St. Kilda: an illustrated account of the geology

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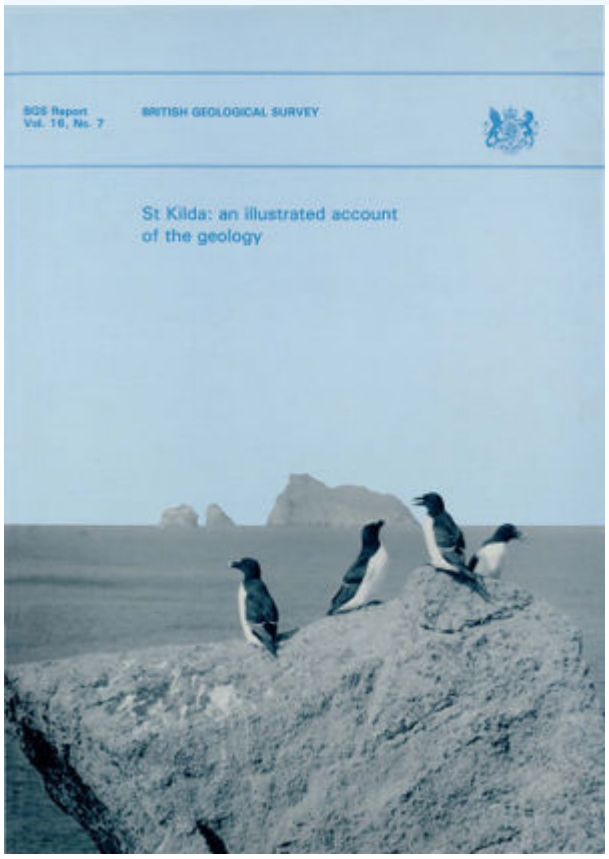
From: Harding, R.R. and Nancarrow, P.H.A. 1984. St. Kilda: an illustrated account of the geology. BGS Report Vol. 16, No. 7. Keyworth: British Geological Survey.].



Front cover.

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Contents

St. Kilda: an illustrated account of the geology

Summary

The islands of St Kilda consist of a range of intrusive igneous rocks which were formed in a Tertiary volcano about 60 million years (Ma) ago. The oldest rock is the Western Gabbro (E^{W}), a banded and layered intrusion with an overall dip of 45°E in the north and 45°N in the south. At its eastern margin parts of the Gabbro have been intensely sheared and recrystallised prior to intrusion of the younger rocks of the Mullach Sgar Complex. The Cambir Dolerite intrudes the Western Gabbro on the western cliffs of the Cambir as thin veins which have a fine-grained metamorphic granoblastic texture. Blocks of gabbro, identical to the Western Gabbro, have been mixed with other gabbros and dolerites and form a widespread breccia (EK) which comprises most of Boreray, Soay and Glacan Mor. The gabbros may once have formed a large layered intrusion which underwent metamorphism, disintegration and finally intrusion by tholeiites and microbreccias. South of the tunnel in Glen Bay the igneous breccias (EK) is cut by the Glen Bay Gabbro (E^{G}). The gabbro has been chilled to a glassy basalt against the breccias, and it itself divided into two parts by intrusion of the Glen Bay

Granite (G). This represents the first evidence of granitic activity on St Kilda and immediately preceded formation of the Mullach Sgar Complex. The Complex consists of four major intrusive phases, each having a mafic and a felsic component, some resembling ring dykes and others extensively fragmented. The last major intrusion on St Kilda was the Conachair Granite (I), a leucocratic, very drusy rock intruded 55 Ma ago with an initial $^{87}Sr/^{86}Sr$ ratio of 0.7041. Late dykes and sheets of a range of dolerites and felsites cut the major intrusions and represent the last phase of igneous activity. Neither lavas nor Tertiary sediments have been found on St Kilda although minerals from contact and regional metamorphic environments occur in the stream sediments and probably represent the residues from rocks that originally enclosed the volcanic centre. Early faults trend NW–SE on Hirta and a later series of NE–SW tensional faults are partly responsible for such features as the Dun Passage and the Cambir neck. Palaeomagnetic data indicate that the major intrusions crystallised in a reversed-polarity magnetic field between 50 and 60 Ma ago, and that St Kilda has drifted north about 19° since that time.

