

Strath 1: Broadford Bay



The peninsula of Ardnish in Strath is composed of Lower Jurassic strata intruded by Paleocene dykes and sills. It benefits from spectacular views west across Broadford Bay to the prominent granite peaks of the Red Hills.

Aspects covered: Lower Jurassic marine sandstones, siltstones, shales, limestones, including two coral beds, and clastic units with chamosite oolites; Paleocene dolerite dykes and sills; a composite sill; minor faults.

Route: Localities 1 and 2: [Broadford](#) - [Ob Lusa](#) - [Rubha Lusa](#) (-return [Broadford](#)); **Locality 3:** [Broadford](#) ([Waterloo](#)) - [Bogha Mòr Achadh a' Chuirn](#) - [Rubha Achadh a' Chùirn](#) - [Ardnish](#) - [Rubha Ardnish](#) - [Ob Bhreacais](#) - [Ardnish](#) (- return [Broadford](#)); **Locality 4:** [Broadford](#) - [Corry](#) - [Rubh' an Eirèannaich](#) (- return [Broadford](#)).

Distance: Localities 1 and 2: 1km; Locality 3: 5km; Locality 4: 2km.

Time: Localities 1 and 2: 2 hours; Locality 3: 3-4 hours; Locality 4: 1-2 hours.

General comments: Coastal exposures are involved and therefore low (preferably spring) tide conditions are necessary. Due to tide restrictions, it is unlikely that all three localities can be visited in one day. The (muddy) [Ob Bhreacais](#) cannot be crossed, except via the [footbridge](#) at the narrow end of the inlet, near to the road-end at [Lower Breakish](#).

[Broadford](#) (Bay) (old Norse, Breiðafjorðr, the broad bay, with the ford being where the river can be safely crossed) is located on the main (A87) road in the central part of Skye, 16km (10 miles) west of [Kyleakin](#) and 40km (25 miles) SE of [Portree](#).

Coastal exposures around the bay are dominated by Lower Jurassic sedimentary rocks intruded by Paleocene dykes and sills. These Lower Jurassic strata were originally (and in some literature still) defined as the Broadford Beds or Broadford Beds Formation. Subsequently, there has been a subdivision into the Breakish Formation (oldest) and the Ardnish Formation (youngest).

This excursion is split into three parts:

Localities 1 and 2: The coastal section at [Ob Lusa](#), 5km (3 miles) east of [Broadford Bay](#), which comprises the lower part of the sequence, the Breakish Formation;

Locality 3: The coastal section on the peninsula of [Ardnish](#) on the east side of [Broadford Bay](#), which comprises the upper part of the sequence, the Ardnish Formation;

Locality 4: The coastal section on the west side of [Broadford Bay](#), at [Corry](#), which comprises strata from the upper part of the Ardnish Formation, intruded by the Paleocene Rubh' an Eirèannaich composite sill.

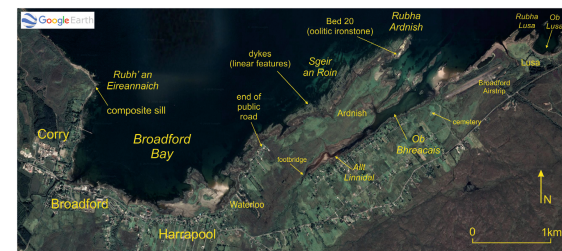
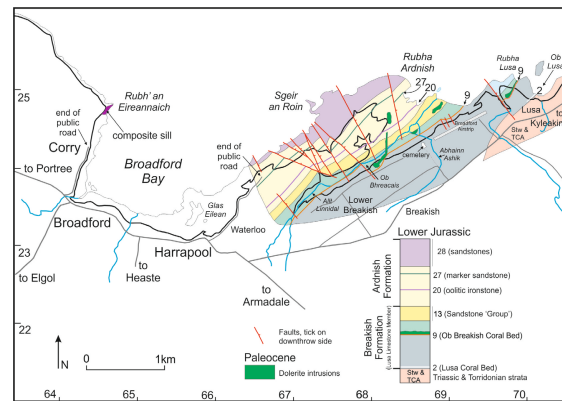
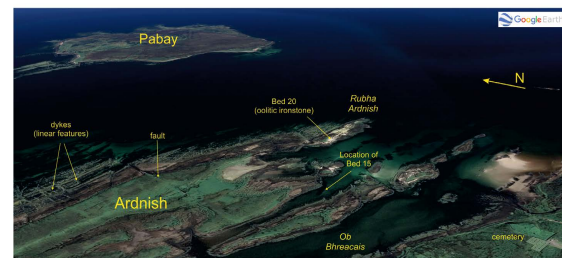
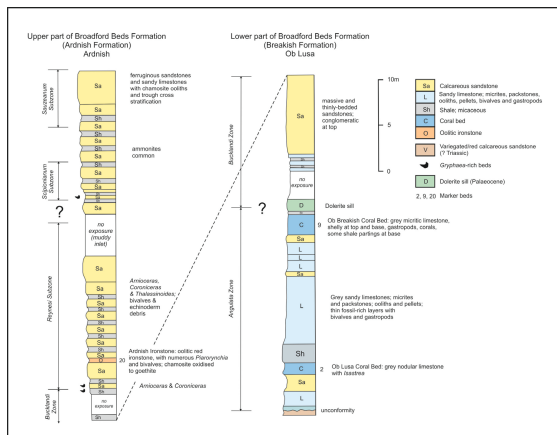


