

Quaternary deposits - St. Kilda: an illustrated account of the geology

From Earthwise

[Jump to navigation](#) [Jump to search](#)

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.].



Figure 30A Cliffs of Quaternary drift on bedrock below St. Brianan's Church. Up to 20 m of massive Ruaival till are overlain by 2-3 m of stratified slope deposit (Ruaival head).



Figure 30B The base of the Ruaival head in A. Ruaival, showing alignment of platy clasts and containing pockets of organic sand with embedded blocks.



Figure 30C The Village Bay till, just west of the pier: an unstratified, locally derived deposit of blocks and cobbles in a gravel and sand matrix.



Figure 31A Water collecting on a terrace formed by a periglacial sheet flow, west side of Gleann Mor. On the opposite side of the glen, on the same contour, a spring breaks by the ruined building.



Figure 31B Protalus rampart below Glacan Chonachair. Scree derived from periglacial

weathering of the crags above has accumulated in front of a former residual ice patch.



Figure 31C Cam Mor blockfield. Periglacial frost-shattering of the Western Gabbro on Mullach Bi has resulted in scree deposits of massive gabbro blocks, up to 7 m across.

Chapter 17 Quaternary deposits

Keywords: glacial erratics, organic sand, protalus rampart, till, blockfield

A considerable gap in the geological record occurs between the intrusion of late dykes and sheets and the deposition of Quaternary tills of the Village Bay and Glen Mor areas. Neither lavas nor Tertiary sediments have been found on St Kilda, but since these rocks almost certainly occur to the west and north-west of the islands (Jones, 1981), it seems likely that the gap in the record represents an extended interval of erosion which ultimately exposed the roots of a complex volcanic centre comparable in size with Tertiary centres found in the Inner Hebrides.

Glacial erosion during the Quaternary era produced many of the present day topographical features of St Kilda and also deposited highly characteristic drifts of boulder, gravels and sands. Detailed studies of these deposits by Sutherland, Ballantyne and Walker (1982) suggest that three Quaternary cold periods can be recognised on Hirta: an early local glaciation, which deposited the Ruaival till, followed by another local glaciation responsible for the more extensive Village Bay till, the two glacial events being separated by an interstadial during which pollen-bearing sands accumulated. A final cold period was characterised by extensive frost shattering giving rise to blockfields, screes and protalus ramparts.

The Ruaival till forms the lower part of thick drift sections exposed below St Brianans Church and in the A. Ruaival ([Figure 30A](#)). It is a massive deposit, up to 20 m thick, consisting of locally-derived blocks and cobbles in a gravel and sand matrix, and is weakly iron-cemented towards its base. In the banks of the A. Ruaival the till is overlain by 1 m to 3 m of grey stratified slope deposits, the Ruaival head, containing platy joint-blocks from the Mullach Sgar Complex which are aligned parallel to the slope. Sutherland and others (1982) used measurements of the thickness of weathering rinds on dolerite clasts to show that the Ruaival till is significantly older than the overlying Ruaival head, and they suggest that the latter formed in periglacial conditions contemporaneously with the deposition of the Village Bay till. Pockets of organic sand with embedded blocks are found in the base of the

Ruaival head in A. Ruaival ([Figure 30B](#)). These sands, up to 20 cm thick, are thought to have formed by fluvial reworking of a pollen-bearing soil horizon which developed during a mild climatic interval; radio-carbon dating indicates that they are at least Middle Devensian in age (Sutherland and others, 1982).

The Village Bay till is exposed in the low cliffs above the storm beach, extending from just east of the pier westwards to the A. Mhor. At the pier, up to 4 m of granitic till can be seen resting on shattered bedrock ([Figure 30C](#)), whereas in the centre of the bay (below the fuel store), some 8 m of till consist of a mixture of local rock, granite, dolerite and gabbro blocks, in a gravel and sand matrix. Petrological analysis of the matrix shows that plagioclase is the main constituent of the coarse sand fractions, while illite and vermiculite predominate in the finest material. Up to 5 m of till, containing a mixture of local rock types, are exposed in the A. Mhor, near to the end of the village street. The local glacier responsible for these deposits probably occupied much of the bay from An Lag to the eastern slope of Mullach Sgar, but actual drift limits are mostly obscured by later flows of soliflucted debris and hill slope deposits. Springs commonly appear where the leading edges of these later deposits rest on the Village Bay till, for example at just above 100 ft contour west of the A. Mhor, and at a higher level, about 400 ft below Glacan Chonachair. A similar line of springs breaks at the 300 ft contour in Gleann Mor ([Figure 31A](#)), suggesting that here also hill slope deposits have flowed onto a more consolidated till. The latter, which may be contemporaneous with the Village Bay till, is well exposed above the rock shelves at the mouth of the bay, where some 2-3 m of unstratified blocks and cobbles in a gravel and sand matrix are seen, all of it apparently locally derived.

