

Strath 4:

Beinn an Dubhaich



Much of the heather-covered high ground of Beinn an Dubhaich on the east side of Loch Slapin is composed of a Paleocene granite, intruded into pale Cambro-Ordovician Durness Group dolostones, most obvious in the coastal exposures. In the distance is the summit ridge of Bheinn Shuardail, also composed of Durness Group dolostones.

Aspects covered: Holocene raised marine deposits at Camas Malag; the Paleocene Beinn an Dubhaich Granite of the Eastern Red Hills Intrusive Centre; Cambro-Ordovician Durness Group dolostones, locally thermally metamorphosed to produce marbles; dykes of the Paleocene regional swarm; Triassic and Lower Jurassic sedimentary rocks; Cambrian sandstones (quartzites); Torridonian sandstones; a gabbro macro-dyke; a layered picrite dyke.

Route: [Camas Malag](#) – [Allt na Garbhlain](#) - [Allt nan Leac](#) - [Glen Borerraig](#) - [Dùn Kearstach](#) - [Stac Suisnish](#) (- return [Camas Malag](#)).

Distance: 9 kilometres.

Time: Up to 7 hours.

General comments: A route that allows the examination of the Paleocene Beinn an Dubhaich Granite of the Eastern Red Hills Intrusive Centre, the surrounding country-rock Late Proterozoic ('Torridonian') and Cambro-Ordovician strata involved in the Moine Thrust Zone, unconformably overlain by Mesozoic (Triassic and Jurassic) strata, and various Paleocene minor intrusions.

Coastal exposures are involved and, therefore, low (preferably Spring) tides are important for some exposures.

Locality 4, on the shore of Loch Slapin at [\[NG 5837 1863\]](#), where the [Allt na Gabhlain](#) enters [Loch Slapin](#), can be treated as optional when visiting Locality 3. It is suggested that before commencing this excursion, the text for Localities 3 and 4 is read through and a decision is made.

Proceed towards [Kilbride](#) on the Broadford-Elgol (B8083) road, 8km (5 miles) SW of [Broadford](#). 1.5km (1 mile) west of [Loch Cill Chriosd](#) the [road branches](#). Follow the less-prominent left-hand (south) fork for [Kilbride](#), over the cattle grid, along the gated road, to [Camas Malag](#). The quality of this road has deteriorated over the years and it might be prudent to first check its condition. NW of the road is a large [marble quarry](#) at [Torrin](#), the working face of which exposes pale, thermally-metamorphosed Cambro-Ordovician Durness Group dolostones ('marble') intruded by contrastingly dark basalt and dolerite minor intrusions. The marble is used both as a decorative stone/aggregate and as a source of agricultural lime. Parking is available on the grass-covered raised beach SW of the end of the metalled road at [Camas Malag](#).

