
Chapter 16 Agglomerates or breccias of vents

Introduction

It has been pointed out in Chapter 15 that tumultuous agglomerate or breccia, plays a very important part in the geology of Central Mull; and that, while considerable masses of it seem to be remnants of surface-accumulations, others again certainly occupy eruptive vents. These latter are lettered V on the one-inch Map. Here and there, the difference of field-relations in the two cases has been obscured by later happenings, but (Plate 5) (p. 165), supplemented by (Plate 3) and (Figure 30) and (Figure 35) (pp. 204, 237), emphasizes the frankly transgressive behaviour of the vent-breccias as compared with those that occupy the heart of the Coire Mòr Syncline. In considering (Figure 30), it should be realized that the Sgùrr Dearg Big-Felspar Gabbro, the Glas Bheinn Granophyre, and the Torness Felsite can all be clearly proved to be of earlier date than the adjoining breccia.

When the transgressive relationships of much of the breccia were first realized, two interpretations seemed possible: either the transgressive breccias might be a scree-formation blocking valleys of erosion, or they might be—as all now agree they are—a volcanic agglomerate choking funnels and fissures opened by explosion. The evidence in favour of the latter alternative may be illustrated under two heads: E.B.B .

a) If one supposes the breccia, wherever found, to be a superficial deposit, one should be able to reconstruct from its many isolated outcrops a fair picture of the pre-breccia land-surface. However, if one attempt any such reconstruction, it is only to find progress blocked by what appear to be insuperable obstacles. Thus, the hypothetical pre-breccia river-system south-east of Ben More would have to correspond altogether too closely with the modern river system to be at all probable *when considered in relation to the number of post-breccia, intrusions* developed in the district. The reader will appreciate the force of this argument when he learns that several patches of breccia, too small to be indicated on the one-inch Map, intervene between the two outcrops shown at 1½ and 2 miles, respectively, east-south-east of the summit of Ben More. Of these two, the more easterly is exposed on the floor of Sleibhte-coire, and the more westerly lies 600 ft. higher up and just beyond the summit of a ridge. Exactly the same difficulty presents itself in other localities. For instance on the two slopes of Glen More, facing one another in Cruach Choireadail and Creag na h-Iolaire, patches of breccia are constantly found in association with older rocks. One cannot resist the feeling that these patches are not restricted to a surface, but extend through and through the framework of the country. (C.T.C), E.M.A .

b) A recurrence of breccia-conditions can sometimes be demonstrated under circumstances which seem to render an erosion-origin for the deposit quite impossible. The most striking instance is afforded in the Ben Buie district ((Figure 38), p. 247). On the southern slopes of the mountain, the Ben Buie Gabbro cuts across a great mass of breccia which had previously been traversed by a whole suite of cone-sheets. The relationship is everywhere clear, and is emphasized locally by the gabbro developing a compact edge against the breccia and sheet-complex. But on the northern slopes, west of Loch Airdeglais, the gabbro meets another though similar breccia, and the tables are turned; here the gabbro, as it approaches the breccia, is shattered to pieces and yields abundant fragments to be incorporated in its neighbour. In considering the weight of this evidence, it is important to understand that the breccia of the south face of Ben Buie is full of granophyre-fragments derived, without a doubt, from some portion of the Glas Bheinn Granophyre-Complex (Chapter 12). An erosion-theory is therefore faced with the following sequence of events: (1) the baring of the Glas Bheinn Granophyre; (2) the accumulation of the southern breccia of Ben Buie; (3) the further accumulation of cover for the Ben Buie Gabbro and the intrusion of this mass; (4) the baring of the Ben Buie Gabbro and the accumulation of a northern breccia of the same unbedded, unassorted character as its southern predecessor. Surely, such a recurrence of unusual erosion and accumulation is incredible. Accordingly, one is driven to admit that the transgressive breccias of Central Mull occupy vents opened by explosion at more than one stage in the history of the igneous focus. G.V.W.

A complete account, or even enumeration, of Mull explosion-vents is not attempted in this chapter. Certain examples have already been dealt with in connexion with the alkali-rocks considered in Chapter 14. Many more must be passed over in silence, except in so far as they are covered by general statements in the sequel. The subject-matter will be divided under four main headings which give prominence to various aspects of the matter:

1. The Materials characteristic of Mull explosion-vents are discussed from the point of view of field-observation. Special attention is directed to the frequent occurrence of rhyolite or rhyolitic debris, and also to the local distribution of gneissic fragments ((Figure 29)).
2. Under the heading of Repeated Explosions, the whole question of age-relations is dealt with.
3. The Sgùrr Dearg Vents, reaching from Beinn Chreagach Bheag through Sgùrr Dearg, Glas Bheinn, and Ben Buie, to Sleibhte-coire, are given detailed consideration, not only on account of their great intrinsic interest, but also because they may be regarded as good representatives of the explosion-vents of Central Mull taken as a whole.
4. The Petrology of the vent-agglomerates is treated on the same lines as that of the surface-agglomerates of Chapter 15. Descriptions are almost confined to acid rocks associated with the agglomerates, either in solid or fragmental form. In regard to the non-fragmental rhyolites it may be said that they are lettered R on the one-inch Map, just the same as their fellows occurring among the surface agglomerates. The petrological description is closed with an account of contact-alteration induced by subsequent intrusions.

In describing the surface-accumulations of agglomerate (Chapter 15), it has been pointed out that, within the caldera area, some small proportion of the agglomerate coloured on the one-inch Map as vent-agglomerate really rests upon basalt-lavas. The geological complication of the district where this occurs is in fact too great to permit of satisfactory differentiation of surface- and vent-agglomerate in every instance, but the uncertainties thus introduced are of very secondary importance.

Materials as observed in the field

The contents of the vent-agglomerates vary from place to place. Tertiary basalt-lavas, Tertiary plutonic rocks, Mesozoic sediments, and Moine gneisses are locally abundant. As in the case of the surface-agglomerate (Chapter 15), rhyolites occur both in mass and as fragments; in fact it is thought that most of the agglomerates of Mull have resulted from the breaking up of country-rock by explosions emanating from acid magma. Rhyolite is particularly abundant in the north-western caldera on both sides of Loch Bà where large outcrops are shown on the one-inch Map. W.B .W., E.B.B.

