

Seabed and coastal features - 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.].

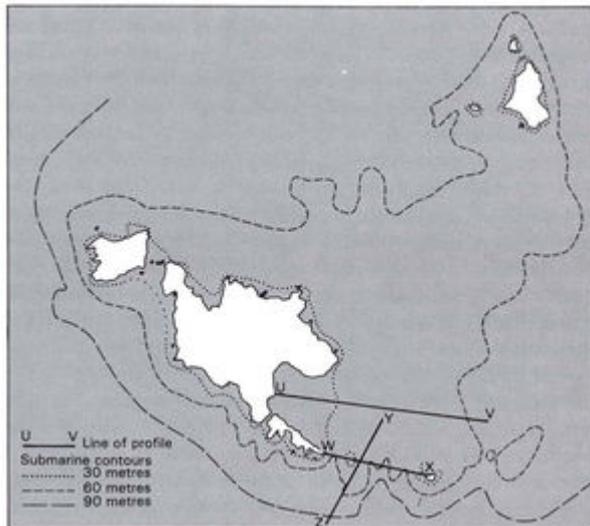


Figure 34 Seabed contours round St Kilda and positions of the profiles

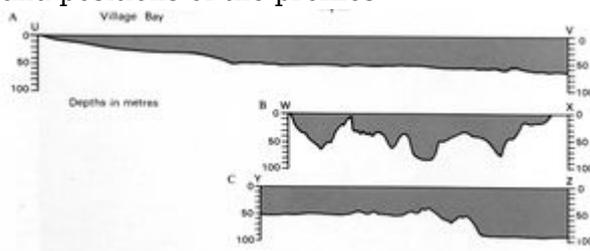


Figure 35 A. Profile UV from St Brianan's east-south-east across and outside Village Bay. B. Profile WX from Dun to Levenish (2.3 km). C. Profile YZ in a SW direction over the submarine ridge between Dun and Levenish.

Chapter 19 The seabed and coastal features

Keywords: bottom profiles, dredge samples, drowned landscape

A series of traverses using a recording echo sounder aboard the mv *Golden Chance* revealed strong contrasts in the submarine topography around St Kilda. North and east of the main island group, a gently undulating platform at depths between 45 and 70 m extends to Boreray, whereas along the south-west coast the sea floor is very irregular, with ridges and gullies sloping steeply to depths of 80 m or more. East of Dun, the crest of this slope forms a hummocky ridge (Figure 35B), (Figure C), extending to about 5 km ENE of Levenish and forming an arcuate southern margin to the platform east of Village Bay. A similar feature extends NNW from Soay but is less distinct due to the extremely rugged topography of this area. North of Soay there is a transition from the rough ground

of the west coast eastwards to a platform, which rises very gradually to an indistinct culmination between Oiseval and Boreray and then slopes down eastwards, reaching a depth of 90 m some 3 km east of Boreray. Away from the coasts the platform appears to be relatively featureless, except for a group of isolated 'peaks' rising to -42 m about 2 km north of Mina Stac, and a ridge running east-west at the same latitude about 2 km south of Stac Lee, near which divers recovered gabbro from a smooth, well-jointed rock surface. Gabbro was also found at 50 m depth about 1.5 km ENE of Levenish near the southern margin of the platform, indicating that the Western Gabbro, or substantial blocks of it, extends eastwards from Dun for several kilometres past Levenish.

The precipitous cliffs around Boreray, Soay and the north side of Hirta commonly continue beneath sea level with no change in slope to depths exceeding 30 m. Underwater overhangs occur beneath Stac Lee; and Scarbhstac, off the south coast of Boreray, lies above a submerged natural arch, with its apex at 30 m below sea level (Ridley, 1980). On the sea bed near the cliffs in many places are abundant large boulders scattered over bare rock surfaces, but the relative scarcity of loose talus indicates that large volumes of rock have been removed from the vicinity. The greatest amount of cliff debris is at the base of the north face of Conachair, but even this lies mostly below sea level. No wave cut platform associated with long term marine erosion at present sea level is found anywhere around the islands, and the stacs are separated from the main islands by deep water (more than 40 m between Stac Lee and Boreray). The coast most exposed to prevailing wave action, from Soay to Dun, is almost devoid of beach deposits and along the south-west coast of Hirta, divers found 'cliffs, overhangs and gullies with rock walls covered with encrusting life'. (Ridley, 1980.) Only small patches of boulder beach west of Stac a Langa and by the Cambir 'neck' occur on the north coast of Hirta. The comparatively sheltered Glen Bay has no significant beach deposits, and soundings revealed a hard smooth floor with a U-shaped east-west profile and a concave slope northwards to about 40 m depth at the mouth of the bay. Along the east side of Glen Bay underwater cliffs down to about -25 m are covered with anemonies. The beach in Village Bay lies along the most sheltered shore of the islands, and at the foot of comparatively gentle slopes.

