrop where it recuperates, still further south.) Within (Figure 15) Hardie followed his western slide northwards into the heart of the Binnein Quartzite outcrop as western boundary of Area (c) — to be explained below. On the south coast of Loch Leven he could not locate it; but it seems fairly certain that it does cross the loch as shown in (Figure 15) to join up with a similarly situated western slide long recognised on the north coast. Here the slide is very clear, for it is responsible for discordances of dip in the Binnein Quartzite on its two sides.

Between the two slides as drawn on (Figure 15), Areas (a), (b) and (c) have been distinguished by attention to current-bedding.

In. Area (a) current-bedding youngs away from the Binnein Schist outcrop that we are considering. North of Loch Leven, Area (a) occupies the whole space between the two slides. South of the loch it is at most 100 yards wide. (Current-bedding, younging S.W., is very well exposed in Binnein Quartzite adjoining Binnein Schist alongside each of the two main roads, north and south of the loch respectively.)

In Area (b) current-bedding youngs towards our Binnein Schist outcrop. It is not known whether or no Area (b) anywhere reaches the Binnein Schist margin.

In Area (c), first recognised by Hardie, current-bedding youngs away from our Binnein Schist outcrop, from which it is separated by 400 yards occupied by Areas (b) and (a). Area (c) is only 400 yards long and 100 yards wide. Its western margin (the western slide) separates it obliquely from Binnein Quartzite which is younging in the opposite direction.

Itwill be understood that it is the orientation of current-bedding in Area (a) that has led to the drawing of the eastern slide that is shown alone in Sheet 53. The quartzite of all three areas, (a), (b) and (c), is of the pure white Binnein type, the same as occurs beyond the Binnein Schist outcrop that lies to the east. As stated above, this Binnein Schist outcrop in Sgòr an Fhuarain [NN 177 637] is seen to be antiformal. Therefore we should expect that, if there were no sliding, the age relations of the flanking quartzites should be identical. In actual fact, as we have noted, the quartzite on the east, in junctions that are unmistakably unslid, youngs towards the mica-schist (p. 106); while the quartzite on the west youngs away from the same — and the junctions are not of a kind to preclude the possibility of sliding.

Tectonic detail: Binnean Mòr and Binnein Beag [NN 222 677]

The present district, mapped by W. B. Wright, extends the Kinlochleven district north-eastwards from Sgòr an Fhuarain [NN 177 637] to Binnein Beag [NN 222 677]. The behaviour of the Eilde Schist and Eilde Quartzite outcrops along its south-east margin continues what we have described north of Kinlochleven so simply that it can be understood on consulting Sheet 53 without further comment.

We have already noted how the Allt Nathrach [NN 160 631] outcrop of Binnein Schist ((Figure 15), east) terminates north-eastwards antiformally on the west side of Sgòr an Fhuarain [NN 177 637] (Sheet 53), with Binnein Quartzite crossing over it. On the east side another outcrop of Binnein Schist, which we may name after Na Gruagaichean [NN 203 653], terminates south-westwards in the same quartzite setting, but without local indication as to whether it closes up or down. Followed to Binnean Mòr, however, its antiformal character becomes self-evident. The Binnein Quartzite of this mountain is thrown into a picturesque succession of two synforms and two anti-forms with gently inclined axes. The antiforms have very steep south-east limbs and quite gently inclined north-west limbs. Current-bedding demonstrates convincingly that, as at Kinlochleven, the antiforms and synforms affect quartzite already upside down, part of the Kinlochleven Inversion.

Returning towards Sgòr an Fhuarain [NN 177 637], we find in Allt Coire na Bà [NN 190 640], a section across the Gruagaichean strip of Binnein Schist, that we now know serves as core to a steep antiform. The outcrop of the schist is here 100 yards wide, and it is flanked by outcrops of Binnein Quartzite, about 300 yards wide on either side. Both these flanking outcrops are proved by current-bedding to young towards the intervening Binnein Schist and away from external outcrops of Eilde Schist. As shown in Sheet 53 the Eilde Schist outcrop on the north-west reaches across strike to the Eilde Quartzite outcrop of Am Bodach and An Garbhanach [NN 187 665]; while that on the south-east reaches across strike to the Eilde Quartzite outcrop of Sgùrr Eilde Mòr [NN 232 654].

Here then we have in epitome the structure of the whole Kinlochleven–Binnein Mòr [NN 213 664] region: a central antiform with Binnein Schist core, flanked either side by an inverted succession of Binnein Quartzite, Eilde Schist and Eilde Quartzite. Of course if we look at details we find a complication, namely the slide previously discussed that serves as south-eastern boundary to the Eilde Quartzite outcrop of Am Bodach.

Let us now face other complications. From the Cauldron-Subsidence of Glen Coe as far north as Na Gruagaichean [NN 203 653] the Binnein Quartzite of the antiformal complex is always bounded externally by mica-schist older than itself, that is, Eilde Schist. At Binnein Beag [NN 222 677] things are different. The schist to the east is still Eilde Schist, as demonstrated for instance by current-bedding in the quartzite margin at Meall Doire na h-Achlais [NN 245 685]; but that to the west and north is now Binnein Schist according again to evidence from current-bedding. In keeping with this, where the outcrop of this Binnein Schist sweeps eastwards half across the quartzite outcrop on the north-east slope of Binnein Beag [NN 222 677], the deviation is due to south-westerly pitch (admittedly in some cases steep). Also, in an antiform indicated on Sheet 53 by outcrop lines the current-bedded quartzite is seen, correspondingly, to be upside down.

The solution to the puzzle is afforded by study of the most north-westerly portion of the Binnein Beag [NN 222 677] outcrop of quartzite. At about a quarter of a mile south-west of the mountain summit this portion of the outcrop begins to separate as a distinct band from the main mass by insertion of a strip of mica-schist. The resultant band of quartzite, at first 400 yards wide, eventually dwindles to nothing a mile and a quarter to the south-west. Current-bedding is well exposed in a stream draining north of west midway between Binnein Beag [NN 222 677] and Binnean Mòr. It is seen in quartzite intercalations in the mica-schist and incessantly across the whole width of the quartzite under consideration; and it invariably youngs northwest. Accordingly:

1. The mica-schist of the insertion is Eilde Schist, obviously connecting with the Eilde Schist belt that further south flanks the Binnein Quartzite- complex of Sgòr an Fhuarain [NN 177 637] externally on its north-west side.
2. The Binnein Quartzite band to the north-west is a stratigraphical intercalation between this Eilde Schist and Binnein Schist to the north-west again.