A feature of very general interest is the virtual limitation of gneiss-fragments to the more peripheral vents. This point is illustrated in (Figure 29). Many of these peripheral vents follow closely the region of upheaval surrounding the south-eastern caldera, and are often seen in contact with the old gneiss-floor, nowadays reexposed by erosion ((Plate 5) and (Figure 30), pp. 165, 204). This is the case in the district reaching from the west end of Loch Spelve northwards to Sgùrr Dearg. The abundance of gneiss-fragments in such a situation is of course exactly what might be expected; elsewhere it is more surprising. The data are as follows:

For more than four miles north-westward from Sgùrr Dearg, where vents figure fairly prominently in the lava-country lying outside the calderas, gneiss is still a conspicuous component of the agglomerate, though for the most part represented by small fragments. Of quite exceptional size is a huge block shown on the one-inch Map just south-west of a fault on the north face of Beinn Mheadhon. This mass of gneiss has a triangular outcrop 200 yds. long. It occurs associated with ordinary neck-agglomerate, which seems at this point to be piercing lavas 1500 ft. or so above the base of the volcanic pile. E.B.B.

In the other direction, agglomerate with recognizable gneiss-fragments is a feature of the southern slopes of Ben Buie and of several small vents encountered east of Ben More. In some of these exposures, one must admit that the gneiss has been carried upwards for more than 3000 ft. E.M.A., G.W.L.

Within the Central Calderas, agglomerate or breccia is very freely developed; but it is to all intents and purposes free from gneiss-fragments. W.B.W., E.B.B, J.E.R.

On the reasonable assumption that many of the explosions of the more central and more peripheral regions originated at about the same time and at about the same depth, the contrast illustrated in (Figure 29) certainly suggests that the

gneissic floor beneath the caldera-areas was already relatively much depressed when these explosions occurred (p. 180). On the other hand, some may prefer to interpret the evidence by supposing that the more central explosions originated at a comparatively high level; or, perhaps, that they continued longer and thus were more successful in clearing the throats of the resulting volcanoes. It is too speculative a subject whereon to dogmatize.

Although it does not affect the matter discussed above, it is proper, perhaps, to direct attention here to a little string of gneiss-bearing breccia seen traversing the basalt-lavas near the mouth of Loch Spelve at a point indicated by a note on the one-inch Map. The peculiarity of this occurrence is that the schist-floor at this point consists almost certainly of relatively lowly metamorphosed sediments unrepresented in the breccia-vein. Accordingly it seems probable that the vein was filled from above with material supplied by some explosion which occurred in the gneiss-floored district lying farther west. E.B.B.

Repeated explosions

Before passing on to the consideration of local detail, let us return for a moment to the vitally important matter of the recurrence of explosive activity at widely different periods in the history of Central Mull.

The earliest<ref>If the widespread basal mudstone is a weathered ash, as is probable (p. 54), it betokens considerable explosive activity at the very beginning of the volcanic history of the district.</ref> certain epoch of paroxysmal explosion is responsible, among other things, for the breccias that occupy, not only the Coire Mot. Syncline, but also the long row of gneiss-characterized vents lying more or less outside the caldera limits from Beinn Chreagach Bheag through Sgùrr Dearg and the southern face of Ben Buie to Sleibhte-coire (cf. one-inch Map and (Plate 5), p. 165). These vents are shown by their field-relations to be of later date than the Glas Bheinn Granophyre (Chapter 12) and Torness Felsite (Chapter 17); but they are earlier than the Beinn Mheadhon Felsite (Chapter 17), the Early Acid and Early Basic Cone-Sheets (Chapters 19 and 21), and the Ben Buie and Corra-bheinn Gabbros (Chapter 22). E.B.B., G.W.L.

The next great explosive epoch to be distinguished has already been singled out for special notice in the introductory remarks of this chapter. It is responsible for the agglomerate-vent, which has burst its way along the northern margin of the Ben Buie Gabbro west of Loch Airdeglais ((Figure 38), p. 247). G.V.W.

Perhaps to this second period should be attributed a strip of breccia, about a third of a mile west of Cruachan Dearg, and too small to show on the one-inch Map. The agglomerate is clearly later than the Corra-bheinn Gabbro, with which it is seen in contact. It is largely made up of gabbro-fragments, together with little pieces of an acid igneous rock. C.T.C.

(Figure 37) (p. 244) illustrates a clear case, where agglomerate in contact with an intrusion may at one point be earlier, and at another later than its associate. In this case, it is the Beinn Bheag Gabbro (Glen Forsa) that is involved. E.B.B.

The more central agglomerates or breccias are, in certain clear cases, later than neighbouring intrusions; but, at the same time, they are almost altogether earlier than the ring-dykes and other masses shown in (Plate 6) (p. 307). Whether they are in the main earlier or later than the Ben Buie, Corra-bheinn, and Beinn Bheag Gabbros, is an open question.

It has just been stated that almost all the agglomerate of Central Mull is earlier than the ring-dykes of (Plate 6). It is therefore particularly interesting to find what appears to be tuff made of rhyolitic and granophyric debris, associated with the Loch Bh, Felsite (Chapter 32), the very latest of the suite. Suggestive exposures in this connexion are afforded by the streams draining either side of Coill' an Aodainn, where the ring-dyke reaches the most southerly part of its course. There can be very little doubt that the Loch Bà Ring-Dyke was in communication with the surface, and that its vapours were thus enabled to escape with the violence required to produce volcanic ash (p. 345). W.B.W., E.B.B.

A few small agglomerate-vents have been found in significant association with some of the relatively narrow North-West Dykes of Mull. These occurrences are extremely important as evidence that at any rate a few of the North-West Dykes communicated with the surface. Their consideration is deferred till Chapter 34. E.B.B., G.V.W.

The Sgùrr Dearg vents—detailed account

Under the heading, Repeated Explosions, it has been pointed out that a series of early vents can be traced from Beinn Chreagach Bheag through Sgùrr Dearg and Glas Bheinn to the south slopes of Ben Buie and northwards to Sleibhte-coire. In most respects, apart from the matter of age already discussed, this series is thoroughly typical of the Mull vents in general—of which indeed they constitute a very large part.

Beinn Chreagach Bheag to Beinn Mheadhon

On the basaltic slopes above Fishnish Bay, there are numerous irregular outcrops of breccia, and tuff, consisting largely of broken up basalt with a fair proportion of gneiss, rhyolite, and other foreign ingredients. Except for the immense block of gneiss, already described (p. 202) as occurring near the fault on Beinn nam Meann, the fragments throughout are of moderate to small size. In fact, in the biggest vent, as exposed in Allt Mòr Coire nan Eunachair, tuff frequently grades into well-bedded volcanic grit and mudstone.

In addition to rhyolite-ash, there are many outcrops of unbroken small-felspar rhyolite of the same type as occurs associated with the agglomerates of the Coire Mòr. Syncline (Chapter 15). Some of the more important of these outcrops are inserted on the one-inch Map.