The dominant topographical features of St Kilda are the result of Quaternary glaciation and a small glacier probably occupied Village Bay during the Devensian glacial maximum. Today St Kilda is part of a drowned landscape.

Specimens referred to in the text

Prefix Collection

S — Rock from the Scottish Sliced Rock Collection housed at BGS, Murchison House, Edinburgh

MR — Rock from the Museum Reserve Collection housed at BGS, Exhibition Road, London

HM — Rock from the Hunterian Museum, Glasgow

CC — Rock from the Cockburn Collection, Royal Scottish Museum, Edinburgh

Acknowledgements

We wish to acknowledge the generous help afforded by the many people in different organisations in carrying out the St Kilda project. In particular Dr J. Morton Boyd, R. N. Campbell, C. Brown and Dr M. E. Ball of the Nature Conservancy positively encouraged the project as did Mr D. MacLehose of the National Trust for Scotland. The local knowledge of Wally Wright, the Warden on St Kilda representing both organisations, made possible more extensive mapping and collecting than we had hoped for, and the rock-climbing skills of Stewart Murray enabled access to many of the islands. The assistance and cooperation of the St Kilda Detachment, Royal Artillery, Guided Weapon Range under (at various times) Captains M. S. Forsyth, A. Cameron, and D. J. A. Cooke are much appreciated, and the willingness and expertise of our boat captain Andy Miller Mundy and his crew in undertaking the hazardous survey work near the cliffs is now legendary. We are very grateful for submarine samples collected by G. Ridley and his team (1979) and by Dr P. Kokelaar (1983), and their assistance has added significantly to ideas both about extent of intrusions and about Quaternary geology.

Specimens and thin sections were prepared in the Petrology Unit by C. W. Wheatley and R. D. Fakes, and Mr R. K. Harrison Dr M. T. Styles and Mr B. R. Young have assisted materially with discussion and X-ray data. We are grateful to R. T. Smith (Metalliferous Minerals and Applied Geochemistry Unit of BGS) for training and advice in geochemical sampling, and aspects of the Quaternary geology owe much to ideas discussed with both Dr J. D. Peacock (Highlands Unit of BGS) and Dr D.

G. Sutherland (Edinburgh University). All the photographs were processed in the Photographic Department and special thanks are due to J. M. Pulsford, H. J. Evans, C. J. Jeffery and R. E. Collins for the help they gave at all stages in the project. Miss L. Wahl drew the map and the diagrams and made many valuable suggestions for their improvement, and the final production of the map and report owes much to G. F. Inzani, J. B. A. Evans, Gill Cutress and Dr T. J. Dhonau.

References

BELL, J. D. 1982. Acid intrusions. Pp. 427–440 in SUTHERLAND, D. S. (Ed.). *Igneous rocks of the British Isles.* (New York: Wiley.)

COCKBURN,A. M. 1935. The geology of St Kilda. *Trans. R. Soc. Edinburgh,* Vol. 58, Pt. 2, 511–547.

FLINN, D. 1964. Coastal and submarine features around the Shetland Islands. *Proc. Geol. Assoc.,* Vol. 75, 3, 321–339.

GEIKIE,A. 1897. The ancient volcanoes of Great Britain. Vol. 2. (London: Macmillan.)

HARDING, R. R. 1966. The Mullach Sgar Complex, St Kilda, Outer Hebrides. *Scott. J. Geol.,* Vol. 2, 165–178.

HARDING, R. R. 1967. The major ultrabasic and basic intrusions of St Kilda, Outer Hebrides. *Trans. R. Soc. Edinburgh,* Vol. 66, 419–444.