3. Where the Binnein Quartzite band fails to the south-west it allows Eilde Schist to make direct contact with Binnein Schist.

Whether the south-west disappearance of the Binnein Quartzite band is stratigraphical or tectonic, it is impossible to say. On Sheet 53, a heavy broken line is inserted to mark approximately the cross-country position of the direct junction between Eilde and Binnein Schists. It leads, as drawn, to the locality north of Loch Leven, three-quarters of a mile north-west of Caolasnacon, where undoubted Binnein Quartzite reappears.

Another heavy broken line marking a hiatus, likely a slide, is inserted on Sheet 53, for a mile and a half south-west from Binnein Beag [NN 222 677]. At first it separates the Eilde Schist tongue of Binnein Beag [NN 222 677], younging north-west, from the much folded quartzite of Binnean Mòr. Further south it brings the same Eilde Schist, for three-quarters of a mile along strike, into contact with the Binnein Schist core of the Na Gruagaichean Antiform. Still further south, on the Na Gruagaichean [NN 203 653] ridge, its place is taken conspicuously by Binnein Quartzite in normal succession.

Tectonic detail: Meall a' Bhiùirich [NN 253 706]

Special complications present themselves in Meall a' Bhiùirich [NN 253 706] on the eastern border of Sheet 53, and require for their discussion knowledge of a considerable area lying to the north-east. Here two points may be mentioned: (1) rapid thinning leads to disappearance of Eilde Quartzite of the type outcrop as it approaches and crosses the continuation of Glen Nevis; and (2) north-east pitch at the very margin of the map carries Eilde Quartzite and associated Eilde Schists under Eilde Flags, the last we see of the Kinlochleven Inversion. A little further information is given in the following section K.

K. Problem at Blackwater Reservoir [NN 250 605]

The western end of Blackwater Reservoir [NN 250 605] just enters Sheet 53 half way along its eastern margin; and the problem referred to in the title of this section is the stratigraphical and structural position of four bands of metamorphic sediments outcropping east of the type Eilde Flags and west of the reservoir. The four formations have been given local names to avoid premature correlation: Stob Quartzite, next to the Eilde Flags; Reservoir Schists; Reservoir Quartzite; Reservoir Flags. The name Stob has been taken from eastern Stob Coire Easain in Sheet 54 (nat. grid [NN 308 731]).

Carruthers was of opinion that these four formations were successively older than the Eilde Flags; but here more recent work seems to have proved him mistaken. Current-bedding at eastern Stob Coire Easain demonstrates that the Stob Quartzite youngs away from Eilde Flags at what appears to be a transitional contact (Bailey 1934a, p. 502). There is very considerable inversion at this point, for the Stob Quartzite pitches under Eilde Flags in a well exposed synform and antiform which together measure more than a mile across strike.

It is highly probable: that the Stob Quartzite is Eilde Quartzite, coalesced perhaps with Binnein and Glen Coe Quartzites; that the Reservoir Schists are Leven Schists, with which, despite higher metamorphism, they agree rather closely in character; that the Reservoir Quartzite is Stob (Eilde) Quartzite reappearing; and that the Reservoir Flags are Eilde Flags.

Stob (?Eilde) Quartzite

The Stob (?Eilde) Quartzite is fine-grained, considered as a sediment, though metamorphism has sometimes led to coarse recrystallisation. It is in part white, massive and pure; in part felspathic. Its outcrop in the River Leven is nearly a third of a mile wide; but elsewhere it is much narrower until eastern Stob Coire Easain is approached in Sheet 54. Further on again it vanishes. Search for current-bedding in the River Leven has proved unavailing.

Reservoir (?Leven) Schists

The Reservoir (?Leven) Schists have a central band characterised by conspicuous biotite pseudomorphs after actinolite. This band has been named by Carruthers the "Ermine Rock", and has been traced by him for twelve miles along strike north-east from the River Leven. It is like certain developments of the Leven Schists far to the south-west between Glen Creran and Glen Etive. West of the Ermine Rock Carruthers describes the Reservoir Schists as garnetiferous, and east of it as non-garnetiferous and usually red.

Reservoir (?Eilde) Quartzite

The Reservoir (?Eilde) Quartzite is fine-grained and yellowish. It is best exposed at the foot of the reservoir and on Stob Beinn a' Chrùlaiste [NN 232 564] three miles to the south.

Reservoir (?Eilde) Flags

The Reservoir (?Eilde) Flags are like the Eilde Flags. They are cut off to the east by the Moor of Rannoch Pluton.

When we turn to consider structure we note (*cf.* Sheets 53, 54; (Figure 28), (Figure 29); Bailey 1934a, pl. xv):

According to the above suggested correlations, based partly on current-bedding and partly on character, the Eilde Flags of the type outcrop are bounded, both to north-west and to south-east, at the present surface of erosion, by Eilde Quartzite, younger than themselves..

North-east pitch carries these type Eilde Flags in the Kinlochleven Inversion northwestwards over type Eilde Quartzite of the north-west outcrop, both past the outlet of Loch Eilde Mòr [NN 230 640] and at Meall a' Bhiùirich [NN 253 706] on the eastern margin of Sheet 53.

South-west pitch carries them in the Stob Inversion south-eastwards over presumed Eilde Quartzite of the Stob outcrop, both at eastern Stob Coire Easain [NN 308 731] in Sheet 54 and, 10 miles further south, from Altnafeadh [NN 222 563] to Càm Ghleann, where the effect of pitch is supplemented by down-throw within the Cauldron-Subsidence of Glen Coe.

Accordingly, if we were restricted to localities enumerated above, the natural interpretation would be to equate the Kinlochleven and Stob Inversions and to picture the Eilde Flags of the type outcrop as everywhere floating on one and the same band of Eilde Quartzite. Mapping, however, further north-east, for which we are mainly indebted to Carruthers (1923, fig. 1, p. 18; modified slightly in Bailey 1934a, pl. xv and p. 507), has shown that this is too simple an interpretation. Here we can only state dogmatically the outcome of the most recent work on the subject.