The transgressive relationship of the ashes of this district is shown by their not mapping out as regularly interstratified beds would do. The only outcrop, which seems at first sight to be that of an intercalated ash, contours the hill-side for about half a mile, as indicated on the Map, two-thirds of a mile south of Bailemeonach Cottage. South of this outcrop, there rises a low lava-scarp as if belonging to a later overlying flow. However, the appearance can be shown to be misleading, for near the eastern extremity of the exposure the breccia is seen to cut up across the lava-scarp in a most striking fashion. It is interesting to note that the breccia here is richly charged with gneiss and granophyre, thus suggesting an underground extension of the Glas Bheinn Granophyre suite of intrusions (Chapter 12).

One of the most striking features connected with these vents, taken as a whole, is the way the neighbouring basalt-lavas go to pieces in their vicinity. This is capitally seen round about the largest vent. The shattered basalt is veined with epidote, and it is significant that both shattering and veining antedate the Beinn Mheadon Felsite (Chapter 17), and also the Early Acid and Early Basic Cone-Sheets of the district (Chapters. 19 and 21). It may be added that, at their numerous contacts with the agglomerate-filled vents, all these intrusions clearly cut through the agglomerate.

Sgùrr Dearg

The agglomerate of Sgùrr Dearg consists for the most part of a coarse unbedded breccia made of blocks of gneiss, granophyre, and basalt, with subordinate big-felspar gabbro, Triassic sandstone, rhyolite, etc. At two points marked H and K in (Figure 30) it is associated with more or less finely bedded sediments such as might have been deposited in local pools of water.

In considering (Figure 30), it is essential to realize that all the intrusions shown, with the exception of the Behan Mheadhon Felsite, are of Pre-Breccia age. This sufficiently emphasizes the transgressive relationship of the great breccia, or agglomerate, of the Sgùrr Dearg outcrop.

The brecciation of the gneiss and early intrusions everywhere within (Figure 30) is intense. As the mixed breccia is approached, it is often difficult to decide whether to call the rock one stands on breccia, or merely brecciated. It is common to find the mass shattered to bits yet with so little displacement of the parts that one can still trace geological boundaries, for instance, where broken sills or dykes of basalt run through gneiss.

Evidence that the vent-agglomerate is later than the Sgùrr Dearg Big-Felspar Gabbro of Chapter 11 is afforded by contacts lettered A and I on (Figure 30). In keeping with this it may be added that, though as a rule scarce in the vent-agglomerate, Big-Felspar Gabbro is a conspicuous feature of the neighbouring mass enclosed in the Coire Mòr Syncline (Chapter 30).

Evidence that the vent-agglomerate is later than the Glas Bheinn Granophyre of Chapter 12 is supplied by the contacts lettered F, G, and H (Figure 30). This evidence is supplemented by the universal brecciation of the granophyre, coupled

with the fact that, from Sgùrr Dearg to the southern slopes of Ben Buie, granophyre-fragments are one of the main constituents of the breccia. Two additional contacts will be mentioned presently from the Loch Spelve district.

Evidence that the vent-agglomerate is later than the Torness Felsite of Chapter 17 is afforded in stream sections to which the reader is referred in the explanation of the letter E, (Figure 30). On the one-inch Map, the critical exposures can be located as they lie within a sharp westward inflection of the agglomerate-boundary, due east of Torness Cottage.

The vent-agglomerate is earlier than the Beinn Mheadhon Felsite of Chapter 17, but the latter is itself so much cut up by later intrusions within (Figure 30) that this area is not as suitable as the district already described farther north-west for demonstrating the point. On the other hand, what is abundantly clear within the limits of (Figure 30) is that the breccia of Sgùrr Dearg, along with the brecciated gneiss and associated intrusions, is traversed by a vast number of dolerite cone-sheets belonging to the Early Basic Suite of Chapter 21. These cone-sheets are not shown on (Figure 30), but many of them are indicated on the one-inch Map, Sheet 44. They have suffered enough change to have all their olivine decomposed, but most of them are unbrecciated and have distinctive chilled margins. On the south slopes of Sgùrr Dearg, however, many of these sheets enter an area within which they are broken, veined, and epidotized like the lavas neighbouring the vents of the Beinn Chreagach district. In fact, were it not that here they have as their country-rock the Torness Felsite, it would be hard to be sure whether some of them in this particular part of the district might not be metamorphosed lavas. Very probably, their local brecciation is a sign of a recurrence of explosive activity in connection with the relatively late intrusions which are known in plenty a little farther west.

Glas Bheinn and Loch Spelve

There is such a mass of Early Basic Cone-Sheets in the Glas Bheinn country that little can be deciphered of the original held-relations of the continuation of the Sgùrr Dearg agglomerate-outcrop south-westwards past Was Bheinn summit. In the more open country near Loch Spelve, there are a few easily accessible breccia-exposures to which attention may usefully be directed. In four of these, the agglomerate, or breccia, is seen in contact with, and in large measure derived from, intrusions of the Glas Bheinn Granophyre suite of Chapter 12:

(1) A small vent exposed in Abhuinn Coire na Fèola, two-thirds of a mile above road; it is shown on the one-inch Map just north-east of a north-west basalt-dyke.

(2 and 3) The southern margin of a vent exposed in two streams separated by Teanga Bhàn, respectively 200 yards north-west and 500 yards north-east of Kinlochspelve Farm.

(4) A minute, but rather conspicuous, vent towards the head of Allt a' Ghoirstein Uaine, 1300 yards up from Creach Bheinn Lodge. The vent is not shown on the one-inch Map, but is easily located on the north-west bank of the stream, 100 yards up from the mouth of a little tributary that enters Allt a' Ghoirstein Uaine from the north.

The material of these Loch Spelve vents sometimes grades to line sediments. Much of the deposit seen in the streams north-west of Loch Spelve is a bedded sandstone derived from the attrition of granophyre. The bedding is now generally at high angles. E.B.B.

Ben Buie

Attention has already been directed to the vents opened successively on the south and north sides of Ben Buie (p. 199). The more southerly vent is an obvious continuation of the Sgùrr Dearg and Glas Bheinn series. Its material consists largely of granophyre-debris with many fragments of gneiss, and is cut across by Early Acid and Early Basic Cone-sheets (Chapters 19 and 21) followed by Ben Buie Gabbro (Chapter 22). G.V.W.

Sleibhte-coire

There are comparatively few peripheral vents north-west from Ben Buie, and most of them are of small size. The largest example is rather less than half a mile long, and is exposed in Sleibhte-coire between Tòrr na h-Uamha and Guibeau Uluvaill. It is thoroughly typical of its kind, and its agglomerate, containing fragments of gneiss, is cut across by Early

Petrology

The most striking feature of the assemblage of rocks dealt with in the present chapter is the preponderance of what may be termed the foreign or accidental element in the constitution of the agglomerates. Naturally only the finer parts of the volcanic breccias can be examined microscopically, and on the whole there is little additional information to be gathered from the many slides that have been prepared to illustrate the phenomena recounted in the Field Descriptions. Moine gneisses and Tertiary granophyres, gabbros, and lavas are all abundantly represented as blunted rock-fragments, degenerating by further comminution into angular crystal-debris. Olivine is always decomposed, but feldspar and augite, even where separately enclosed in the breccia-matrix, are sometimes unaltered.

