SW Skye 1:

The Allt Geodh a' Ghàmhna and the Allt Mòr

The headland between Loch Brittle and Loch Eynort is built of a thick sequence of Paleocene plateau lavas, giving rise to dramatic cliffs, commonly c. 150m in height. These coastal exposures demonstrate the typical architecture of the volcanic sequence. At two localities, the Allt Geodh a' Ghàmhna and the Allt Mòr, clastic sedimentary deposits interbedded with the lavas can, with care, be examined, and demonstrate the complex interplay between volcanism and sedimentation.

The volcanic sequence west of Glen Brittle, as far as Loch Eynort, comprises the Bualintur Formation, overlain by the An Cròcan Member of the Cruachan Formation. The boundary is defined by the presence of a laterally restricted sequence of sedimentary rocks, exposed in the Allt Geodh a' Ghàmhna and Allt Mòr river sections. Elsewhere, the boundary may be represented by an erosion surface in the volcanic sequence. This excursion involves a detailed examination of these two volcanic-sedimentary exposures.

Aspects covered: Paleocene basaltic-mugearitic plateau lavas; clastic terrestrial sedimentary sequences interbedded with the lavas; lateritised tops of lavas; dykes of the Paleocene regional swarm; a complex fault zone, with brecciated, sheared and veined basaltic rocks.

Route: Bualintur – An Cròcan - Allt Geodh a' Ghàmhna – Dùnan Thearna Sgùrr - Allt Mòr (- return Bualintur).

Distance: 12 kilometres (return trip).

Time: 7-8 hours.

General comments: The coastal cliffs from Loch Brittle to Loch Eynort are spectacular and demonstrate the internal complexity, albeit in two dimensions, of the Bualintur Formation lavas. The cliffs cannot be descended: view from a safe distance with binoculars.

There is a walk of *c.* 5km from Bualintur in Glen Brittle to the first of the two sedimentary sections in the Allt Geodh a' Ghàmhna. There is no obvious path, although the route is straightforward, essentially following the coastline, inland from the precipitous cliffs formed by the Bualintur Formation lavas. These lavas are mainly basaltic types, with a few interleaved hawaiite and mugearite lavas. The excursion can be cut short after the section at the Allt Geodh a' Ghàmhna has been visited, returning to Bualintur. The Allt Mòr section, a further *c.* 1km to the NW, has more difficult access via a steep boulder-filled gully on the east side of the river and should only be visited in good weather by those comfortable on steep ground.

Glen Brittle lies on the west side of the main Cuillin ridge at the head of Loch Brittle. Follow the Broadford- Portree (A87) road to Sligachan (26km (16 miles) from Broadford and 14km (9 miles) from Portree). Take the Dunvegan (A863) road along Glen Drynoch to the Carbost (B8009) road (8km; 5 miles). From here, follow the Carbost road, along the south side of Loch Harport, as far as Merkadale (2.5km (1.5 miles)) and thence take the minor road signposting Glen Brittle. Descend into Glen Brittle (Gleann Bhretail) and continue to the end of the public road, to the entrance to the campsite (13km; 8 miles). Parking is available at the side of the track leading to the campsite above Glen Brittle beach.

Locality 1 [NG 3697 1970]:

Follow the vehicle track back up towards Glen Brittle for *c.* 250m to where there is a footbridge that crosses the River Brittle. Upon crossing the bridge (west) to Bualintur, follow the track south. The river can also be forded a short distance downstream from the bridge, although this requires a low tide and for the river to have a low flow, typical during dry spells in the Spring months. The advantage is not significant. The faint path crosses a few streams before fading out. Thereafter, continue SW to gain height, staying well away from the coastal cliffs as they become more prominent. A useful marker after *c.* 3km is Loch Cròcan and its neighbouring unnamed circular lochan. Along the way are a few isolated exposures of lava, mainly the more evolved types, hawaiite and mugearite, most easily identified by their pronounced fabrics, formed due to the alignment of groundmass plagioclases. Continue due west, to safely cross an unnamed stream above its waterfall [NG 3788 1920], which has formed a steep gully further south. From here, the coastline trends NW. Continue along the relatively flat ground between the coastal cliffs and a parallel inland set of crags for *c.* 1km to reach the Allt Geodh a' Ghàmhna.