The Kinlochleven Inversion north-west of the Eilde Flag type outcrop in Sheet 53 is on a higher structural level than the Stob Inversion south-east of the same. Both these inversions mark the lower limbs of recumbent anticlines, the Kinlochleven Recumbent Anticline above, and the Stob Recumbent Anticline, below. The Eilde Flag cores of these two anticlines join in the type outcrop of this formation within the limits of Sheet 53, but are separated north-westwards by the quartzites and mica-schists that, in Sheet 53, outcrop between Loch-Eilde Mòr and Am Bodach. Furthermore, the Kinlochleven Inversion shrinks greatly towards the north-east. Thus it is found in Sheet 54 that the younger formations of Meall a' Bhùirich [NN 253 706] soon fail to penetrate south-eastwards under the Eilde Flags continuing the type outcrop. For further information the reader is referred to the descriptions quoted above, with the proviso that the position of a hypothetical slide separating Binnein and Eilde Schist north of Meall a 'BhÙirich (*in* Bailey 1934a, pl. xv) requires minor adjustment. E. B. B.

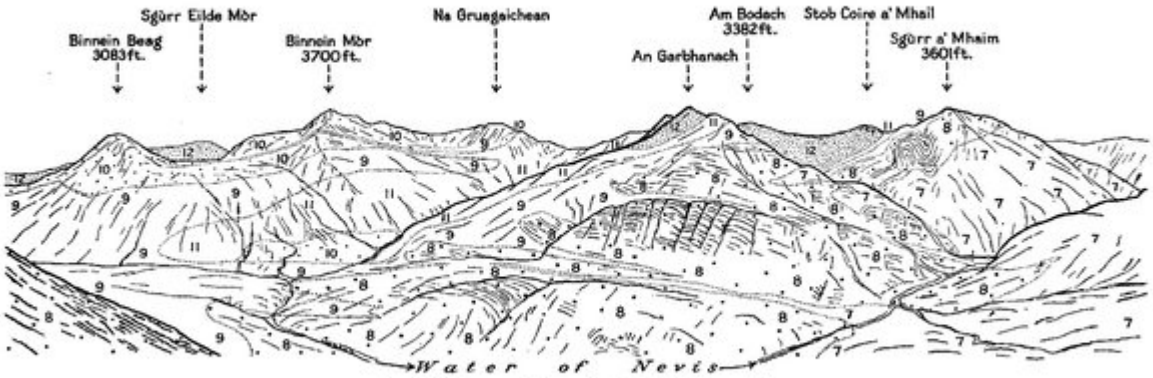


FIG. 12. View across Upper Glen Nevis, looking south

7, Leven Schists (youngest); 8, Glen Coe Quartzite; 9, Binnein Schists; 10, Binnein Quartzite; 11, Eilde Schist; 12, Eilde Quartzite. For slides, see Sheet 53 and Figs. 14, 16

(Figure 12) View across Upper Glen Nevis, looking south. 7, Leven Schists (youngest); 8, Glen Coe Quartzite; 9, Binnein Schists; 10, Binnein Quartzite; 11, Eilde Schist; 12, Eilde Quartzite. For slides, see Sheet 53 and (Figure 14), (Figure 16).

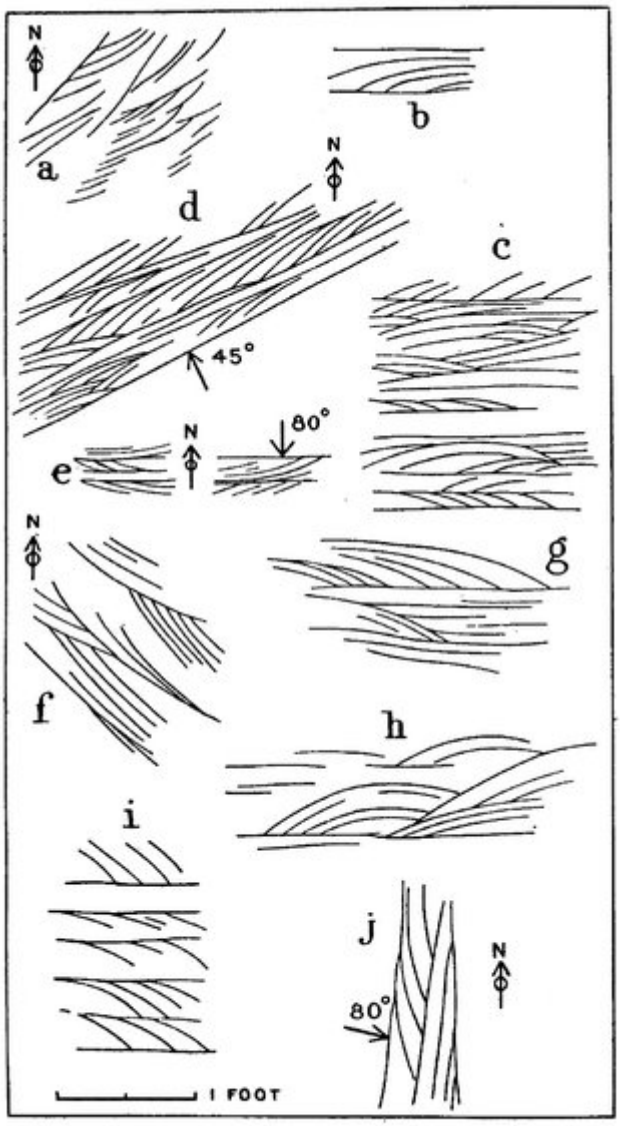


FIG. 13. Sketches of current-bedding

(Figure 13) Sketches of current-bedding. Explanation of Figure. 13 — Sketches of Current-Bedding Sketches a, d, e, f and j, which represent current-bedding on a fairly flat surface, are treated as maps with the north point at the top. The remaining sketches, of current-bedding on fairly steep faces, are treated like strike-sections with the main bedding represented horizontally. a. Glencoe Quartzite youngs north-westward, away from Binnein Schist. Eastern side of the