Instead of elaborating this side of the subject, our attention will be directed more particularly to the acid rocks which, whether in mass or fragments, may be regarded as the probable representatives of the magma responsible for the explosions that produced the breccias and agglomerates.

Associated rhyolites

The main development of rhyolite in association with vent-agglomerate was investigated by Mr. Wright, and occurs in the north-western caldera indicated in (Plate 5), p. 165. The outcrops figure quite prominently on the one-inch Map, Sheet 44.

A specimen collected west of Loch Bà, from the stream that flows out of the lochan one mile west-north-west of Clachaig Cottage, proves to be a partially devitrified obsidian ([S17126](#)) [NM 5585 3680] containing small phenocrysts of albitized oligoclase. Quartz has formed around these phenocrysts, and also occurs elsewhere infilling cavities. There are, in addition, a few pseudomorphs that suggest the original presence of enstatite-augite. In the ground-mass, may be noted a conspicuous zonal arrangement of colouring matter connected with vaguely defined spherulitic growths that centre upon the quartz already mentioned.

Other specimens were collected on the east side of Loch Bà, and are located as follows: ([S14847](#)) [NM 5814 3915] from south of Na Bachdanan; ([S17984](#)) [NM 5941 3841]–([S17985](#)) [NM 5931 3850] from the more southerly of the two outcrops east of A' Bhog-àiridh; and ([S14687](#)) [NM 5957 3709]–([S14688](#)) [NM 5956 3707] from the north-west face of Beinn na Duatharach. Of these, one ([S14847](#)) [NM 5814 3915] is a devitrified perlitic rhyolite with a few small phenocrysts of alkali-feldspar; others ([S17984](#)) [NM 5941 3841]–([S17985](#)) [NM 5931 3850] show lath-shaped phenocrysts of albite in a ground of microspherulitic structure consisting mainly of alkali-feldspar—the whole approaching a bostonite in composition; while those from Beinn na Duatharach ([S14687](#)) [NM 5957 3709], ([S14688](#)) [NM 5956 3707] are so contact-altered that they are difficult to interpret—possibly ([S14688](#)) [NM 5956 3707] is an altered acid tuff.

In the south-eastern caldera, rhyolite has again been found associated with vent-agglomerate, at Beinn Chàisgidle, though not on a sufficiently large scale to show on the map. The rock ([S17931](#)) [NM 6028 3235] is a small-feldspar rhyolite, or felsite, similar to the Loch Bà Felsite described in Chapter 32.

Outside the two calderas, minor outcrops of acid rock have been encountered at several localities in connexion with vent-agglomerate, notably in the neighbourhood of Beinn Chreagach Mhòr. A specimen ([S16444](#)) [NM 6306 3917] taken from a point 100 yds. north-west of this summit is of the small-feldspar felsite, or rhyolite, type (*cf.* Loch Bà, type, Chapter 32), but is intensely altered by the gabbro cone-sheet of the mountain separately mapped in (Figure 36) (p. 238). This type of acid rock is characteristic of the district, but another specimen from the south-eastern side of the summit is non-porphyrific, and consists of minute oligoclase laths set in a felsitic matrix ([S16447](#)) [NM 6330 3897].

Similar occurrences are met with in association with the vent agglomerates on the south-west of the calderas, though they are too small to show on the one-inch Map. A specimen taken from the Sleibhte-coire Vent, midway between Tòrr na h'Uamha and Guibean Uluvailt, is again of the small-feldspar type ([S16279](#)) [NM 5577 3247] with phenocrysts of alkali feldspar and augite. It shows intense contact-alteration by the Corra-bheinn Gabbro with a development of microscopic

biotite.

Acid fragments

An examination of a large suite of slides shows that fragments of acid rocks of glassy or very finely crystalline texture are to be met with everywhere among the vent-agglomerates. Occasionally, they are the main constituent of a coarse volcanic grit ([S16476](#)) [NM 6408 3849]; more often, they provide isolated fragments set in the midst of other debris ([S16479](#)) [NM 6548 3503].

More than one type is commonly met with in a single slice, so that, in general, specific localities are omitted from the following brief summary. The types represented include: perlitic non-porphyrific rhyolites ([S14679](#)) [NM 5764 3824], ([S17929](#)) [NM 6133 3321]; perlitic rhyolites with phenocrysts of andesine and augite, some showing conspicuous banding ([S17210](#)) [NM 5888 3076]; porphyritic rocks that have a patchy devitrified felsitic base ([S18051](#)) [NM 6136 2644]; rhyolites and felsites similar to that of Loch Bà, Chapter 32, with micro-porphyrific crystals of oligoclase and augite ([S17214](#)) [NM 6118 3101]; many fine-grained felsites ([S16480](#)) [NM 6548 3503]; and also a large number of somewhat trachytic aspect ([S14689](#)) [NM 5984 3702], ([S18053](#)) [NM 6085 2614], with minute feldspar-laths developed in profusion, although without much parallelism. The Coire-sleibhte Vent, between Tòrr na h-Uamha and Guibean Uluvaill, is interesting on account of its containing fragments of a bostonite ([S16274](#)) [NM 5491 3218], ([S16275](#)) [NM 5491 3218], a matter already discussed (p. 188).