Figure Strath 1.1: Summary map of the Broadford Bay area and annotated Google Earth® image.



Strath 1.2: Annotated oblique Google Earth® images of the Broadford Bay area.



Strath 1.3: Summary stratigraphic log of the Breakish and Ardnish formations, Broadford Bay.

Essentially, the Breakish and Ardnish formations comprise a complex, laterally variable sequence of nearshore limestones and sandstones. The lithological variation can be attributed to changes in relative sea level. In the [Broadford Bay](#) area, these strata dip at a shallow angle, typically less than 10°, towards the NW.

The lowest part of the sequence, the Breakish Formation, is dominated by marine limestones, some of which are interpreted as coral beds, and texturally-mature clastic units, sandstones and shales. Ammonites are very rare within the Breakish Formation. The relatively restricted diversity of the fauna indicates a near-shore, shallow lagoon environment of deposition.

The upper part of the sequence, the Ardnish Formation, comprises marine sandstones and shales, commonly rich in mica and distinctly ferruginous; chamosite is a common constituent and, in one instance, is sufficiently common to justify the name ironstone. The fauna is more diverse and ammonites are relatively abundant; many beds contain an abundance of the oyster, *Gryphaea (arcuata)*, referred to as the 'Devil's toenails'. These bivalves lived on the seabed in relatively shallow water, most likely in large colonies. Growth bands are typically obvious and the larger of the two shells sat within the seabed sediment.

These present-day coastal sections are faulted on a relatively small scale and intruded by several Paleocene dykes of the regional swarm. Sills of similar age are also present, although not common. The diagenesis of these strata is predominantly due to burial, with only minor, localised effects due to the minor intrusions, together with a small thermal input due to the emplacement of the Paleocene Skye Central Complex.

Locality 1 [NG 7017 2493]:

The coastal section at [Ob Lusa](#), the Breakish Formation (or lower part of the Broadford Beds Formation), east of Broadford Bay:

From [Broadford](#), proceed east along the Broadford-Kyleakin (A87) road, towards [Kyleakin](#), for 5km (3 miles)

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to the [turn-off to Kylerhea](#). Limited parking is available near to the road junction. Continue on foot east along the north side of the main road, past the forested ground, for c.750m. Gain access to the shore at Ob Lusa via the [path to the small croft](#).

On the east side of [Ob Lusa](#), faintly-bedded, red arkoses and sandstones of the Late Proterozoic ('Torrionian') Applecross Group crop out. These strata strike NE-SW and dip at c. 25° to the NW. Cross the cobble beach to the [promontory NE of the croft](#) to where the Lower Jurassic Breakish Formation is exposed. The unconformity that separates the Torrionian and the Jurassic strata (with intervening Triassic strata?) lies unexposed below the pebble beach.



Strath 1.4: Ob Lusa, east of Broadford Bay, viewed towards the north, with Raasay in the distance. The cobble-rich beach marks the junction between Torrionian strata to the south and Lower Jurassic Breakish Formation strata that forms the mid-ground northern side of the bay.

The lowest bed is distinctly reddened and may either belong to the Triassic Stornoway Formation, or to the overlying Breakish Formation. The lowest beds of the formation, proper, are grey and contain abundant fragments of gastropod and bivalve shells.

The Ob Lusa Coral Bed forms a recess beneath the small crag north of the croft and can also be traced onto the upper part of the beach. It is a nodular limestone with rounded colonies of the compact colonial coral, *Isastrea murichsoni*, bivalves (including *Liostrea*), and various gastropods and pectinids. In the overlying cross-stratified bed of calcareous sandstone are abundant shells of the bivalve *Cardinia*, size-sorted by wave action.



Strath 1.5: Small crag at back of the beach at Ob Lusa, north of the croft. The Ob Lusa Coral Bed forms the minor recess, below more resistant sandstone. Pole c. 1m long.