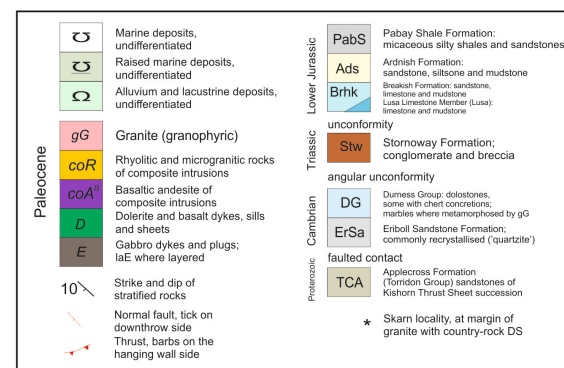
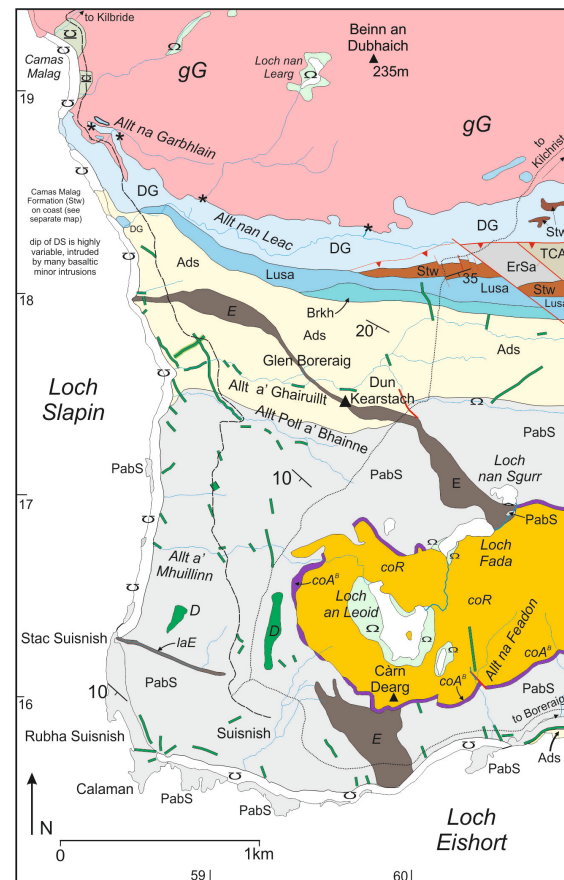


Figure Strath 4.1: Summary map of the Beinn an Dubhaich area.

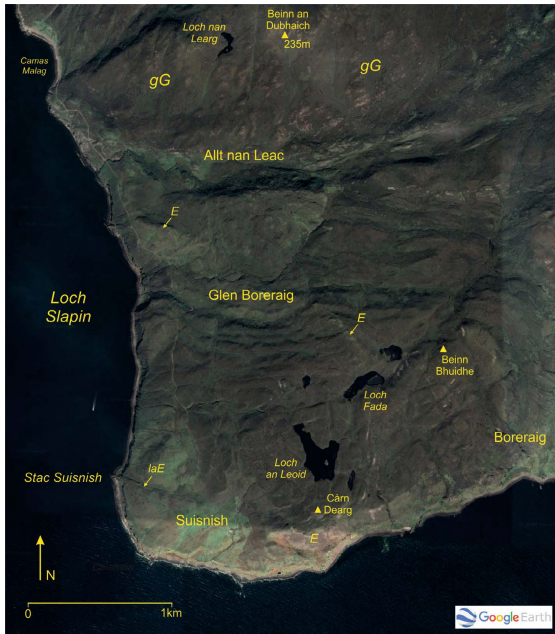


Figure Strath 4.2: Annotated Google Earth® image of the Beinn an Dubhaich area. [E: gabbro; gG: Beinn an Dubhaich Granite; laE: layered gabbro (dyke)].



Figure Strath 4.3: Annotated oblique Google Earth® image of the Beinn an Dubhaich area. [Ais: Ardnish Formation; DG: Durness Group dolostones; E: gabbro; ErSa: Eriboll Sandstone Formation; gG: Beinn an Dubhaich Granite; laE: layered gabbro (dyke); Lusa: Lusa Limestone Member; PabS: Pabay Shale Formation; Stw: Stornoway Formation; TCA: Applecross Formation (Torridon Group)].



Figure Strath 4.4: The working Torrìn marble quarry. Intruded into these pale contact-metamorphosed Cambro-Ordovician Durness Group dolostones ('marbles') are dark basalt and dolerite minor intrusions. View is towards the NW, with, in the distance, left-to-right, Belig, Glas-Bheinn Mhòr and Beinn na Crò.