Contact-alteration

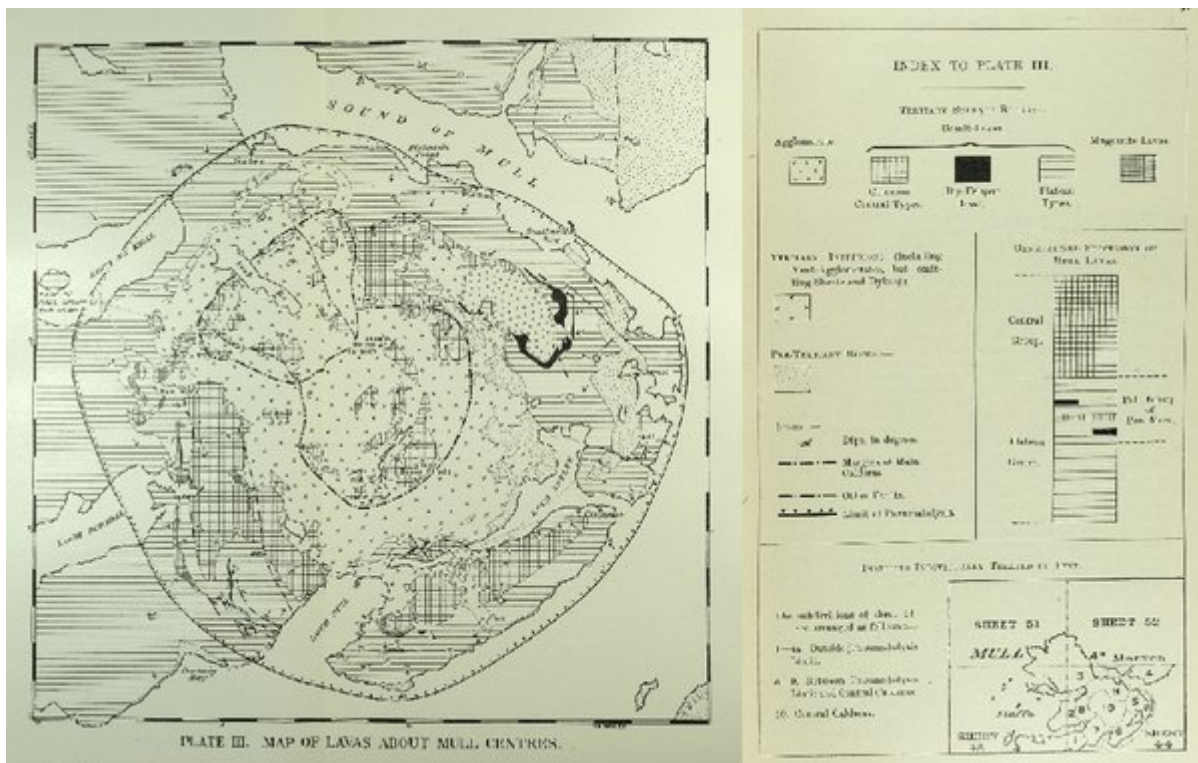
Several specimens in the collection illustrate the local baking of the agglomerates by later intrusions. A rock ([S14685](#)) [NM 5952 3692], mapped with rhyolites that form the roof of the Glen Cannel Granophyre of Chapter 31 on the north-west face of Beinn na Duatharach, is a fine-bedded but completely reconstructed tuff, or possibly a fluxional rhyolite. It has been converted into a banded micro-granulite that consists of hypersthene, augite, biotite, alkali-feldspar, quartz and magnetite. The hypersthene tends to cluster in the more quartzose areas, and the biotite, where of larger size than usual, builds poecilitic plates.

Another rock ([S16445](#)) [NM 6306 3917] comes from near the Gabbro Cone-Sheet of Beinn Chreagach Mhòr. It was originally a mixed breccia of gabbro granophyre, basalt, and felsite. It shows the same mineral development as in the previous case. In some instances, an ophitic augite has been granulitised in situ, and the porphyritic plagioclase has been honeycombed by albite.

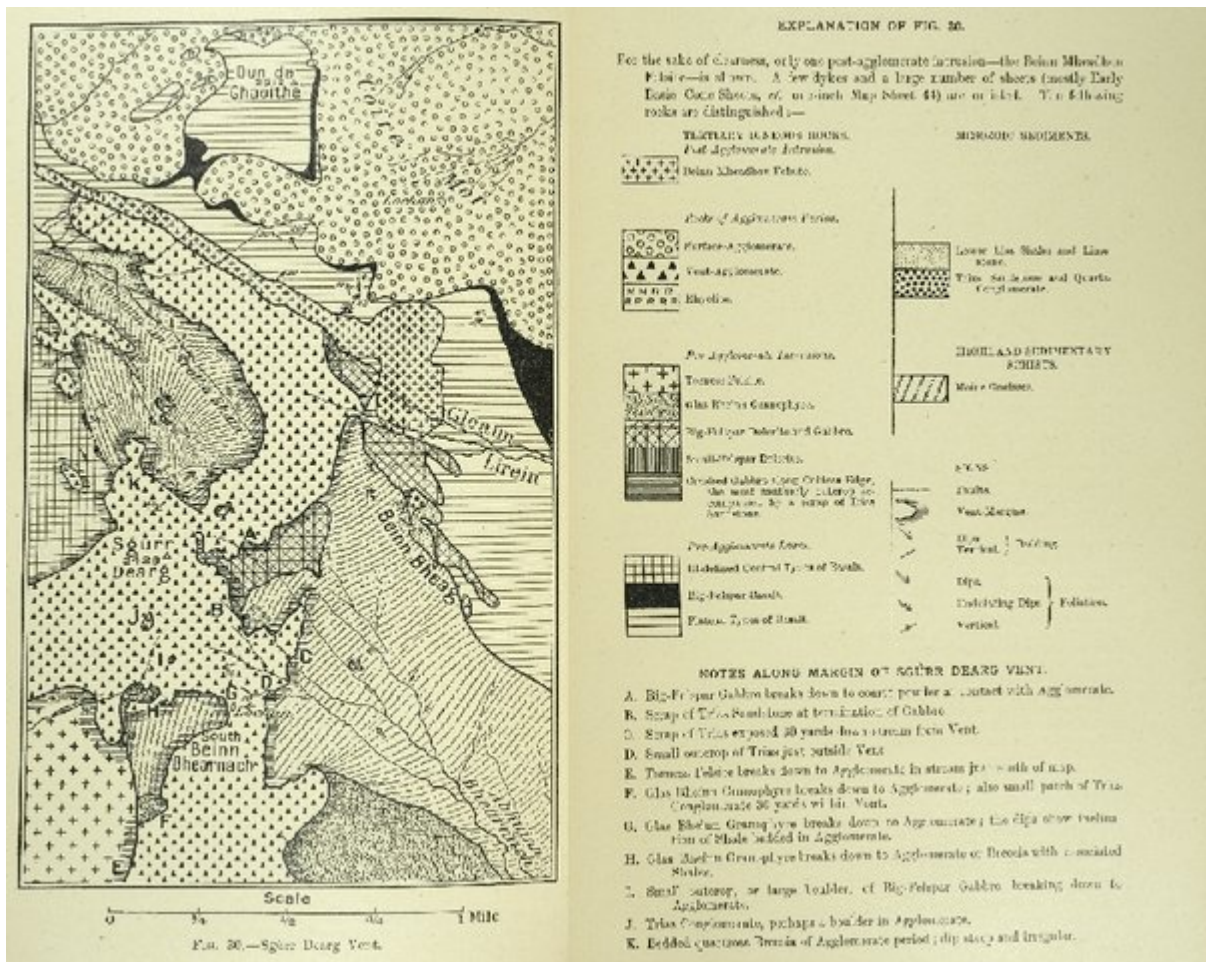
The vent-agglomerate of Sleibhte-coire situated between Tòrr na h' Uamha and Guibean Uluvaill is locally invaded by granophyre ([S16280](#)) [NM 5581 3261], ([S16281](#)) [NM 5581 3261]. As will be explained in Chapter 22, the granophyre concerned is intimately connected with the Corra-bheinn Gabbro, and veins in intricate fashion the country-rock immediately bordering the latter. In the present instance, the result has been the furnishing of an acid igneous matrix to an agglomerate that is in large measure composed of basic igneous fragments. Interesting hybridization has resulted, and is best illustrated in ([S16281](#)) [NM 5581 3261], where pyro-genetic brown hornblende is an important constituent of the acid matrix. The changes involved are comparable with those dealt with in Chapter 33. E.B.B.