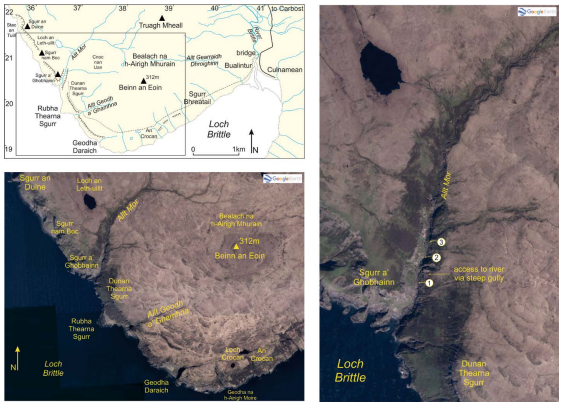


Figure SW Skye 1.1: Location map and annotated Google Earth® images of the Allt Geodh a' Ghàmhna and Allt Mòr areas.

Figure SW Skye 1.2: The headland of south Minginish between Geodha na h-Airigh Mòire and Geodha Daraich, viewed towards the NW from the east side of Loch Brittle. These cliffs provide an appreciation of the internal complexities of the architecture of the Bualintur Formation lava sequence.

The sedimentary section to be examined is exposed in the SE side of the river, below the waterfall, which formed due to the more resistant (to erosion) overlying basal lava of the An Cròcan Member of the Cruachan Formation.

Of importance, some of the cobbles and pebbles in the conglomerates are not recognised from any *in situ* outcrops on Skye and may be regarded as 'exotic'. These include quartz-porphyritic felsite (or vitrophyre) and granophyric-textured granite, that petrographically match intra-caldera crystal (quartz)-rich ignimbrites and a granite (the so-called Western Granite of the Rum Central Complex), respectively. These rocks crop out >20km to the south on the island of Rum and formed during the Paleocene as extrusive and intrusive units, respectively.

The sedimentary motifs of these conglomerates are of fluvial character and, therefore, imply the development of a river system draining northwards from the unroofed Rum Volcano across the contemporaneously aggrading Skye Lava Field. The penecontemporaneous sedimentary sequences in the Allt Geodh a' Ghàmhna and the Allt Mòr sections between Loch Brittle and Loch Eynort are important sequences and are attributed to the Minginish Conglomerate Formation.

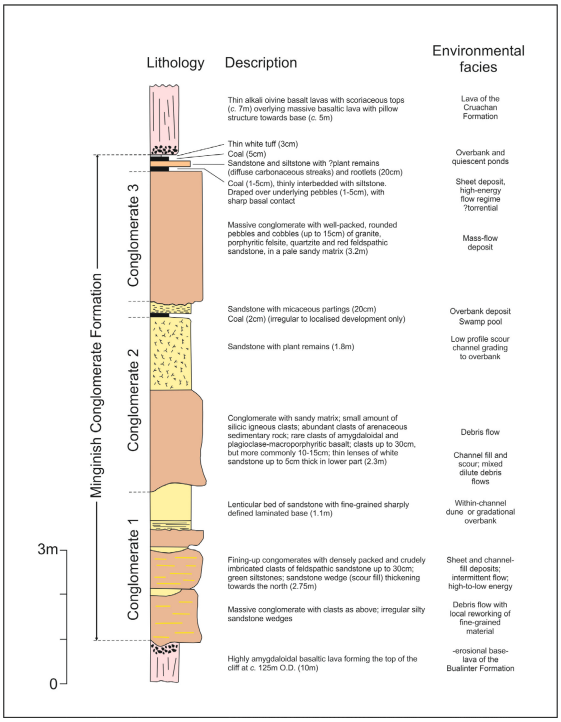


Figure SW Skye 1.3: Lithostratigraphic column and environmental facies interpretation for the Minginish Conglomerate Formation in the Allt Geodh a' Ghàmhna.

Figure SW Skye 1.4: The lower part of the Minginish Conglomerate Formation, with the stratified channel-fill Conglomerate 1 (with thin interbedded sandstones) overlain by the massive, poorly sorted, debris flow Conglomerate 2 and associated sandstones.

Figure SW Skye 1.5: Detail of Conglomerate 1 with thin, discontinuous sandstones wedges, deposited within a channelised fluvial system. Pole *c.* 1m long.