Locality 1 [NG 5826 1926]:

From [Camas Malag](#) several features of the general geology of the surrounding area may be noted. Due west, forming the ridge of [An Càrnach](#) on [Strathaird](#), Paleocene plateau lavas overlie Middle and Upper Jurassic strata, which dip at a shallow angle to the west. Further west, the irregular ridge of [Blà-bheinn](#) ('Blaven') marks the eastern edge of the Paleocene Cuillin Intrusive Centre. Dykes of the Paleocene NW-SE -trending regional swarm intrude the layered rocks that crop out on [Blà-bheinn](#) and are commonly inweathered. 4km to the north are the prominent summits of [Beinn na Crò](#), [Beinn Dearg Mhòr](#), [Beinn Dearg Bheag](#) and [Beinn na Caillich](#), composed of Paleocene granite(s) of the Eastern Red Hills Intrusive Centre. Directly east, the Beinn an Dubhaich Granite is intruded into the core of a broad anticline within Cambro-Ordovician Durness Group dolostones. Dykes of the Paleocene regional swarm are common and obvious throughout the surrounding area and are particularly well-exposed along the east coast of [Loch Slapin](#). However, they are rare within the relatively late-stage granite that forms [Beinn an Dubhaich](#). At [Camas Malag](#), a Holocene raised marine/beach platform lies immediately to the NE of the present-day beach. The cobbles and sand of this platform can be examined in the banks of the small stream directly to the SW of the [small bridge](#) at the western end of the bay. Cobbles of the following rock-types are readily identified: granite, basalt, dolerite, gneiss, schist, (Torridonian) sandstone, (Cambro-Ordovician) dolostone, and (Jurassic) sandstone, limestone and shale. The wave-cut platform at the NW end of [Camas Malag](#) is composed of the Beinn an Dubhaich Granite, a slightly porphyritic granite containing phenocrysts of alkali feldspar and quartz. The main mafic minerals are hornblende and biotite. Rare, fine-grained, mafic inclusions, typically round and up to 5cm across, are dispersed throughout this intrusion.

Proceed to the headland on the south side of the [Camas Malag](#).



Figure Strath 4.5: Camas Malag on the east side of Loch Slapin, with the working marble quarry in the middle ground, and, in the distance, left-to-right, Glas-Bheinn Mhòr, Beinn na Crò and Beinn Dearg Mhòr.

Locality 2 [NG 5825 1885]:

This headland is partly composed of granite, giving way, to the south of a [prominent gully](#), to Cambro-Ordovician Durness Group dolostones. These impure carbonates have been partially recrystallised to calc-silicate-bearing marbles by the granite and have undergone substantial de-dolomitisation. Throughout these steeply-dipping, fine-bedded, alternating pale- and dark-banded rocks are chert nodules that have reacted to varying extents with the carbonate matrix during thermal metamorphism, producing concentric bands of calc-silicate minerals, including: talc, tremolite, diopside, serpentine after forsterite, and brucite after periclase. The chert within the dolostones appears to be of diagenetic origin, rather than depositional, and may replace original features such as burrows and stromatolites.

The dolostones are cut by dykes, some deformed, of the Paleocene NW-SE -trending regional swarm. These commonly near-vertical minor intrusions are typically less than 1m wide and are predominantly composed of basalt and dolerite. One obvious feature of the dykes is the development of boudin structures, with the necks of the individual boudins exhibiting significant amounts of thinning. The dykes have well-developed chilled margins, even within the necks, suggesting that cooling was contemporaneous with deformation. Little, if any, penetrative fabric of tectonic origin is present within these dykes, in contrast with the country-rock dolostones, which locally contain cleavages that are deflected into the boudin necks. It is likely that these dykes were intruded whilst the district was being subjected to radial compressive forces, during the emplacement of the nearby granite(s). A good example of these relationships is shown by the third dyke that crops out on the headland south of the near-vertical granite-dolostone contact. 10m south of this dyke, good examples of large chert nodules within the marbles may be examined.



Figure Strath 4.6: Dolerite dyke within vertically-bedded Cambro-Ordovician Durness Group dolostones. View is west across Loch Slapin to (left-to-right) An Càrnach, Blà-bheinn, Clach Glas, Garbh-bheinn, Belig and Glas-Bheinn Mhòr.