Strath 1.7: Weathered surface of the Ob Breakish Coral Bed, SE of the dolerite sill on the Rubha Lusa section, west of Ob Lusa. Coin c. 20mm across.



Strath 1.6: Foreshore exposure of the Ob Lusa Coral Bed, with rounded colonies of the compact colonial coral, *Isastrea murchisoni*. Coin c. 20mm across.



Strath 1.8: Shell debris within the Ob Breakish Coral Bed, SE of the dolerite sill on the Rubha Lusa section, NW of Ob Lusa. Coin c. 20mm across.

Continue NW around the bay over continuous exposure of Breakish Formation sandstones and shales to the obvious crag in the beach formed by a prominent dolerite sill.

Locality 2 [NG 6981 2507]:

The Ob Breakish Coral Bed forms a prominent feature on the [Rubha Lusa](#) shore. It is locally shelly, with gastropods and bivalves, including *Liostraea*. Corals are rare by comparison with exposures further west at the type-locality, where the branching coral, *Thecosmilia martini*, forms small patch reefs. Overlying the coral bed is a dark shale with pale shell fragments, which is in contact with a thick dolerite sill with distinctly smooth bulbous weathering surfaces. The top of the exposed sequence is a thick sandstone, locally cross-stratified and locally conglomeratic.



Strath 1.9: Resistant-to-erosion dolerite sill at Rubha Lusa. The Ob Breakish Coral Bed crops out below the sill. Pole c. 1m long.



Strath 1.10: Dark contact-metamorphosed shale with shell fragments, above the Ob Breakish Coral Bed (and below the dolerite sill). Coin c. 20mm across.

Return to the road.

The coastal section of the Ardnish Formation (or upper part of the Broadford Beds Formation), is on the east side of [Broadford Bay](#).

Return to the east side of [Broadford Bay](#). Take the [minor road signposting Waterloo](#) for 1km to its [end](#). Waterloo derived its name when veterans of the Napoleonic Wars settled there in the early part of the 19th Century. There is very limited parking along the Waterloo road.

Access to Ardnish is gained from the end of the metalled public road via a [short footpath](#) over a narrow drainage ditch and through a wooden gate. Immediately to the NW, on the shore, is the promontory of [Bogha Mòr Achadh a' Chuirn](#), comprising of a 10m-wide multiple dolerite dyke trending NNW-SSE. The foreshore of [Rubha Achadh a' Chuirn](#), to the SW, is composed of Ardnish Formation sandstones, sandy limestones and shales, intruded by Paleocene dykes and disrupted by minor faults.

The Ardnish Formation was deposited in a more wholly marine environment, with relatively abundant ammonites. The north side of Ardnish is built of cross-stratified, red-stained (ferruginous) sandstones and sandy oolitic limestones. Beds containing abundant *Gryphaea (arcuata)* are common.



Strath 1.11: Siltstone with abundant *Gryphaea (arcuata)*, Ardnish Formation, Ardnish. Hammer c. 30cm long.

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Strath 1.12: Siltstone with *Gryphaea (arcuata)*, showing growth bands, Ardnish Formation, Ardnish. Hand lens c. 50mm long.



Strath 1.13: Siltstone with cast of the ammonite, *Coronicerias*. Hammer c. 30cm long.

As these strata dip at a shallow angle towards the NW, the oldest units crop out on the SE side of the peninsula. However, for ease of location within the sequence it is proposed to start at the distinctive, red-weathering 'Bed 20'.

From the wooden gate, follow the rough path NE along the NW side of the peninsula (above the high-water line) for approximately 1km to the first [tidal inlet](#) at [\[NG 6745 2421\]](#). On the NE side of the inlet, sandstones, siltstones and shales provide particularly good specimens of the bivalve *Gryphaea (arcuata)* that have been outweathered by tidal action. Specimens can be observed on the many boulders strewn around the inlet.

From the inlet, continue NE along the coast for a further c. 600m to [Rubha Ardnish](#) at [\[NG 6780 2471\]](#) to a 5m-wide, NW-SE trending, multiple dolerite dyke, which forms a prominent wall-like feature. Walk a further c. 150m towards the [NE end of Rubha Ardnish](#) and cross over the narrow peninsula (to the east) to the [top of a 1m-high coastal bank](#) at [\[NG 6832 2494\]](#). Here, the 'Bed 20' oolitic ironstone crops out. With this bed identified, it is possible to locate all units above and below.

Locality 3 [\[NG 6832 2494\]](#):

The most distinctive bed in the sequence is a fossiliferous oolitic ironstone ('Bed 20'), a red oolite with common bivalves and ammonites (including large *Coronicerias*).

