Allt Molach – Beinn Chaisgidle

OS Grid Reference: NM622313

Highlights

Continuous stream sections expose acid and basic ring-dykes and numerous cross-cutting cone-sheets associated with Mull Centre 2. Extensive acid veining of basic rocks occur where these intrude acid rocks. Screens of country rock (earlier volcanic and igneous rocks) are present between the ring-dykes. Acid intrusions of Mull Centre 3, including the classic Loch Bà ring-dyke, truncate the earlier Centre 2 intrusions.

Introduction

The geological significance of the Allt Molach–Beinn Chaisgidle site lies in the exposure of various members of the second intrusive centre on Mull – the Beinn Chàisgidle Centre (Centre 2) (Table 5.1). The intrusions are predominantly ring-dyke structures of felsite and quartz dolerite/gabbro compositions and the screens between them are formed by earlier volcanics erupted into the South-East Caldera. The Loch Bà felsitic ring-dyke, together with granophyre bodies belonging to the Glen Cannel complex, truncate the ring intrusions and are associated with the third, and last, Loch Bà Centre (Centre 3).

The classic Mull Memoir (Bailey *et al*., 1924) remains the main reference source for this site, although a field guide to the area has been published bySkelhorn (1969), which contains a more detailed petrological description of the intrusions than is presented here.

Description

The site is conveniently divided into three geographical sections (Fig.5.17):

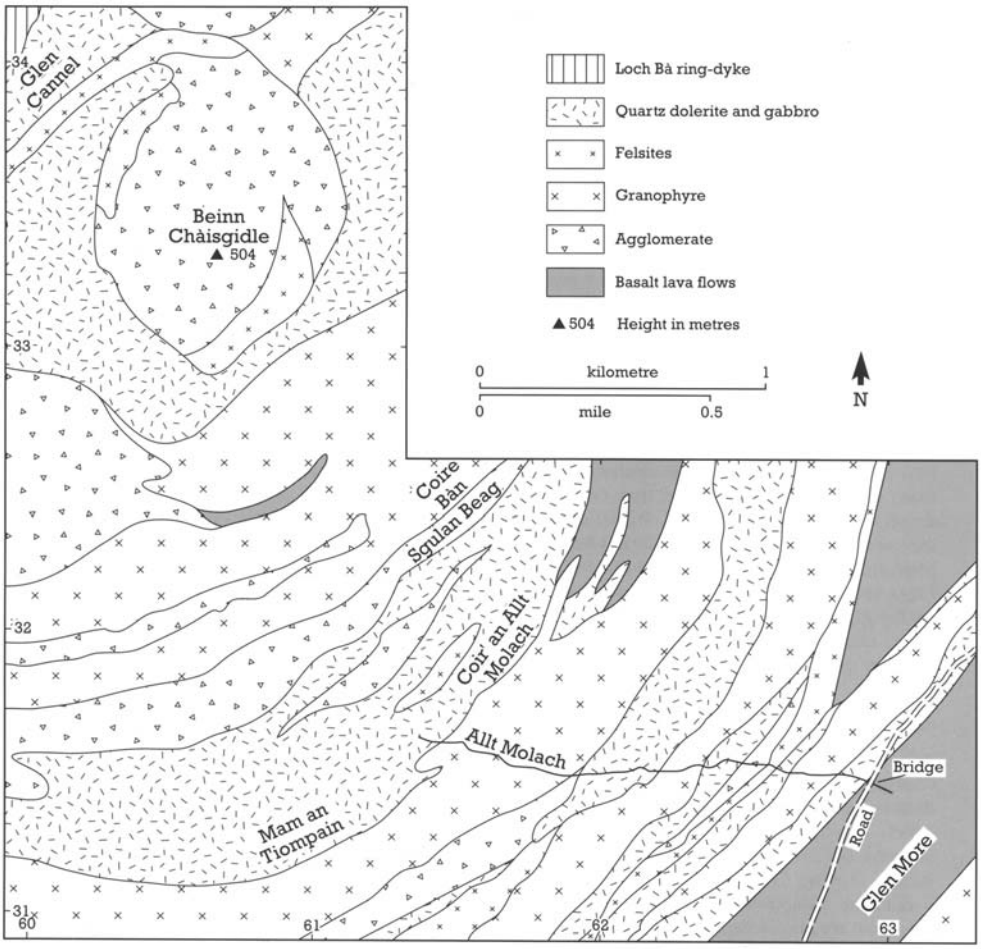

Figure 5.17 Geological map of the Allt Molach–Beinn Chàisgidle site (adapted from the British Geological Survey 'One Inch' map, Sheet 44, Mull).