Figure SW Skye 1.6: Unstratified and poorly sorted debris flow Conglomerate 2 with dominant randomly oriented subangular to rounded cobbles of red feldspathic sandstone ('Torridonian') in a silt-mud matrix. Hammer *c.* 60cm long.

Figure SW Skye 1.7: Detail of unstratified and poorly sorted debris flow Conglomerate 2 with dominant randomly oriented subangular to rounded cobbles of brown sandstone ('Torridonian') in a silt-mud matrix. Coin *c.* 24mm across.

Figure SW Skye 1.8: Pale sandstones with plant remains overlying Conglomerate 2.

Figure SW Skye 1.9: Poorly stratified Conglomerate 3 with well-packed, rounded pebbles and cobbles (up to 15cm) of granite, porphyritic felsite, quartzite and red feldspathic sandstone ('Torridonian') in a pale sandy matrix. Pole *c.* 1m long.

Figure SW Skye 1.10: Poorly stratified Conglomerate 3 with well-packed, rounded pebbles and cobbles (up to 15cm) of granite, porphyritic felsite, quartzite and red feldspathic sandstone in a pale sandy matrix. Hammer *c.* 60cm long.

Figure SW Skye 1.11: Detail of poorly stratified Conglomerate 3 with well-packed, rounded pebbles and cobbles (up to 15cm) of pale granite, pale porphyritic felsite, pale quartzite and red feldspathic sandstone ('Torridonian') in a pale sandy matrix. Coin *c.* 24mm long.

Figure SW Skye 1.12: Upper part of poorly stratified Conglomerate 3 with well-packed, rounded pebbles and cobbles (up to 15cm) of granite, porphyritic felsite, quartzite and red feldspathic sandstone in a pale sandy matrix. Above (with hammer head sitting on) are thin, discontinuous, interbedded siltstones and coals. The dark rock at the top of the exposure is basaltic lava of the An Cròcan Member of the Cruachan Formation. Hammer *c.* 60cm long.

Figure SW Skye 1.13: Detail of the thin, discontinuous, interbedded siltstones and coals at the top of the Minginish Conglomerate Formation. The dark fractured rock at the top of the exposure is basaltic lava of the An Cròcan Member of the Cruachan Formation. Hammer *c.* 60cm long.

Figure SW Skye 1.14: Detail of the thin, discontinuous, interbedded siltstones and coals at the top of the Minginish Conglomerate Formation. Coin *c.* 24mm across.

At the level of the sedimentary section, leave the Allt Geodh a' Ghàmhna and follow a rough path NW for a short distance to where the top of the section (below the overlying Cruachan Formation lavas) is exposed at [NG 3692 1970]. Here, Conglomerate 3 is somewhat different and contains obvious lenses of (channel) sandstone.

Figure SW Skye 1.15: Conglomerate 3 with thin, laterally-discontinuous, interbedded sandstones at the top of the Minginish Conglomerate Formation, NW of the main exposure in the Allt Geodh a' Ghàmhna. Pole *c.* 1m long.

Figure SW Skye 1.16: Conglomerate 3 with thin, laterally-discontinuous, interbedded sandstones at the top of the Minginish Conglomerate Formation, NW of the main exposure in the Allt Geodh a' Ghàmhna. Pole *c.* 1m long.

To exit from here, return to the Allt Geodh a' Ghàmhna and gain the high ground, above the waterfall, reversing the route used to access the stream section.

Either return to Bualintur, or continuing NW for *c.* 1km to the Allt Mòr. Access to the ravine of the Allt Mòr is restricted and there are very few places where this can be safely achieved. **Figure SW Skye 1.19** indicates the location of a steep gully on the east side of the Allt Mòr that provides access. Great care must be exercised.

Upon approaching the Allt Mòr, an excellent view of the Bualintur Formation lavas, forming the cliffs of Sgùrr a' Ghobhainn (*c.* 150m OD) comes into view.

Figure SW Skye 1.17: Sgùrr a' Ghobhainn (*c.* 150m OD), composed of Bualintur Formation (predominantly) basaltic lavas. View is towards the SW.

The exposures in the Allt Mòr are complicated by minor intrusions, dykes and sills, and by a significant fault zone exposed in the west bank of the river. However, these features can help to locate the various parts of the sections of strata.