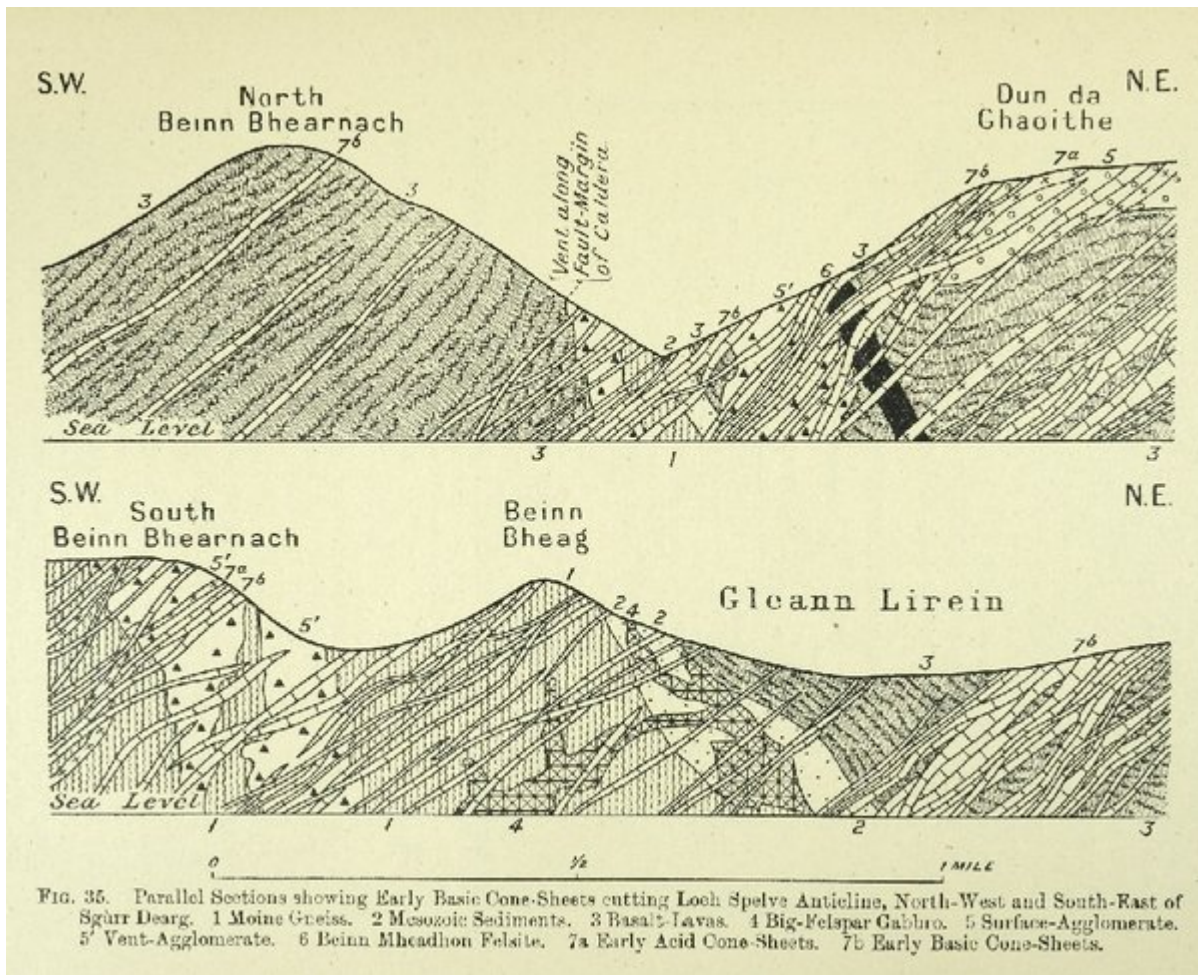
(Plate 5) Map showing calderas, major intrusions, and folds



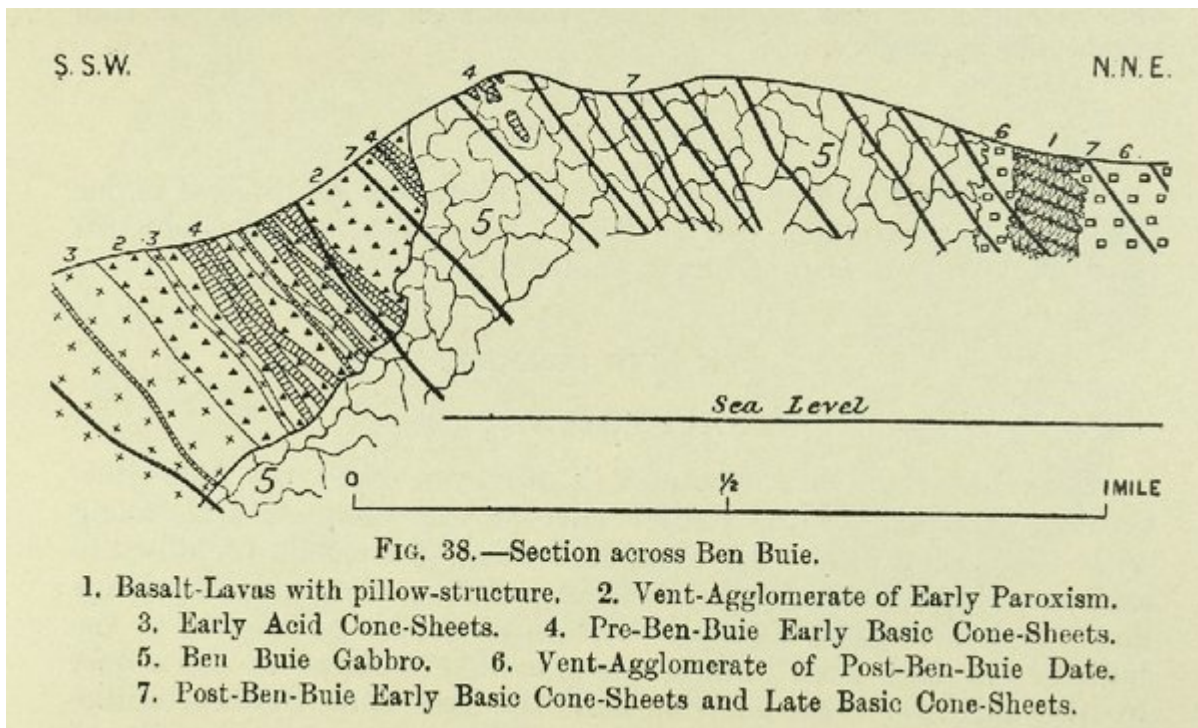
(Plate 3) Map showing the distribution of lava-types and the limit of pneumatolysis