Figure 5.17: Geological map of the Allt Molach-Beinn Chàisgidle site (adapted from the British Geological Survey 'One Inch' map, Sheet 44, Mull)

1. The stream section and valley sides of the Allt Molach from the head ofLoch Sguabain at Ishriff to Sgulan Beag (NM 610 320).

2. The bleak upland plateau between Sgulan Beag and Beinn Chaisgidle.

3. Beinn Chaisgidle and northwards to Glen Cannel.

(a) The Allt Molach–Sgulan Beag

The section along the Allt Molach contains 14–15 separate, subvertical intrusions of felsite, granophyre and quartz dolerite/gabbro. These are cut by a suite of cone-sheets inclined towards either Centre 2 or Centre 3. Composite dykes are also present in this section. Bailey*et al*. (1924, p. 308) have recorded the following sequence of ring-dyke intrusions striking NE–SW across the stream from Loch Sguabain, the detail of which is not shown on the accompanying site map (but see Skelhorn, 1969, fig. 3): (No time sequence is implied here; sequence commences at Loch Sguabain.)

1. Glen More ring-dyke – gabbro merging to granophyre

2. Ishriff ring-dyke – granophyre

3. Quartz gabbro cut by quartz + alkali feldspar segregation veins

4. Granophyre–feldspar-phyric felsite

5. Acidic quartz gabbro merging to granophyre

6. Xenolithic feldspar-phyric felsite

7. Quartz gabbro

8a. Granophyre

8b. Felsite

9. Quartz gabbro passing uphill into granophyre

10. Quartz dolerite possibly merging uphill into granophyre

11. Non-porphyritic granophyre

12. Feldspar-phyric granophyre

13. Vesicular quartz dolerite

Acidic net-veining is common in the basic intrusions which are often chilled against the acidic ones. Late basic cone-sheets cut most of the ring-dykes and also show net-veining by rheomorphic acidic material.

Discontinuous arcuate patches of basic and acid rock intervene between the various ring-dykes and have been interpreted by Bailey *et al*. (1924) as screens of: earlier porphyritic basaltic lava between intrusions 2/3; non-porphyritic basaltic lava between intrusions 3/4, 5/6, 4/6, 6/7; fine-grained dolerite possibly metamorphosed cone-sheets between intrusions 6/7; agglomerate between intrusions 6/7; cone-sheets, agglomerate and associated brecciated early dolerites between intrusions 10/11, 9/11; and tuff and undifferentiated lava between intrusions 12/13.

Various dykes, some of them composite (tholeiite–felsite–tholeiite), cut many of the ring-dykes but, in general, exposure is not sufficient to conclude that they cut all.

(b) Sgulan Beag–Beinn Chaisgidle

The ring-dykes of the Allt Molach area pass uphill into a series of acid and basic intrusions cut by many cone-sheets and separated from one another by screens of brecciated basic sheets, agglomerates and basaltic and rhyolitic lavas which form prominent, upstanding N- and NW-dipping ridges. Exposure is again poor in many places, especially on the grassy slopes of Coire Ban (NM 613 328) to the east, and Mam an Tiompain (NM 604 315) to the west.

(c) Beinn Chaisgidle–Glen Cannel

The summit and northern slopes of Beinn Chaisgidle are formed by agglomerates, quartz dolerite and a profusion of cone-sheets, all of which are truncated abruptly by a number of intrusive bodies associated with the later Loch Bà centre (Centre 3). Parts of the Glen Cannel peralkaline granophyre and the Loch Bà felsite ring-dyke are poorly exposed on Beinn Chàisgidle and in the valley. The granophyre forms low, smooth, striated knolls within the arcuate caldera fault intruded by the Loch Bà ring-dyke. It has a uniform appearance, weathering to a pale-pink colour and is moderately coarse-grained, consisting of perthitic orthoclase, quartz, aegirine-augite, magnetite and sphene. Occasionally the granophyre may appear spherulitic or more obviously granophyric as it is immediately south of the old burial ground at Gortenbuie (NM 599 345), just north of the site.