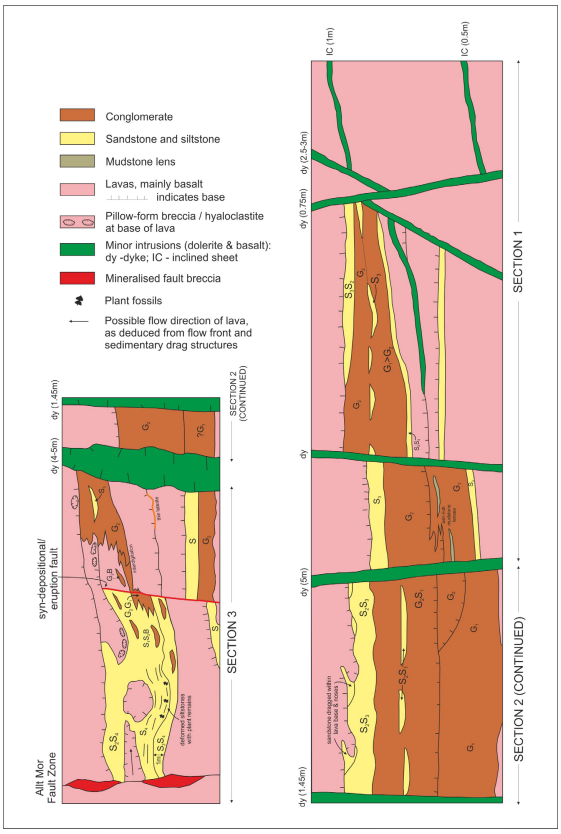
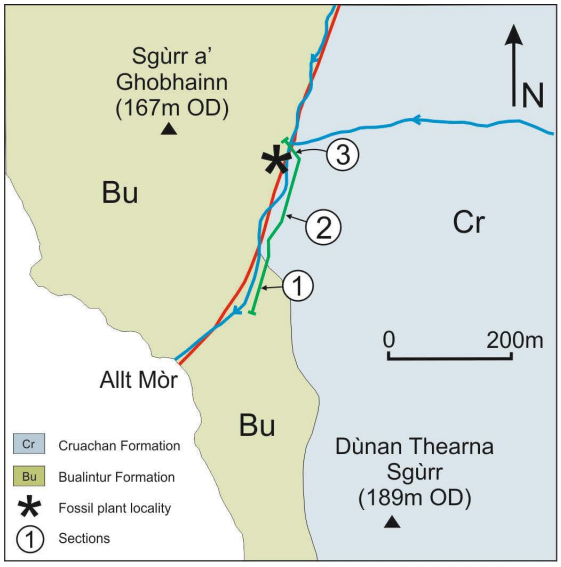


Figure SW Skye 1.18: Schematic sections for the main exposures of the Minginish Conglomerate Formation in the Allt Mòr. Locations of sections and access point are indicated in **Figure SW Skye 1.19** and lithofacies codes are detailed in the table in **Figure SW Skye 1.20**.



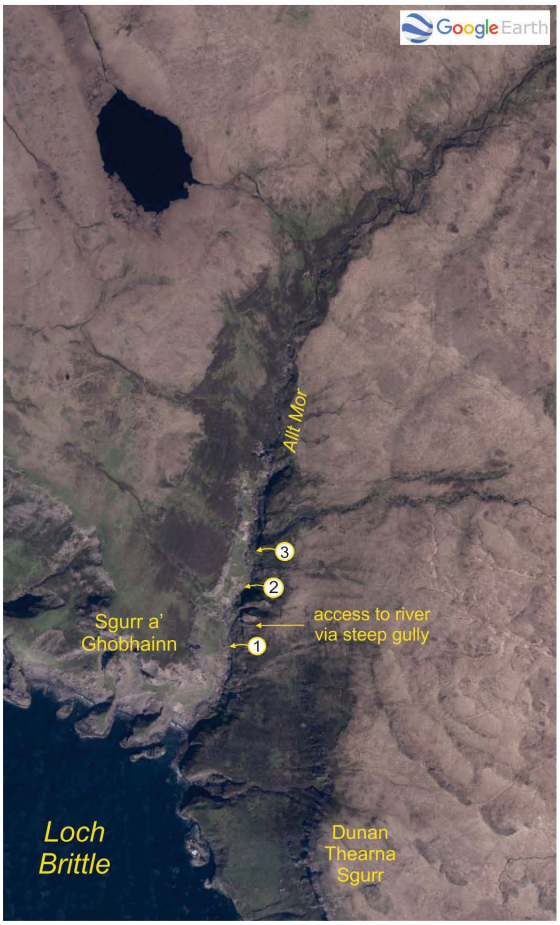


Figure SW Skye 1.19: Location map and annotated Google Earth® image of the Allt Mòr area indicating the locations of the sections depicted in **Figure SW Skye 1.18** and an access point to the river bed.

