Glen Bay Granite - St. Kilda: an illustrated account of the geology

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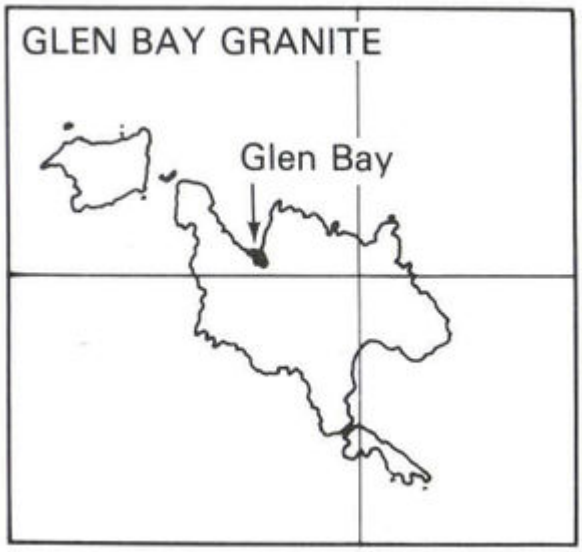
From: Harding, R.R. and Nancarrow, P.H.A. 1984. St. Kilda: an illustrated account of the geology. BGS Report Vol. 16, No. 7. Keyworth: British Geological Survey.].



Map 5 Glen Bay Granite

Figure 16A Contact of Glen Bay Gabbro and fine-grained Glen Bay Granite on the western rock shelves of Glen Bay. Both rocks are crossed by shear planes, many of which are sub-parallel to the contact.

Figure 16B The light-coloured rock in foreground and middle distance is Glen Bay Granite. Dark rock in lower foreground is sheared gabbro and there is an irregular contact between the two rock types in the rubbly cliffs to the right.

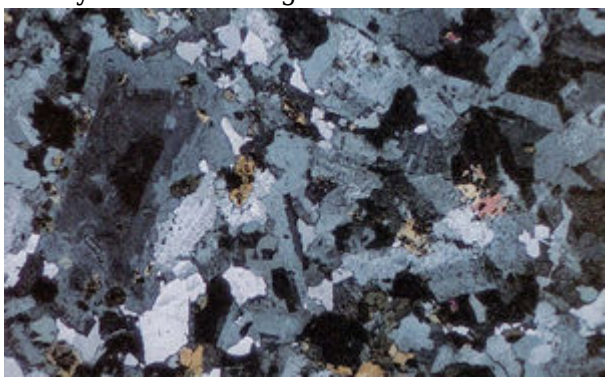


Figure 17A Photomicrograph of Glen Bay Granite. Crystals of plagioclase up to 2 mm long rest in a groundmass of smaller crystals of plagioclase mantled with orthoclase, pyroxene, amphibole, quartz and opaque minerals. (S67632) from near eastern end of Granite, cross-polarised light.

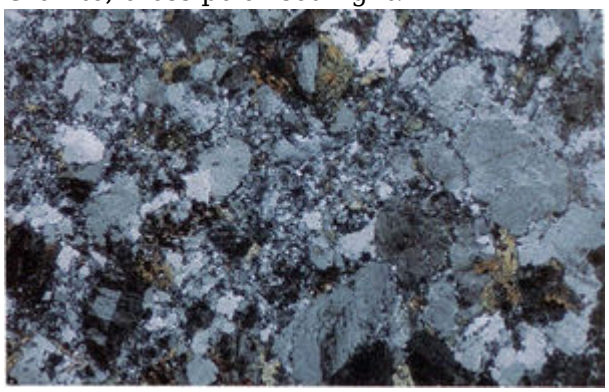


Figure 17B Photomicrograph of crushed Glen Bay Granite. Grains up to 1 mm across, penetrated by zones of incipient granulation, lie in a mosaic of plagioclase, orthoclase, quartz, amphibole and opaque minerals. (S64819) near contact with eastern part of Glen Bay Gabbro.