Continue c. 200m SE along the track, over Cambro-Ordovician dolostones, to [where it crosses the Allt na Garbhlain](#). En route, especially on the SW (seaward) side

of the track, the following features should be noted: the development of a typical limestone pavement containing clints (highs) and grykes (lows); the highly folded nature of the strata; and, Paleocene NW-SE -trending basalt and dolerite dykes.

On the seaward side of the track, the [Allt na Garbhlain](#) disappears into a [sink](#), part of an extensive cave system within the Durness Group dolostones.



Figure Strath 4.7: Sink where the Allt na Garbhlain disappears into the cave system within the Durness Group dolostones (marbles). Iain Allison for scale.

Continue SE along the track to where it crosses the [Allt nan Leac](#). Access the shore of Loch Slapin and head NW along the coast for c. 100m to [\[NG 5847 1842\]](#). Here, the Cambro-Ordovician dolostones are unconformably overlain by inclined, well-bedded Lower Jurassic limestones, sandstones and shales.

Locality 3 [NG 5847 1842]:

The angular unconformity separating the Cambro-Ordovician dolostones and the overlying Lower Jurassic strata of the Ardnish Formation occurs where the clint and gryke pavement of the former gives way to the predominantly heather-covered ground of the distinctly stratified latter. Directly north of the mouth of the [Allt nan Leac](#) is a c. 60m-wide inlier of the dolostones, exposed above the High-Water line. Unconformably above the dolostones of the inlier, the Lower Jurassic sedimentary rocks comprise thin limestones and shales (shell beds) containing chert debris and common *Gryphaea (arcuata)* (an oyster, commonly referred to as the Devil's toenails) and the bivalve, *Oxytoma*, together with laminated sandy shales and sandstones that contain the ammonite *Arnioceras*.



Figure Strath 4.10: Inlier of Cambro-Ordovician Durness Group dolostones, overlain by west-dipping, fossiliferous Lower Jurassic Ardnish Formation limestones and shales. The sea-cliffs in the distance are composed of Pabay Shale Formation strata. View towards south.



Figure Strath 4.11: Fossiliferous Ardnish Formation shales on the south side of the inlier of Cambro-Ordovician Durness Group dolostones on the shore of Loch Slapin, with abundant *Gryphaea (arcuata)* and *Oxytoma*. Pole c. 1m long.

An optional **Locality 4** occurs on the shore of Loch Slapin at [NG 5837 1863], where the [Allt na Gabhlain](#) enters [Loch Slapin](#). Access is c. 350m NW along the beach from where the [Allt nan Leac](#) enters [Loch Slapin](#).

Locality 4 [NG 5837 1863]:

On the beach where the [Allt na Gabhlain](#) enters [Loch Slapin](#), the Triassic Camas Malag Formation crops out. Access requires a low tide and is easiest from further to the SE where the [Allt nan Leac](#) enters [Loch Slapin](#). These locally preserved, thinly bedded sandstones, siltstones, mudstones and conglomerates are non-fossiliferous and represent lacustrine and alluvial fan deposits. They dip at 25–35° to the west and are best examined on the near-vertical back wall of the beach and at the top of the sea-cliff. These strata appear to be preserved within lows (grykes) of the palaeo-karst surface of the Durness Group dolostones.

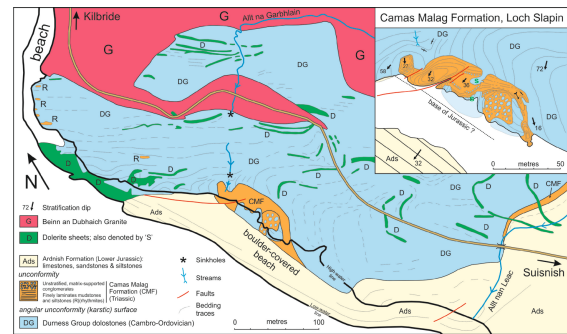


Figure Strath 4.8: Geological map showing the location of the Camas Malag Formation, unconformably overlying deformed Cambro-Ordovician Durness Group dolostones intruded by Paleocene dolerite dykes and sheets.