mouth of quarry at Rudha Cladaich [NN 122 610], north shore, Loch Leven ((Figure 15), west). b. Glencoe Quartzite youngs downwards, away from Binnein Schist. Southern side of Glen Nevis, almost in a line with a shatter-belt or smash shown on Sheet 53 and (Figure 16). c. Binnein Quartzite youngs downwards towards Binnein Schist. Near northern shore, Loch Leven, half a mile east of Allt Nathrach [NN 160 631] ((Figure 15), east). d. Binnein Quartzite youngs south-eastward, away from Eilde Schist. Northern shore, Loch Leven, three-quarters of a mile west of Allt Nathrach [NN 160 631] ((Figure 15), east). e. Binnein Quartzite youngs northward, away from Eilde Schist. At junction of these formations, southern shore, Loch Leven opposite Eilean nam Ban [NN 159 619] ((Figure 15), east). f. Binnein Quartzite youngs north-eastward, away from Eilde Schist. Same junction as (e), but half a mile inland along strike and just outside (Figure 15), east. g. Eilde Quartzite youngs downwards towards Elide Schist. Roadside, half a mile northeast of Caolasnacon ((Figure 15), east). h. Eilde Quartzite youngs downwards towards Eilde Schist, but at some distance from the contact. Roadside, 1¼ miles east-north-east of Caolasnacon ((Figure 15), east). i. Eilde Quartzite youngs downwards towards Eilde Schist. Near western junction, a little above deer-stalkers' path, 1½ miles north-east of Am Bodach and 3 miles north of Kinlochleven. j. Eilde Quartzite youngs eastward, towards Eilde Schist. Near eastern junction, close to same deer-stalkers' path as (i), but only one mile north-east of Am Bodach.

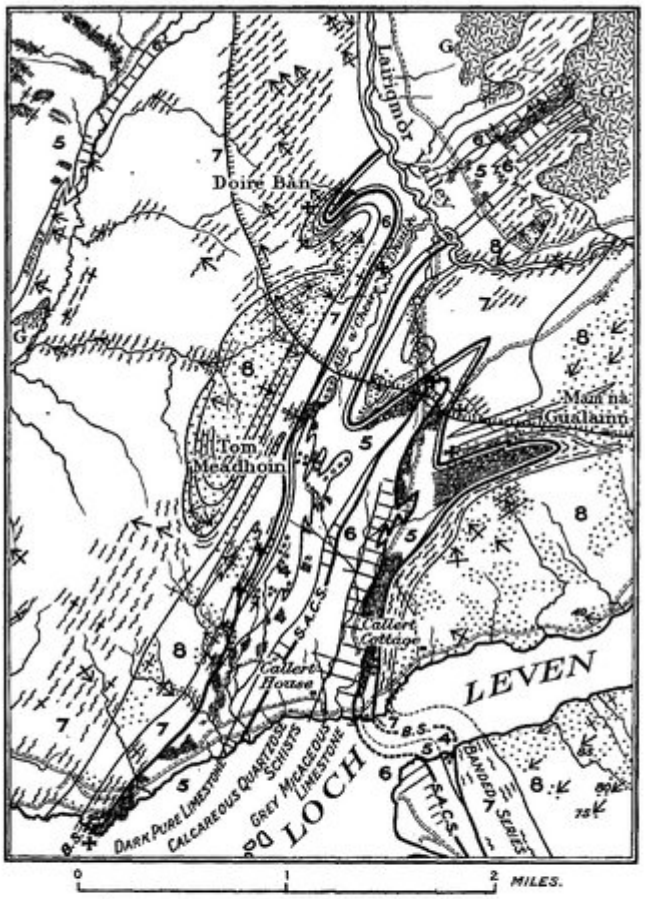


FIG. 8. Map showing outcrops in Callert district

4, Appin Quartzite (youngest); 5, Ballachulish Slates; 6, Ballachulish Limestone; 7, Leven Schists; 8, Glen Coe Quartzite; G, Granite

(Figure 8) Map showing outcrops in Callert district 4, Appin Quartzite (youngest); 5, Ballachulish Slates; 6, Ballachulish Limestone; 7, Leven Schists; 8, Glen Coe Quartzite; G, Granite.

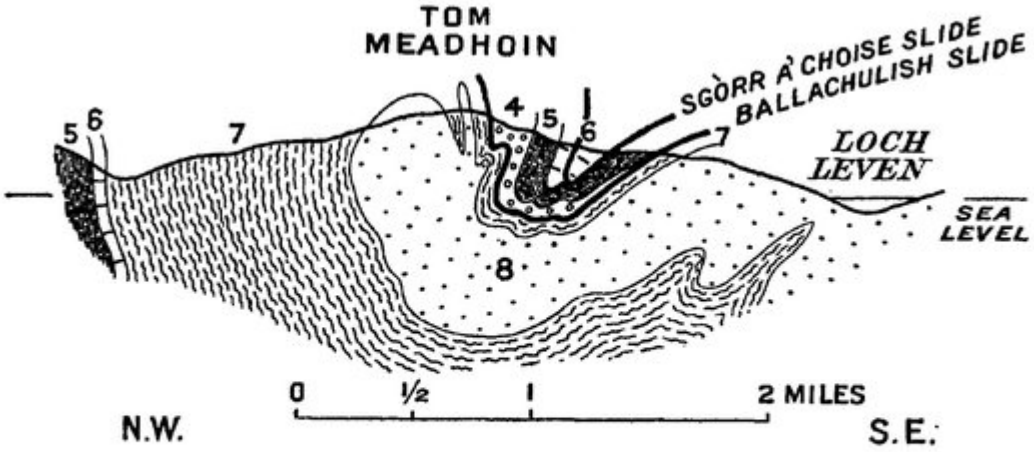


FIG. 9. Section across Fig. 8 showing the relation of the Ballachulish Slide to the Tom Meadhoin Antiform

4, Appin Quartzite (youngest); 5, Ballachulish Slates; 6, Ballachulish Limestone; 7, Leven Schists; 8, Glen Coe Quartzite

(Figure 9) Section across (Figure 8) showing the relation of the Ballachulish Slide to the Tom Meadhoin Antiform 4, Appin Quartzite (youngest); 5, Ballachulish Slates; 6, Ballachulish Limestone; 7, Leven Schists; 8, Glen Coe Quartzite.