(Figure 30) Sgùrr Dearg Vent. Explanation of Figure 30. For the sake of clearness, only one post-agglomerate intrusion—the Beinn Mheadhon Felsite—is shown. A few dykes and a large number of sheets (mostly Early Basic Cone-Sheets, cf. one-inch Map Sheet 44) are omitted. Notes along margin of Sgùrr Dearg vent: A. Big-Felspar Gabbro breaks down to coarse powder at contact with Agglomerate. B. Scrap of Trias Sandstone at termination of Gabbro. C. Scrap of Trias exposed 30 yards down-stream from Vent. D. Small outcrop of Trias just outside Vent. E. Torness Felsite breaks down to Agglomerate in stream just south of map. F. Glas Bheinn Granophyre breaks down to Agglomerate; also small patch of Trias Conglomerate 30 yards within Vent. G. Glas Bheinn Granophyre breaks down to Agglomerate; the dips show inclination of Shale bedded in Agglomerate. H. Glas Bheinn Granophyre breaks down to Agglomerate or Breccia with associated Shales. I. Small outcrop, or large boulder, of Big-Felspar Gabbro breaking down to Agglomerate. J. Trias Conglomerate, perhaps a boulder in Agglomerate. K. Bedded quartzose Breccia of Agglomerate period; dip steep and irregular.



(Figure 35) Parallel Sections showing Early Basic Cone-Sheets cutting Loch Spelve Anticline, North-West and South-East of Sgùrr Dearg. 1 Moine Gneiss. 2 Mesozoic Sediments. 3 Basalt-Lavas. 4 Big-Felspar Gabbro. 5 Surface-Agglomerate. 5' Vent-Agglomerate. 6 Beinn Mheadhon Felsite. 7a Early Acid Cone-Sheets. 7b Early Basic Cone-Sheets.



(Figure 38) Section across Ben Buie. 1. Basalt-Lavas with pillow-structure. 2. Vent-Agglomerate of Early Paroxysm. 3. Early Acid Cone-Sheets. 4. Pre-Ben-Buie Early Basic Cone-Sheets. 5. Ben Buie Gabbro. 6. Vent-Agglomerate of Post-Ben-Buie Date. 7. Post-Ben-Buie Early Basic Cone-Sheets and Late Basic Cone-Sheets.



(Figure 29) Distribution of gneiss-fragments in Mull Agglomerates.

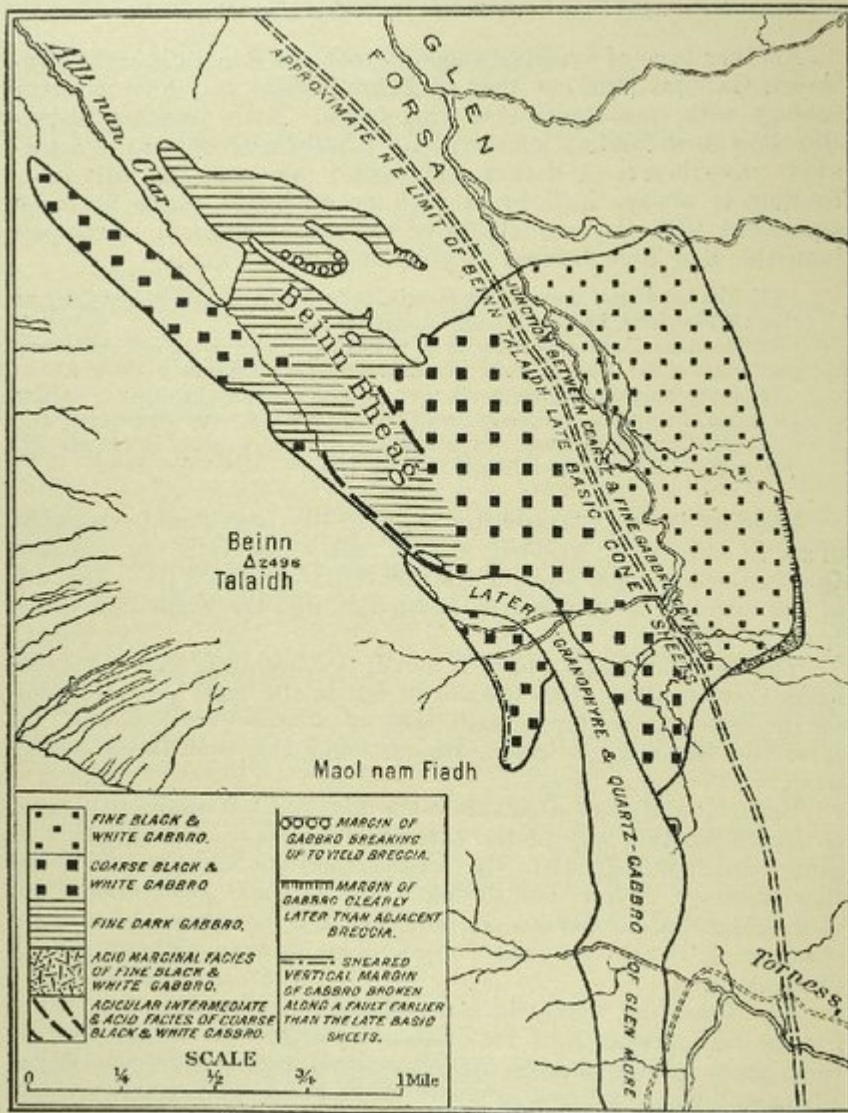
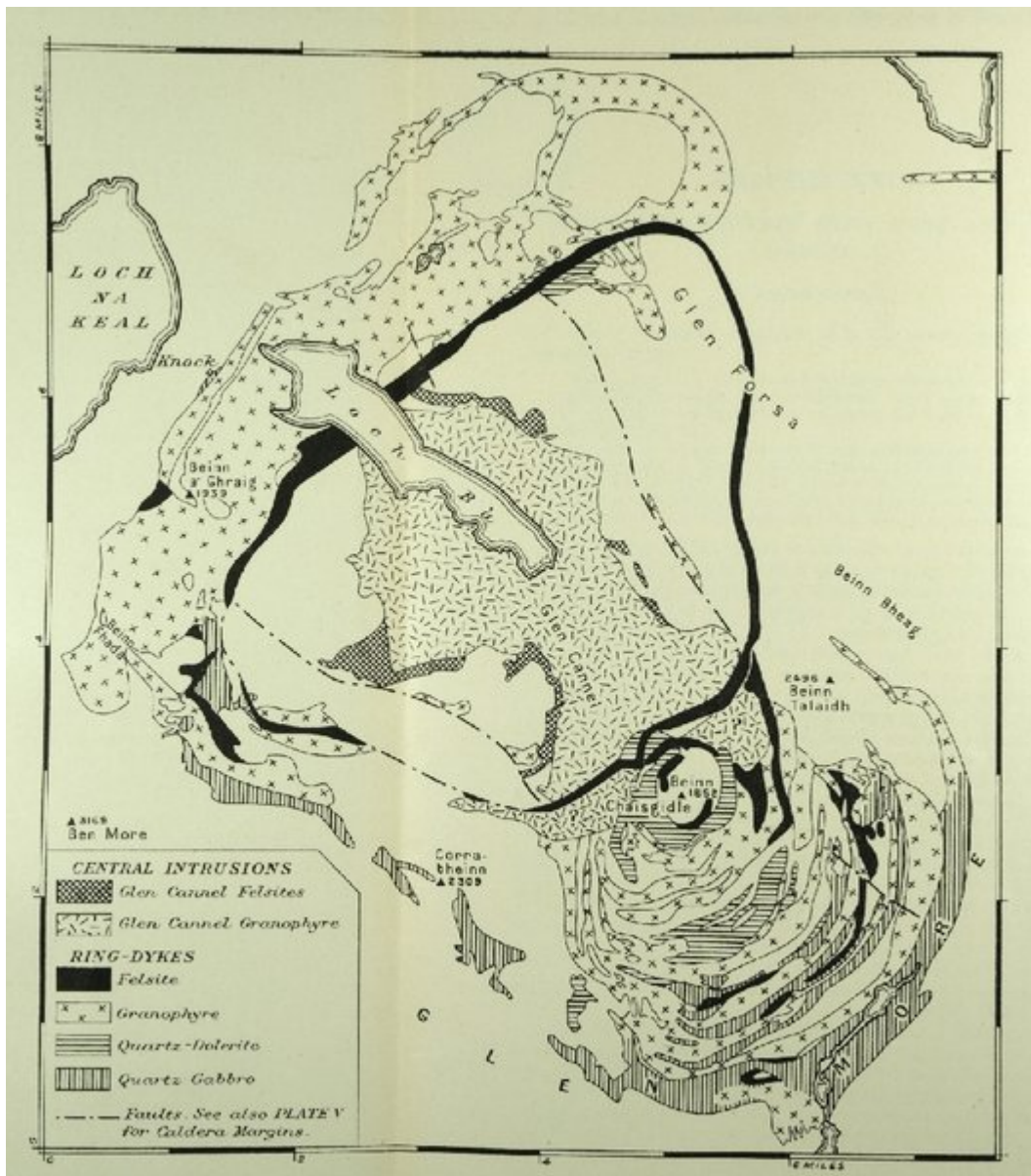