The greatest area of sediment lies on the floor of Village Bay and extends seawards to about 1 km south-east of the base of the cliffs of Oiseval forming a gentle convex 'mound' with a steep slope eastwards which breaks abruptly to the platform at 50 m depth (Figure 35). A dredged sample was collected from this slope between about 1.25 km SSE of Rubha an Uisge (50 m depth), and about 250 m south of the HWM due south of the summit of Oiseval (30 m depth). This consists of 2245 g (total weight) of which 87% is rock material (with encrustations) and 13% shell debris. It is a loose gravel formed largely of pebbles, mostly sub-angular to rounded, up to 60 mm diameter, with very few rock fragments less than 10 mm across. Most have primary and secondary encrusting bryozoa and worm tubes, which although commonly covering the pebbles, yet form very few aggregates. More than half the rock fraction consists of Conachair Granite, and most of the remainder are dolerites and granites of the Mullach Sgar Complex. About 10% of the total sample consists of rock types not known on St Kilda, and these include biotite-granite with pink and colourless feldspar, amphibolite, granitic and quartzose gneisses, a variety of quartzites, and a silica cemented arkosic sandstone. The latter, which is reminiscent of Torridonian Sandstone, is deep buff-pink and consists of well rounded to sub-angular quartz with pink to red feldspar, and contains a fragment of granitic gneiss with biotite and pink feldspar. Most of the shell material consists of broken, worn fragments heavily encrusted with bryozoa, sponges and worm tubes. A wide variety of species is present including mussels and other bivalves, gastropods, brachiopods, echinoid spines, plates and complete small tests, and siliceous sponge spicules and skeletons.

No samples were recovered from several dredge runs in the area south-west of Boreray and much of the sea bed consists of bare rocks. However, one run was more fruitful and 3233 g were dredged from about 2 km south of Stac Lee. About 35% of this gravel sample consists of smooth, clean, well

rounded pebbles and rock granules, only a very few having minor encrustations of bryozoa and worm tubes. The remaining 65% consists mostly of rounded clean shell debris up to about 10 mm across with a few large complete shells. The faunal types are similar to those from Village Bay. The rock fraction of the sample consists of dolerite and gabbro, with some pebbles of basalt and of a hard, grey, very fine-grained rock similar to the early basic sheets. Granules of greenish-grey tuff are also present and may represent extrusive components of the St Kilda igneous suite which have not been preserved above sea level. A single (40 mm) pebble of Conachair Granite was found. Pebbles and granules of rock types not known locally form about 5% of the rock fraction and include biotite-granites, granitic gneiss (some with epidote), amphibolite (some garnetiferous), coarse-grained micaceous quartzite, psammitic schists and epidote-rock. Sedimentary rock fragments include quartzites, siltstones and a variety of sandstones, some red with well rounded quartz grains, and some arkosic with pink feldspar.

A small amount of sand was also obtained from the seabed about 1 km north-east of Mina Stac. It consists of angular quartz sand with some white to buff translucent feldspar, a few pyroxene and magnetite grains and some basic rock fragments.

Although sampling was insufficient to define the exact distribution of sediment, both the divers' observations and the echo-sounding data indicate that much of the sea floor near the islands is free of unconsolidated sediment, and that which does occur is generally present as isolated thin patches. Discrepancies between depths sounded in Village Bay during the present survey and those published on Admiralty charts and between soundings taken a few days apart suggest that some of the sediment present may be moved frequently. (Strong tides are demonstrated in the area by overfalls along the submarine ridge east of Dun). On the other hand, the angularity of the pebbles and their encrustation with delicate bryozoa and worm tubes indicates that the deposit is only rarely disturbed, perhaps during violent storms, which would prevent aggregation of the pebbles and the deposition of fine sediment. Some depth discrepancies may be due to uncharacterised local tide anomalies. The gravel deposit sampled south of Stac Lee is one which has suffered much more abrasion than that in Village Bay, and probably represents material which is frequently disturbed by tidal current and forms patches lying in hollows on the rock platform.

The submarine topography around St Kilda indicates that the present coastline is a very immature one, with many submerged features, well below present sea level, which have been caused by severe erosion. The rugged gully topography to depths of more than 90 m along the west coast may be due to subaerial erosion, and the distinct platform north and east of Hirta, together with the nature of the cliffs and stacs suggests that there was a considerable period when the sea level was 40 to 50 m lower than it is at present. The large bank of heavily encrusted pebbles and shells in Village Bay may therefore be regarded as the remains of a drowned beach, since the outer edge of this deposit lies at about 50 m depth, which is similar to the base of the concave slope below the cliffs of Oiseval.

Studies of sea levels around Scotland (Jardine, 1982) show that although global sea level stood at about -130 m at the Devensian glacial maximum (about 18 000 years ago), relative sea levels around the Scottish mainland were at only about -60 m due to isostatic depression of the land mass near the main centre of glaciation. Peripheral to this basin, isostatic effects are less marked and relative sea levels are more closely related to absolute sea level changes. Some features of the St Kilda coast and sea floor are strikingly similar to parts of the Shetland coast, where submergent cliffs with no wave cut platform or beaches, and concave slopes below sea level from the base of the cliffs to great depths are attributed to a continuing net rise in relative sea level over a long period covering several glacial episodes (Flinn, 1964). Such a process would seem the most likely to account for the present St Kilda coast and submarine features, particularly the great heights of the cliffs and the large area of platform at 40 to 50 m depth.

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=Seabed_and_coastal_features_-_St._Kilda:_an_illustrated_account_of_the_geology&oldid=43467'

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 6 November 2019, at 17:52.

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