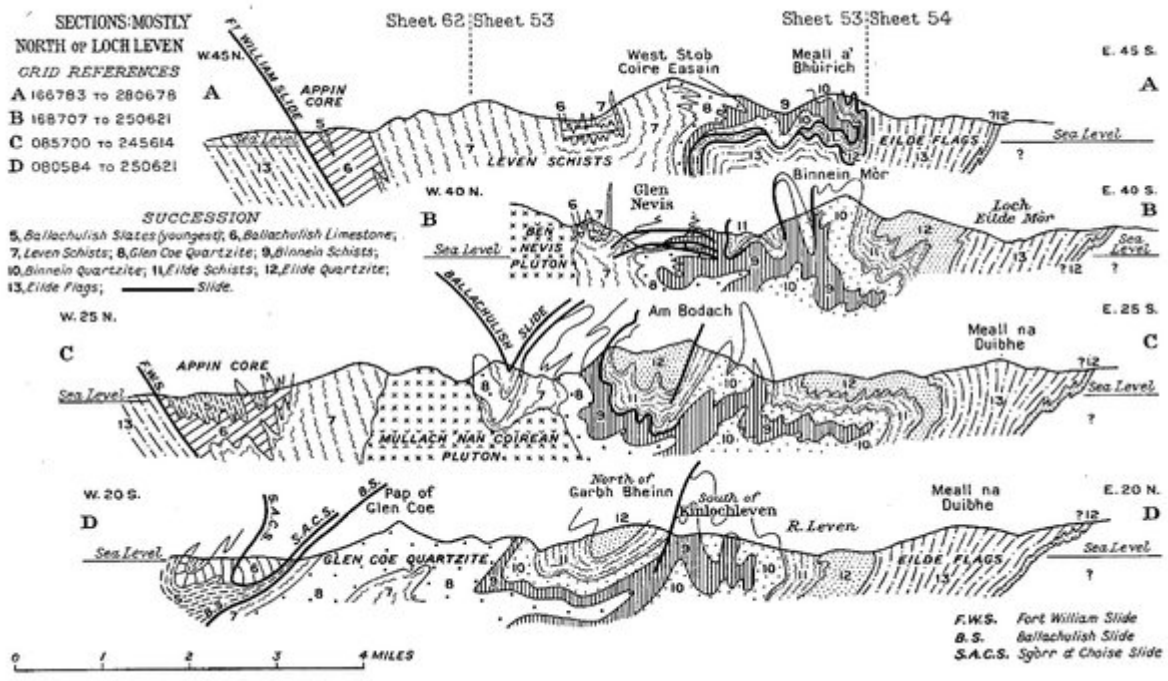


FIG. 14. Sections: mostly north of Loch Leven

(Figure 14) Sections: mostly north of Loch Leven A [NN 166 783] to [NN 280 678]; B [NN 168 707] to [NN 250 621]; C [NN 085 700] to [NN 245 614]; D [NN 080 584] to [NN 250 621].

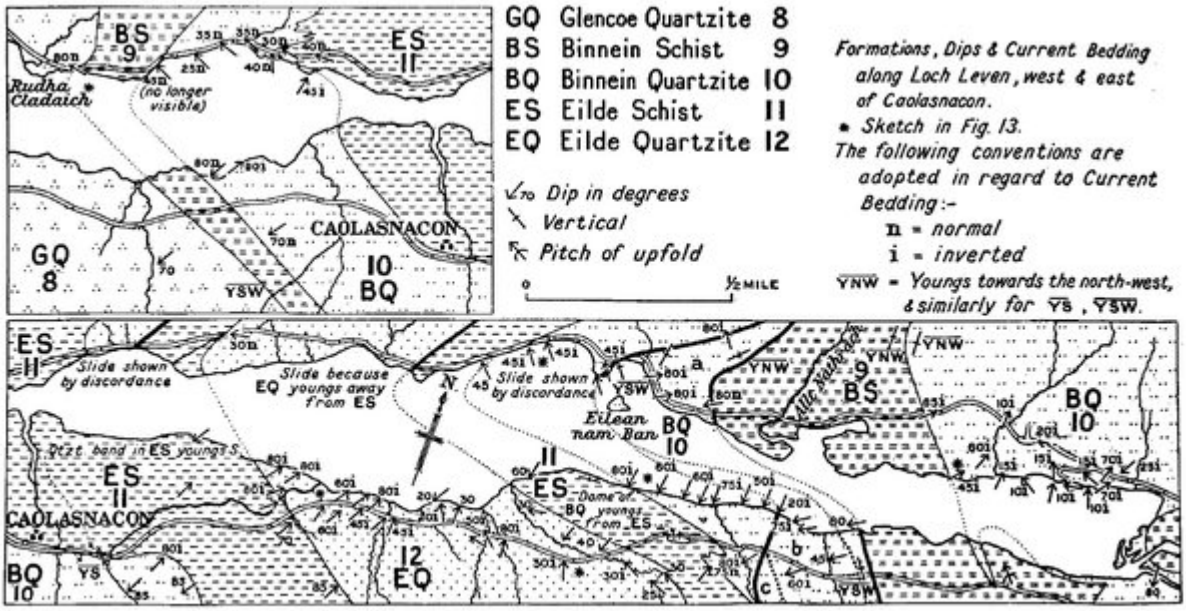


FIG. 15 (West above, east below). Formations, dip and current-bedding west and east of Caolasnacon

(Figure 15) (West above, east below). Formations, dip and current-bedding west and east of Caolasnacon.