FIG. 37.—Map of Beinn Bheag Gabbro.

(Figure 37) Map of Beinn Bheag Gabbro.



(Plate 6) Map showing ring-dykes

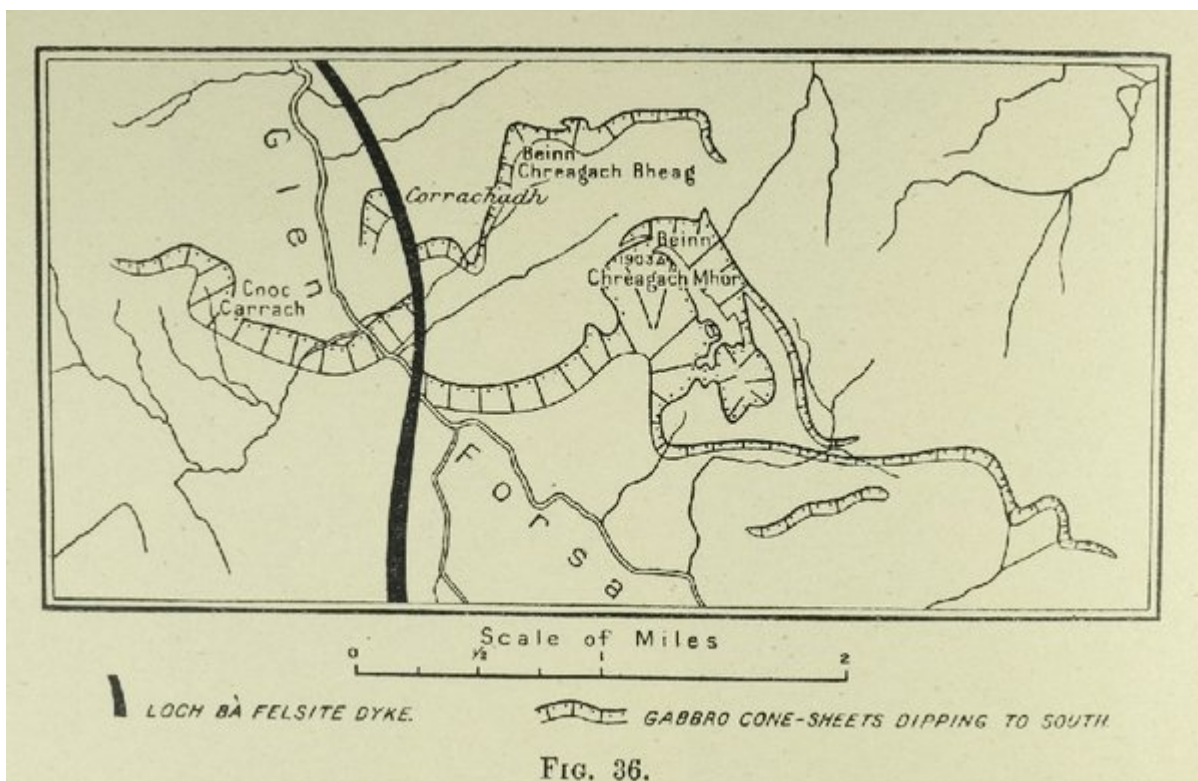


FIG. 36.

(Figure 36) Early Basic Cone-Sheets of Beinn Chreagach Bheag and Beinn Chreagach Mhòr probably displaced at Loch Bà Felsite.