Figure Strath 4.9: Thinly-bedded, contorted siltstones (rhythmites) of the Triassic Camas Malag Formation at the top of the coastal cliff on the east side of Loch Slapin at the Allt na Gabhlain.

Return SE along the coast to the [Allt nan Leac](#) and uphill to where the track crosses the [Allt nan Leac](#).

Note: At the [headland](#) c. 400m south of the [Allt nan Leac](#), the Lower Jurassic sandstones and sandy shales are cut by a 10m-wide olivine gabbro macro-dyke. Inland, this steep-sided intrusion widens and forms a prominent ridge running ESE into [Glen Boreraig](#), and upon which is located [Dùn Kearstach](#) (see below). The route set out below does not involve the coastal exposure of the dyke but does cross it at [Dùn Kearstach](#).

The course of the [Allt nan Leac](#) very approximately defines the southern limit of the dolostones (intruded by the Beinn an Dubhaich Granite). On the south side of the [Allt nan Leac](#), towards the top of the riverbank, the unconformably overlying Triassic (Stornoway Formation) and Lower Jurassic (Breakish Formation) strata crop out. Take the rough path, eastwards, on the south bank, well above the vegetated crags. Distinctly-bedded (*Gryphaea*-bearing) Lower Jurassic limestones (Lusa Limestone Member, Breakish Formation) unconformably overlie Triassic Stornoway Formation conglomerates and breccias, which unconformably overlie Cambro-Ordovician Durness Group dolostones.

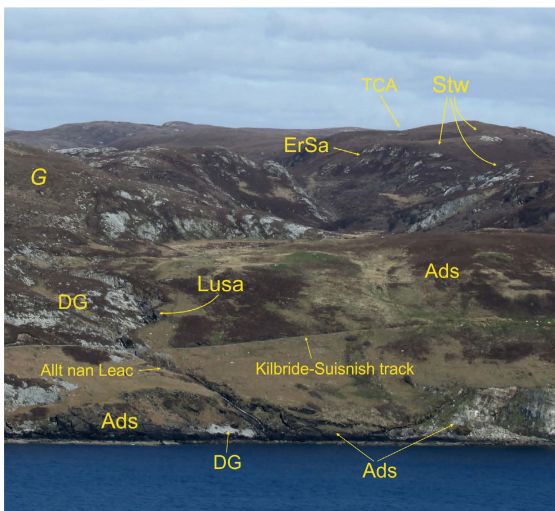


Figure Strath 4.12: Annotated view of the Allt nan Leac valley on the south side of Beinn an Dubhaich, viewed towards the east. The area on the north (left) side of the valley consists of Cambro-Ordovician Durness Group dolostones (DG) intruded by the Paleocene Beinn an Dubhaich Granite (G). A traverse over the ground on the south (right) side of the valley reveals typical exposures of Durness Group dolostones (DG), Triassic Stornoway Formation breccias/conglomerates (Stw), and sequences of Lower Jurassic Lusa Limestone Member (Breakish Formation) and Ardnish Formation limestones, sandstones and shales. In the distance are outcrops of Cambrian Eriboll Sandstone Formation (ErSa) 'quartzites' and rust-red-weathering Applecross Formation (Torridon Group) sandstones (TCA) within the Kishorn Thrust Sheet that overlies the Durness Group dolostones.



Figure Strath 4.13: Chert-bearing Durness Group dolostones, typical of exposures south of the Allt nan Leac. Pole c. 1m long.



Figure Strath 4.14: Stornoway Formation breccia, typical of exposures south of the Allt nan Leac. Hammer c. 30cm long.