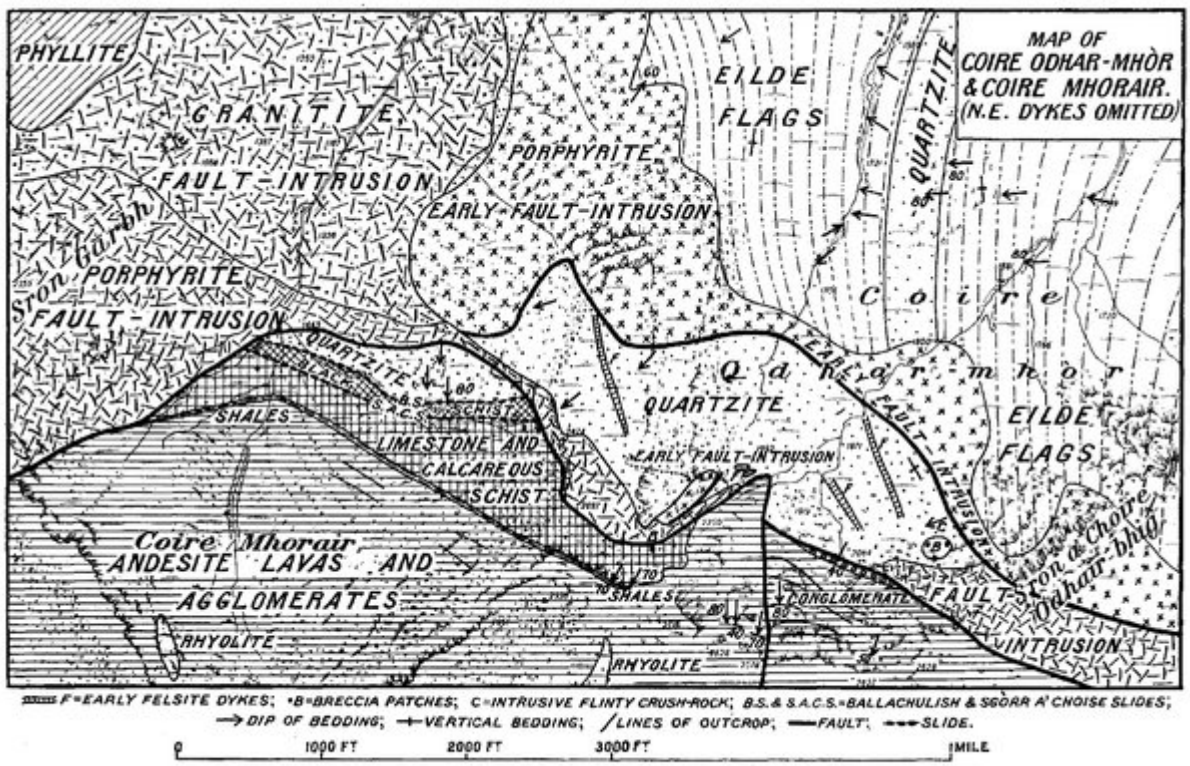


FIG. 24. Map of Coire Mhorair and Coire Odhar-mhòr

(Figure 24) Map of Coire Mhorair and Coire Odhar-mhòr [NN 196 583].

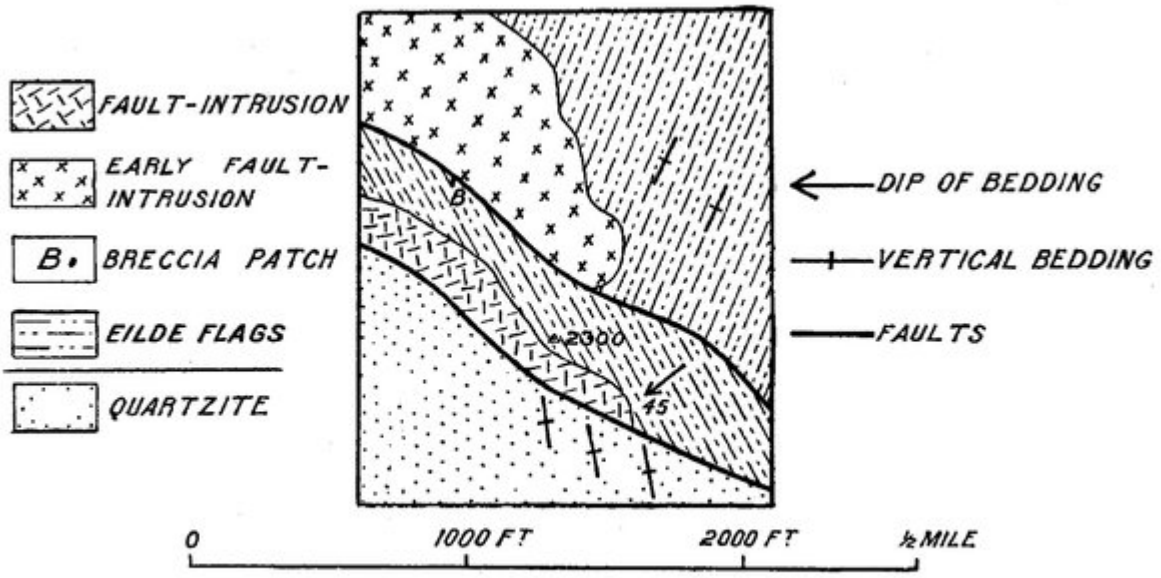


FIG. 26. Map of Stob Mhic Mhartuin. North-east dykes omitted

(Figure 26) Map of Stob Mhic Mhartuin [NN 207 575]. North-east dykes omitted.