HARDING, R. R. MERRIMAN, R. J. and NANCARROW, P.H. A. 1982. A note on the occurrence of chevkinite, allanite and zirkelite on St Kilda, Scotland. *Mineral. Mag.,* Vol. 46, 445–448.

HASKIN, L. A., HASIUN, M. A., FREY, F. A. and WILDEMAN, T. R. 1968. Relative and absolute terrestrial abundances of the rare earths. Pp.889–911 in AHRENS, L. H. (Ed.). Origin and Distribution of the Elements. (Oxford: Oxford University Press)

IRVINE, T. N. and BARAGAR, W. R. A. 1971. A guide to the chemical classification of the common volcanic rocks. Can. J. Earth. Sci., Vol. 8, 523–548.

IRVING, E. 1977. Drift of the major continental blocks since the Devonian. *Nature, London,* Vol. 270, 304–309.

JARDINE, W. G. 1982. Sea-level changes in Scotland during the last 18 000 years. *Proc. Geol. Assoc.,* Vol. 93, 1, 25–41.

JONES, E. J. W. 1981. Seismic refraction shooting on the continental margin west of the Outer Hebrides, northwest Scotland. *J. geophys. Res.,* Vol. 86, B12, 11553–11574.

LE MAITRE, R. W. 1976. The chemical variability of some common igneous rocks. *J. Petrol.,* Vol. 17, 589–637.

LOWRIE, W. and ALVAREZ, W. 1981. One hundred million years of geomagnetic polarity history. *Geology,* Vol. 9, 392–397.

MACCULLOCH, J. 1819. A description of the western islands of Scotland including the Isle of Man. Vol. ii. (London: Constable).

MEIGHAN, I. G. 1979. The acid igneous rocks of the British Tertiary Province. *Bull. Geol. Surv. G.B.,*

No. 70, 10–22.

PLANT, J. and MOORE, P. J. 1979. Regional geochemical mapping and interpretation in Britain. *Phil. Trans. R. Soc. London,* Vol. B288, 95–112.

RIDLEY, G. 1980. Diving in Scotland. Part 2. The British Sub-Aqua club St Kilda Survey Expedition 1979. *Underwater World,* Vol. 3, No. 1, 12–39.

ROSS, A. 1884. A visit to St Kilda. *Trans. Inverness Sci. Soc.,* Vol. iii, 72–91.

STRECKEISEN, A. 1976. To each plutonic rock its proper name. *Earth-sci. Rev.,* Vol. 12, 1–33.

SUTHERLAND, D. G., BALLANTYNE, C. K. and WALKER, M. J. C. 1982. A note on the Quaternary deposits and landforms of St Kilda. *Quaternary Newsl.,* No. 37, 5 pp.

TAYLOR, A. B. 1968. The Norsemen in St Kilda. *Saga Book Viking Soc.,* Vol. 17, 116–144.

THOMPSON, R. N. 1982a. Magmatism of the British Tertiary Volcanic Province. *Scott. J. Geol.,* Vol. 18, 49–107.

THOMPSON, R. N. 1982b. Geochemistry and magma genesis. Pp 461–477 *in* SUTHERLAND, D. S. (Ed.). *Igneous Rocks of the British Isles.* (New York: Wiley.)

THOMPSON, R. N. 1983. Thermal aspects of the origin of Hebridean Tertiary acid magmas, II. Experimental melting behaviour of granites at 1 kbar P_{H2O} . *Mineral. Mag.,* Vol. 47, 111–122.

THOMPSON, R. N., ESSON, J. and DUNHAM, A. C. 1972. Major element chemical variation in the Eocene lavas of the Isle of Skye, Scotland. *J. Petrol.,* Vol. 13, 2, 219–253.

WAGER, L. R. 1953. The extent of glaciation in the island of St Kilda. *Geol. Mag.,* Vol. 90, 177–181.

WAGER, L. R. and BAILEY, E. B. 1953. Basic magma chilled against acid magma. *Nature, London, Phys. Sci.,* Vol. 172, 68.

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