Figure Strath 4.15: Ardnish Formation sandstones, limestones and shales, typical of exposures south of the Allt nan Leac. View towards the west. Pole c. 1m long.



Figure Strath 4.16: *Gryphaea*-bearing Ardnish Formation limestone, typical of exposures south of the Allt nan Leac. Coin c. 20mm diameter.

Continue up (to the east) the [Allt nan Leac valley](#).

Locality 5 [NG 6027 1814]:

Continue east along the south side of the valley to a point just east of where the (sometimes faint) [Kilchrist-Suisnish path](#) crosses the valley. Here, a prominent rock-face is composed of Lower Cambrian Eriboll Sandstone Formation sandstones, which contain a quartz cement that results in their appearance as 'quartzites' (the Kilchrist-Suisnish footpath runs across the base of this face). The sandstones are relatively pure, not obviously bedded, and are highly fractured.



Figure Strath 4.17: Cambrian Eriboll Sandstone Formation 'quartzites', within the Kishorn Thrust Sheet, typical of exposures south of the Allt nan Leac. Pole c. 1m long.

A further c. 300m east (up the valley) at [\[NG 6060 1821\]](#), marked by a minor break in slope, the Cambrian sandstones give way to prominent red sandstones and grits of the Late Proterozoic ('Torridonian') Applecross Formation (Torridon Group) that dip towards the SW. In places, these sandstones contain thin veins of quartz. The Cambrian sandstones unconformably overlie the Torridonian strata and both have been thrust over the underlying (foreland) Cambro-Ordovician dolostones as part of the Kishorn Thrust Sheet. The line of the thrust plane is marked by the conspicuous depression that forms the E-W -trending upper reaches of the [Allt nan Leac](#).



Figure Strath 4.18: Applecross Formation (Torridon Group) sandstones, within the Kishorn Thrust Sheet, typical of exposures south of the Allt nan Leac. Pole c. 1m long.

Within the upper reaches of the [Allt nan Leac](#), Triassic Stornoway Formation strata crop out on the south side of the valley, where they unconformably overlie the Cambrian sandstones and Torridonian sandstones, in contrast to further down the valley (west), where they unconformably overlie the Cambro-Ordovician Durness Group dolostones. These Triassic continental sedimentary rocks were deposited in alluvial fans and range between breccias and conglomerates, containing matrix-supported clasts derived, predominantly, from the Cambro-Ordovician dolostone sequence.



Figure Strath 4.19: Triassic Stornoway Formation breccia, (unconformably overlying Cambrian Eriboll Sandstone Formation sandstones/quartzites) typical of exposures south of the Allt nan Leac. Hammer c. 30cm long.

From here, the view to the north, towards [Beinn na Caillich](#), illustrates the contrasting vegetation that has developed on the Beinn an Dubhaich Granite, compared to that on the Cambro-Ordovician dolostones. The boundary is generally steeply inclined and irregular. One possible reason for this irregularity of the contact may be that when the (granite) magma was emplaced, it was able to flow into substantial cavities within the dolostones, similar to the many present-day caves identified in the dolostones throughout the district of Strath.



Figure Strath 4.20: View towards the north from the upper part of the Allt nan Leac Valley, with pale Cambro-Ordovician Durness Group dolostones (marble) in contact with the heather-covered Paleocene Beinn an Dubhaich Granite. In the distance are the summits of Beinn Dearg Mhòr (left) and Beinn na Caillich (right), both formed of a dome-shaped granite, the Beinn na Caillich Granite, part of the Eastern Red Hills Intrusive Centre.

If desired, the granite is relatively easily accessed from the upper reaches of the [Allt nan Leac](#). The excursion can also be cut short by either returning to [Camas Malag](#) via the [Allt nan Leac valley](#), or by gaining the high ground of the [Beinn an Dubhaich](#) ridge and walking westwards across the granite to [Camas Malag](#).