The ironstone formed in response to a diminished clastic sediment input, thereby allowing the various iron-rich minerals of the ironstone to form and temporarily dominate the deposition process. Siderite (iron carbonate) and berthierine (a silicate) are the dominant iron-bearing minerals.



Strath 1.14: Ardnish Ironstone, Rubha Ardnish, forming a small recess, with abundant fragments of reddened ironstone in the immediate area. Pole c. 1m long.



Strath 1.15: Detail of surface texture of the oolitic Ardnish Ironstone, Rubha Ardnish. Coin c. 20mm across.

Using the summary stratigraphic log, map and annotated oblique Google Earth® images (Figures Strath 1.1, 1.2 & 1.3), the rest of the sequence can be examined as desired.

Return to the [Waterloo road](#).

The coastal section on the [west side of Broadford Bay](#), at [Corry](#), consists of strata towards the top of the Ardnish Formation.

Return to the main (A87) road. Continue west into [Broadford](#) to the west side of the bay. Immediately west of the [bridge](#) over the [Broadford River](#), follow the [minor road](#) along the west side of the bay to the pier at [Corry](#). Parking is available at the end of the metalled public road. Gain access to the beach north of the pier. Between the pier and the promontory of [Rubh' an Eirèannaich](#), higher units (Turneri Zone) of the Ardnish Formation crop out. These strata dip at a shallow angle (10–15°) to the NW. The dominant lithologies are calcareous siltstones and shales, containing *Gryphaea (arcuata)*, passing upwards, to the north, into coarser, but similar, material. Paleocene dolerite dykes of the NW-SE -trending regional Excursion Strath 1: Broadford Bay

swarm, dolerite sills, and a composite sill, intrude these strata.

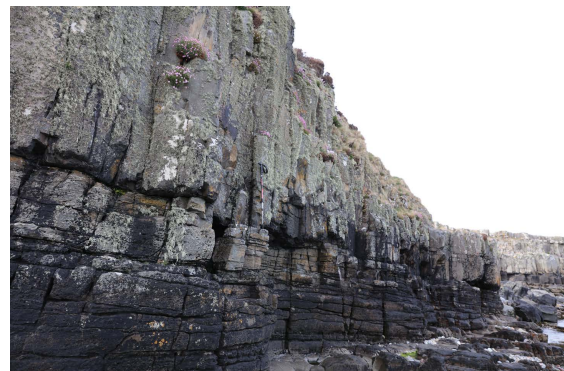
Proceed north, up through the sedimentary succession, to the promontory of [Rubh' an Eirèannaich](#).



Strath 1.16: *Gryphaea (arcuata)* -rich bedding surface of a siltstone in the upper part of the Ardnish Formation, west side of Broadford Bay. Pole c. 1m long.

Locality 4 [\[NG 6460 2480\]](#):

Here, a c. 5m-thick Paleocene composite sill, intruded into sandstones and siltstones, crops out. A complete section through this sill is most easily examined on both sides of a small pebble beach at the cliff face, rather than on the exposures of the headland, itself.



Strath 1.17: Contact of the the Rubh' an Eirèannaich composite sill, with underlying Ardnish Formation strata, Rubh' an Eirèannaich, on the west side of Broadford Bay. Pole c. 1m long. Bottom of pole on contact.



Strath 1.18: Profile of the Rubh' an Eirèannaich composite sill, with underlying Ardnish Formation strata, Rubh' an Eirèannaich, on the west side of Broadford Bay. Bottom of pole on contact. Pole c. 1m long.

The dark (upper and lower) portions of the sill, each c. 1.3m thick, are composed of basaltic andesite, with the lower portion having a glassy chilled contact with the host Jurassic strata. The pale c.2.4m thick central portion of the sill is a porphyritic felsite (micro-granite). Importantly, the boundaries between the central felsite and the marginal basaltic andesite units are gradational over 10-20cm, with no sharp contacts. The basaltic andesite portions contain phenocrysts of labradorite and *xenocrysts* of oligoclase (with rounded margins) and alkali feldspar; the central felsite contains *phenocrysts* of oligoclase and rare alkali feldspar. Within the two compositionally gradational parts of the sill, the xenocrysts of the basaltic andesite portions grade imperceptibly into phenocrysts towards the central felsite portion of the sill. Essentially, the sill preserves evidence for the near-simultaneous emplacement of basic and silicic magmas and their interaction and mixing to produce the hybrid material at their mutual interfaces.

The sill and underlying strata are cut by thin, irregular, basic dykes. Further along the coast, to the NW, two sills (20 and 30cm thick, respectively) with compositions similar to the basic margins of the main Rubh' an Eirèannaich composite sill, intrude Lower Jurassic sandstones.

Return along the track above the beach to the pier at [Corry](#).

End of excursion.