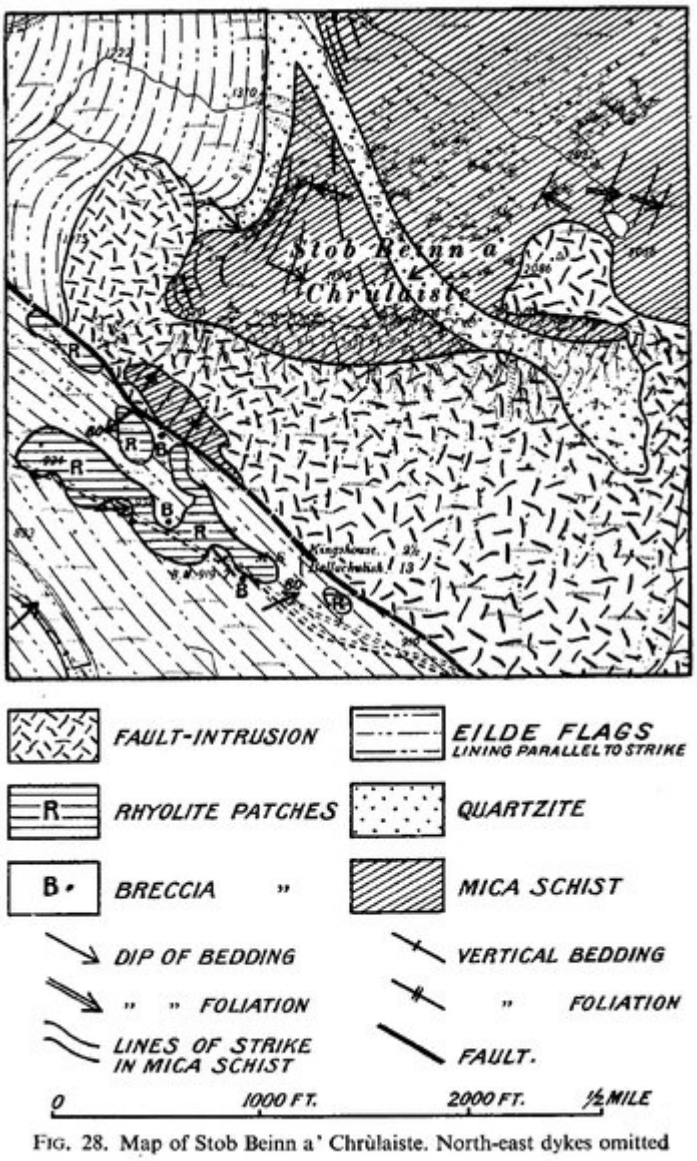
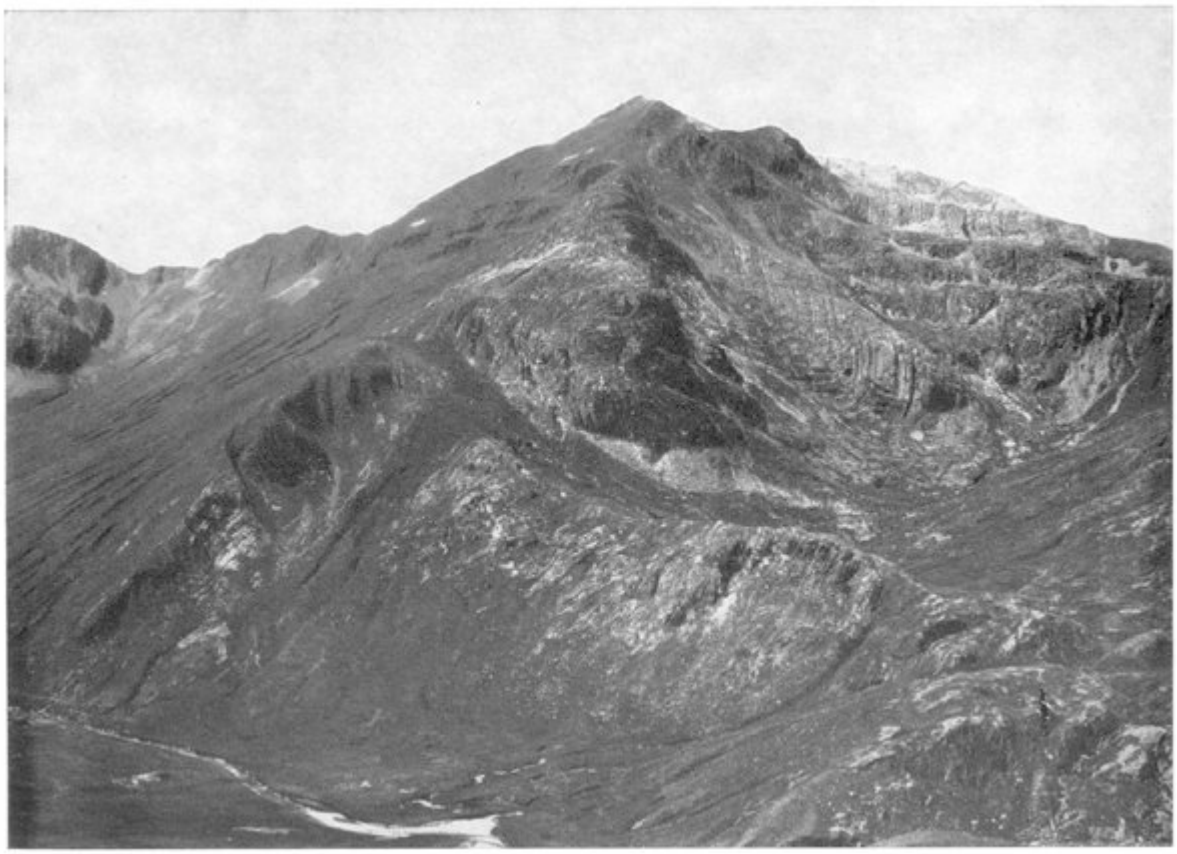


FIG. 28. Map of Stob Beinn a' Chrùlaiste. North-east dykes omitted

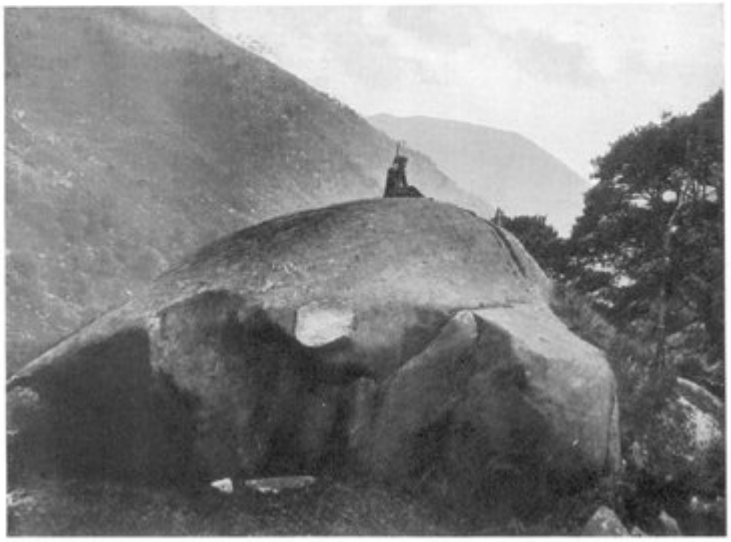
(Figure 28) Map of Stob Beinn a' Chrtilaiste. North-east dykes omitted.