Chapter 10 Glen Bay Granite G

Keywords: age relations, chemical analysis, rare earth minerals

The Glen Bay Granite forms the rock shelves at the southern end or Head of Glen Bay. It extends for a further 200 m south along A. a Ghlinne Mhoir and may underlie the Quaternary sediments to the west of this stream. Fine-grained (probably chilled) granite is present both at the western margin against the western part of the Glen Bay Gabbro and on its eastern side next to the Gabbro at the outfall of A. a Ghlinne Mhoir, and it seems likely that the Granite was intruded as a steeply-dipping north–south sheet into cold gabbro. Gabbro and Granite are both sheared at the contacts (Figure 16A) and shear zones are variably developed throughout the Granite and western part of the Gabbro. Movement associated with the shearing was possibly responsible for the position of the detached outcrop of Granite on the western rock shelves (see foreground of (Figure 16B)) and for the sinuous nature of the Granite–Gabbro contact in the low rubbly cliffs, south of the shelves visible on the right of (Figure 16B). The Granite is intruded by a dyke of dark purplish grey porphyritic felsite near the outfall of A. a Ghlinne Mhoir and this in turn is cut by prominent dykes with a steep south-easterly dip. The latter consist of dolerites, microdiorites and microgranites identical to some of the rock types found in the Mullach Sgar Complex. Late, rusty-weathering, shallow-dipping sheets of dolerite cut both the Granite and the dykes.

The Granite is medium to fine-grained with variable contents of dark minerals and, in contrast with the granites of Na h-Eagan and Conachair, is almost free of drusy cavities. The first minerals to crystallise were andesine ($An_{35}Ab_{65}$), two pyroxenes, ferroaugite ($Ca_{44}Mg_{13}Fe_{43}$) and ferropigeonite ($Ca_{10}Mg_{44}Fe_{46}$), and a calcic amphibole (ferrohornblende or ferroedenite). Most amphibole is euhedral with abundant opaque inclusions but some forms mantles on pyroxene grains, where it clearly crystallised after the pyroxene, in association with more sodic plagioclase (oligoclase), magnetite and ilmenite. There is some tendency for amphibole, pyroxene and opaque minerals, to cluster with accessory biotite, zircon and apatite; these mafic clots show a sporadic distribution through the rock. Most plagioclase grains are zoned from andesine cores to rims of $An_{08}Ab_{92}$ and they are commonly mantled with alkali feldspar microperthite (Figure 17A). With a 5-μm wide electron probe beam, patches of pure albite mixed with patches of composition $Ab_{38}Or_{62}$ were detected but these are not distinguishable under an optical microscope. The alkali feldspar is either intergrown with subhedral grains of quartz, some with prism or rhombohedral faces, or, less commonly, the two minerals are granophyrically intergrown. Isolated euhedral and skeletal crystals of apatite and zircon, and elongate or stumpy grains of the rare-earth mineral chevkinite, are included in alkali feldspar and quartz. Chevkinite contains about 22% Ce_2O_3 and the crystallisation of this rare mineral rather than other Ce-bearing phases such as allanite or monazite suggests that conditions in the later stages of crystallisation of the Glen Bay Granite were unusually rich in Ti and poor in Al and P. Alteration of the original mineralogy is variable throughout the rock and depends partly on the degree of granulation in any one area (Figure 17B). Pyroxene is the least stable mineral and many grains are altered to an iron-rich chlorite (ripidolite). Chlorite is thus a common secondary mineral in the mafic clots referred to above and is accompanied in some places by tiny areas of sphene which adopts the unusual habit of sheafs of radiating fibres. This habit is similar to that of some sphene occurrences in the granites on Na h-Eagan. Chemically the sphene in both granites is not pure $CaTiSiO_5$, and variable contents of Fe, Mg and Al, with up to 8% $A1_2O_3$ in grains , in the Glen Bay Granite are present. In the sheared granite, fragmented crystals of amphibole, feldspar and quartz are penetrated by zones of incipient granulation, resulting in recrystallisation of grain margins to a fine-grained mosaic or mortar texture (Figure 17B).

The small amounts of chevkinite and sphene are not sufficient to increase the TiO_2 content of the Glen Bay Granite unduly (Table 17) and chemically it is similar to the less siliceous granites in other Hebridean centres, notably Grigadale (Ardnamurchan), Papadil (Rhum) and Glamaig (Skye). It has higher Mg, Fe and Ca contents than the Conachair Granite and this is reflected in a higher colour index of 7–9. Again the trace element content is not significantly different from those in other Hebridean granites although Ba, Zr and rare earth elements (p. 43) are relatively high.

Chemical analysis Glen Bay Granite

Major elements Oxide, wt %		Minor elements (ppm)	
SiO_2	69.9	Li	12
TiO_2	0.5	F	850
$A1_2O_3$	13.9	V	<10
Fe_2O_3	2.1	Cr	< 20
FeO	2.3	Co	28
MnO	0.1	Ni	< 20
MgO	0.6	Cu	18
CaO	1.9	Zn	140
Na_2O	5.1	Rb	65
K_2O	3.4	Sr	130
H_2O^{+110}	0.4	Y	94
H_2O^{-110}	0.1	Zr	786
P_2O_5	0.1	Ba	1340
Total	100.4	Pb	< 20

Analysis by A. N. Morigi, A. E. Davis and K. A. Holmes

References

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