The Loch Bà felsite ring-dyke is arguably the most spectacular of its kind in the Province and was the first complete steep-sided ring-dyke to be described in the world. It is described in detail in the Loch Bà report (see below). Although not continuously exposed, this intrusion is well represented in the Allt a Choire Bhain (east of the site) and intermittently on the northern slopes of Beinn Chaisgidle and towards Breapadail (NM 586 328) outside the site. Stream sections flowing northwards from Beinn Chàisgidle expose the ring-dyke and also expose evidence in the rocks on either side of the ring-dyke (such as crushing) for tectonic movements along the ring fault now occupied by the felsite. Considerable subsidence within this ring fault,

of at least 150 m, has been estimated by Lewis (1968).

Interpretation

The site contains representative sections through the intrusions associated with Centre 2 and clearly demonstrates the cross-cutting effects of the final intrusive centre (Centre 3), which developed when the focus of activity shifted to the north-west. The ring-dyke intrusions of the Centre 2 have been conventionally regarded as a suite of separate intrusions. However, Skelhorn (1969) has challenged this view and has suggested that gabbros 3, 5 and 7 are possibly members of the same intrusion split up by a series of later acidic ring-dykes. This could also apply to many of the other intrusions. The time sequence and structure of the intrusions and the status of the intervening screens are also open to reinterpretation. The sequence of Bailey *et al*. (1924) was based upon the fact that acidic veins connecting with the acid intrusions cut the basic ring-dykes and cone-sheets alike. However, as many of these intrusions are chilled against granophyre, the net veining may well be the result of the localized fusion of adjacent acid rock by the basic intrusions which generated rheomorphic magmas resulting in the acid back-veining of the basic rocks. Many of the late basic cone-sheets are also back-veined and chilled against the intrusions, although others apparently truncate the veining, indicating several distinct episodes of cone-sheet emplacement.

Skelhorn (1969) has thrown some doubt on the interpretation of some of the granophyres as ring-dyke structures; for example, intrusion 4 has subvertical contacts which dip at 60°–90° towards Centre 2 and should perhaps be considered as a cone-sheet. As exposure is rather poor in some parts of the site, this problem is not fully resolvable but the relationships between topography and outcrop do suggest steep contacts.

Finally, the Palaeocene history of the site can be summarized as follows (after Skelhorn, 1969 and Bailey *et al*., 1924):

Centre 3

Dykes

Loch Bà Ring-dyke and ring fault

Late basic cone-sheets

Glen Cannel complex – granophyre

Centre 2

Dykes

Glen More Intrusion

Late basic cone-sheets

Various ring intrusions (2–14

(around Beinn Chàisgidle)

Early basic cone-sheets

Early acid cone-sheets

Centre 1

Explosion vents associated with

the South-East Caldera

First lavas and vents

Conclusions

This site provides valuable and informative sections through numerous intrusions of dominantly basic to acidic compositions associated with Centre 2. It shows the complexity of the centre, the evolution of which has, as yet, to be fully resolved. Both acid and basic magmas were emplaced as ring-dykes, together with several generations of basic and acid cone-sheets. Additionally, earlier volcanic rocks erupted into the South-East Caldera (Centre 1) are preserved as altered screens between the ring-dykes. Acidic bodies belonging to the final intrusive centre on Mull, the Loch Bà Centre (Centre 3), truncate Centre 2 intrusions and mark a shift in the focus of activity to the north-west. Clear examples of rheomorphic acid net-veining occur where basic intrusions cut and chill against lower-melting-point acidic rocks.

Reference list

Bailey, E.B., Clough, C.T., Wright, W.B.*et al*. (1924) *Tertiary and Post-Tertiary Geology of Mull*, *Loch Aline and Oban*. Memoir of the Geological Survey of Great Britain, HMSO, Edinburgh.

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Skelhorn, R.R. (1969) *The Tertiary Igneous Geology of the Isle of Mull*. Geologists' Association Guide, No. 20.