Alternatively, to continue, head SW along the rough Kilchrist-Suisnish track to *Dùn Kearstach*, a galleried Iron Age broch or hill fort at [\[NG 5963 1745\]](#), over poorly exposed Ardnish Formation strata. The *Dùn* sits atop a gabbro (locally dolerite) macro-dyke, which forms a marked positive topographic feature. From here, the view, west across [Loch Slapin](#) to [Strathaird](#), and beyond to the Cuillin Hills, is excellent.



Figure Strath 4.21: View from *Dùn Kearstach*, located on a broad gabbro macro-dyke. On the west side of Loch Slapin, Ben Meabost is composed of Paleocene basaltic lavas that overlie Middle and Upper Jurassic sedimentary rock, beyond (west of) which is the distinctive ridge of Blà-bheinn, Clach Glas, Sgùrr nan Each and Belig. In the far distance is the main ridge of the Cuillin Hills.

Continue SW along the path to the abandoned village of [Suisnish](#). Cleared in the 1850s, along with the village of [Boreraig](#), further east on the shore of [Loch Eishort](#).

Archibald Geikie, one-time director of the Geological Survey of Great Britain, recalled in his memoirs when surveying the area:

'A strange wailing sound reached my ears. I could see a long and motley procession winding along the road that led north from Suisnish. There were old men and women, too feeble to walk, who were placed in carts; the younger members of the community on foot were carrying their bundles of clothes while the children, with looks of alarm, walked alongside. A cry of grief went up to Heaven, the long plaintive wail, like a funeral coronach. The sound re-echoed through the wide valley of Strath in one prolonged note of desolation.'

Apparently, the landowner of the time, Lord MacDonald, felt that the villagers lived too distant from the church at Broadford. He feared for their souls.....

Within the ruins of [Suisnish](#), an obvious WNW-ESE – trending ridge marks the outcrop of a dyke, only well exposed on the shore of Loch Slapin at [Stac Suisnish](#).

Locality 6 [\[NG 5850 1628\]](#):

At [Stac Suisnish](#), the main feature is a spectacular layered, dyke-like intrusion of picrite, 30-40m wide, emplaced into strata of the Lower Jurassic Pabay Shale Formation. This coarse-grained, olivine-rich intrusion has well-developed layering, defined by the differing proportions of olivine, clinopyroxene and plagioclase. Autoliths of early-crystallised material also define the stratification of the intrusion. Various mechanisms can be inferred to explain the origin of the layered nature of the intrusion, with gravitational-assisted accumulation being the most likely due to the presence of the autoliths.



Figure Strath 4.22: Inclined layers within the Stac Suisnish Dyke, on the south side of the main exposure above the High-Water Line of Loch Slapin. Layers are defined by both differing proportions of the main mafic minerals (olivine and clinopyroxene) and plagioclase, and by the presence of thin intervals of autoliths. Pole c. 1m long.



Figure Strath 4.23: Detail illustrating the layers within the Stac Suisnish Dyke, defined by mineral proportions, crystal size and the distribution of autoliths. Length of hand lens c. 50mm.

To the north and south of the dyke, gently-inclined strata of the Pabay Shale Formation crop out along the shore of [Loch Slapin](#). These sandy, micaceous shales were deposited in relatively deep marine water, indicated by their benthic fauna, including ammonites and belemnites. Calcareous concretions ('doggers') of diagenetic origin are relatively common, crudely defining stratification. Inland exposures are uncommon, but do occur on the [Camas Malag – Suisnish](#) track.



Figure Strath 4.24: View towards the north from the Stac Suisnish Dyke illustrating the inclined strata (towards the west) of the Pabay Shale Formation on the east side of Loch Slapin. The three Red Hills in the distance are (left-to-right): Beinn Dearg Mhòr, Beinn Dearg Bheag and Beinn na Caillich.

Return to the [Camas Malag – Suisnish](#) track and return north to [Camas Malag](#) (3.5km (2 miles)).

End of excursion.