1. Hanging portion of River Leven with dam site of Blackwater Reservoir

(Plate 2) 1. Hanging portion of River Leven with dam site of Blackwater Reservoir [NN 250 605]. 2. Stob Bàn, Near Watershed of Lairigmòr Valley, showing comparatively recent landslip.



(Plate 5) Sgùrr A' Mhàim across Allt Coire A' Mhail Folded Glen Coe Quartzite.



(Plate 13) An Steall, The Waterfall of a valley hanging to Glen Nevis Water-worn crags on left due to stream cascading down marginal crevasse; Roche moutonnee, Glen Nevis, by roadside above Polldubh [NN 141 686] Note gap on "sloss" side due to plucking.

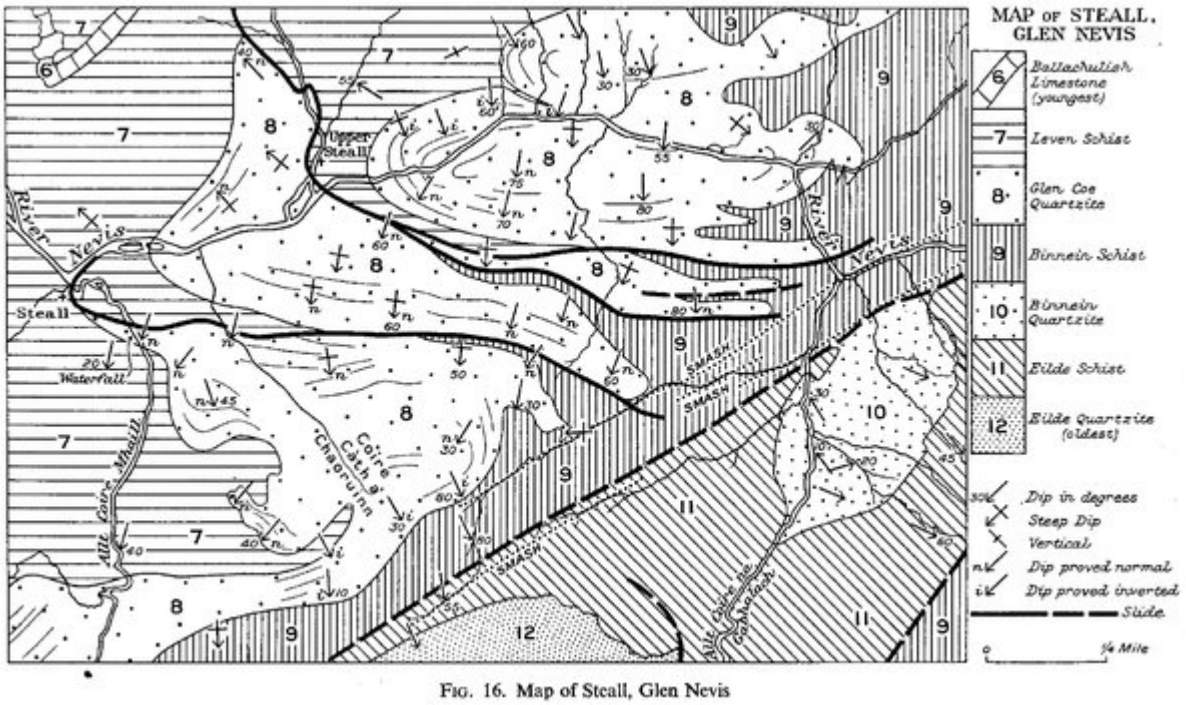
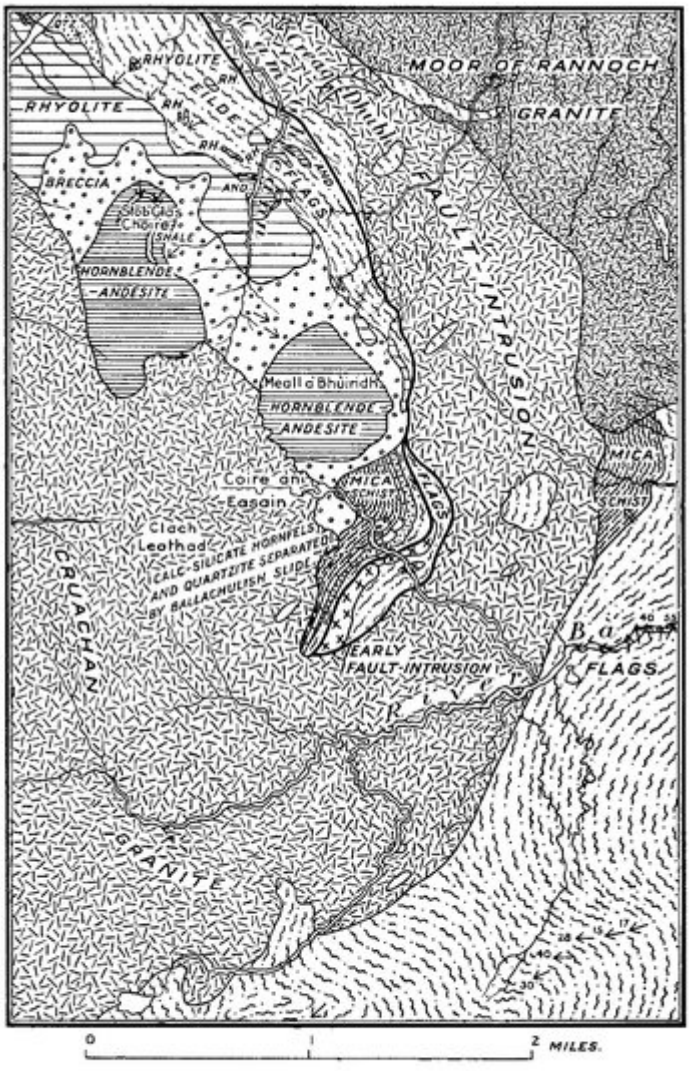


FIG. 16. Map of Steall, Glen Nevis

(Figure 16) Map of Steall, Glen Nevis.



15 Dip, amount in degrees. Vertical 15 Dip of foliation

Fault

FIG. 29. Map of Càm Ghleann and Coire an Easain. North-east dykes omitted

(Figure 29) Map of Càrn Ghleann and Coire an Easain. North-east dykes omitted.