Code	Facies	Sedimentary structures	Interpretation
G1	Matrix-supported conglomerate	Massive to crudely-graded	Debris flow deposit
G2	Clast-supported conglomerate	**A:** weakly stratified, planar, normally-graded, locally imbricate **B:** Lenticular, trough cross-bedded	Sheet deposit or longitudinal bar Channel fill or scour
S1	Pebbly, silty coarse-grained sandstone	Massive	Dilute debris flow or avalanche deposit
S2	Fine- to coarse-grained, locally pebbly, sandstone	**A:** Trough cross-bedded, pebbles at base of troughs **B:** Trough cross-bedded, upper surfaces rippled, graded profiles	Within-channel dunes and lag deposits Within-channel dunes and channel fill and scour
S3	Fine- to medium-grained, silty sandstone	Planar cross-bedded	Linguoid and transverse bar or low-angle scour fills
S4		Massive to faintly sub-parallel laminated; plant remains	Channel infilling, relative quiescence, locally lacustrine
S5	Interbedded siltstones and mudstones	Thinly bedded to coarse inter-laminated; horizontal to wavy laminations	Similar to overbank deposits, but could be upper flow regime (waning current)
C	Coal	**A:** Bright, massive **B:** Dull to banded	Allochthonous, washed-in plant (mainly woody) remains Autochthonous,*in situ* vegetation; swamp/mire conditions

Figure SW Skye 1.20: Lithofacies codes and details of sedimentary structures and environment of deposition of units depicted in **Figure SW Skye 1.18**.

Figure SW Skye 1.21: S_2 and S_4 sandstones below Cruachan Formation basaltic lavas in the east (right) bank and fractured and veined basaltic lavas within the Allt Mòr Fault Zone in west (left) bank. David Bell for scale.

Figure SW Skye 1.22: S_2 and S_3 sandstones overlying G_2 conglomerates in Section 1 in the east bank of the Allt Mòr.

Figure SW Skye 1.23: S_2 and S_3 sandstones overlying G_2 conglomerates in Section 2 in the east bank of the Allt Mòr. Pole *c.* 1m long.

Figure SW Skye 1.24: Typical G_2 conglomerates in Section 2 in the east bank of the Allt Mòr, with well-packed, rounded pebbles and cobbles (up to 15cm) of pale granite, pale porphyritic felsite, pale quartzite and red feldspathic sandstone ('Torridonian') in a pale sandy matrix. Pole *c.* 1m long.

Figure SW Skye 1.25: Deformed siltstones with plant remains, 'intruded' by lobe of basaltic lava in Section 3.

Figure SW Skye 1.26: Detail of deformed siltstones with plant remains, 'intruded' by lobe of basaltic lava in Section 3. Hammer *c.* 60cm long.

Figure SW Skye 1.27: Detail of deformed siltstones with plant remains, 'intruded' by lobe of basaltic lava in Section 3. Hammer *c.* 60cm long.

Figure SW Skye 1.28: Allt Mòr Fault Zone at the end of Section 3 on the west bank of the river, comprising highly disrupted basaltic lava with significant vein mineralisation. View towards the north.

Figure SW Skye 1.29: Allt Mòr Fault Zone at the end of Section 3 on the west bank of the river, comprising highly disrupted basaltic lava with significant vein mineralisation. Hammer *c.* 60cm long.

Figure SW Skye 1.30: Detail of Allt Mòr Fault Zone at the end of Section 3 on the west bank of the river, comprising highly disrupted basaltic lava with significant vein mineralisation. Hammer *c.* 60cm long.

Exit the Allt Mòr section and return to Glen Brittle following the route used on the outward journey.

End of excursion.