On Hirta most of the higher slopes are mantled by a varying thickness of hill slope deposits, material formed during periglacial conditions when frost shattering of exposed crags provided a plentiful supply of rock fragments. The most spectacular periglacial deposits can be seen in the Village Bay area where two protalus ramparts have developed over the Village Bay till. The best preserved rampart is found beneath Glacan Chonachair where a mound 250 m long and up to 8 m high has accumulated at the foot of the crags ([Figure 31B](#)). Thick screes can also be found on the eastern slopes of Mullach Sgar where a former protalus rampart has been breached by later flows of scree and hill slope material. In An Lag, mass movement of hill slope deposits is preserved as soliflucted gravel lobes. The lobes, up to 60 m long, form mounds 3-6 m across and 0.5 m high and display a regularity reminiscent of cultivation strips, with which they have been confused. Less regular solifluction sheets are found on the southern slopes of Mullach Geal and a sheet flow from the western slopes of Glacan Chonachair has diverted the course of the A. Mhor at about 350 ft, leaving a dry gully at 300-225 ft.

Prolonged frost shattering has developed highly characteristic block fields on the gabbroic rocks of Hirta. The most extensive is found on Cam Mor where blocks up to 7 m across form a massive scree below Mullach Bi ([Figure 31C](#)). On Ruaival and Dun the blockfields are essentially residual and associated with tor-like features on the summit ridges. Phosphatic cementation of the residual blocks on Ruaival points to a long history of seabird activity since, and perhaps during, the periglacial period. Similar blockfields occur on the south eastern side of Soay, on the northern part of Boreray, and one, albeit small, is perched on the top of Stac an Armin.

Apart from a few boulders of gneiss, believed by Cockburn (1935) to have been transported as ships' ballast, no large foreign erratics have been found on St Kilda. However, detailed petrological analyses of coarse sand fractions (0.5 mm - 2.0 mm) from drift deposits reveal the presence of rare clasts of red sandstone, reddened feldspars and rounded quartz grains in samples of the Ruaival and Village Bay tills and the Ruaival head. Rare grains of garnet also occur and other heavy minerals have been identified in stream sediments (pp. 32, 33). Since these foreign grains occur in the oldest till deposit, they must have been introduced prior to the local glaciation. Sutherland and others (1982) suggest that the Scottish ice sheet may have encroached on St Kilda depositing erratics

which were subsequently reworked into locally derived deposits. These erratics could have been derived from rocks outcropping close to the St Kildan volcanic centre.

References

At all times follow: [The Scottish Access Code](#) and [Code of conduct for geological field work](#)

Retrieved from

'http://earthwise.bgs.ac.uk/index.php?title=Quaternary_deposits_-_St._Kilda:_an_illustrated_account_of_the_geology&oldid=43456'

Category:

- [2. Northern Highlands](#)

Navigation menu

Personal tools

- Not logged in
- [Talk](#)
- [Contributions](#)
- [Log in](#)
- [Request account](#)

Namespaces

- [Page](#)
- [Discussion](#)

Variants

Views

- [Read](#)
- [Edit](#)
- [View history](#)
- [PDF Export](#)

More

Search

Navigation

- [Main page](#)
- [Recent changes](#)
- [Random page](#)
- [Help about MediaWiki](#)

Tools

- [What links here](#)
- [Related changes](#)
- [Special pages](#)
- [Permanent link](#)
- [Page information](#)
- [Cite this page](#)
- [Browse properties](#)

• This page was last modified on 5 November 2019, at 22:17.

- [Privacy policy](#)
- [About Earthwise](#)
- [Disclaimers](#)

