

The Beum a' Chlaidheimh Breach and the Dulnain-Findhorn divide.

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The localities described in this section are pertinent to understanding the regional history of glaciation and deglaciation (Merritt et al., 2017). The landscape may be viewed from various passing places along the B9007 road linking Duthill and Lochindorb, but longer walks are recommended across rough ground to see specific features to the west and east of the highest section of the road at the **Beum a' Chlaidheimh** (cleft of the sword) [NH 937 305] (Fig. 124) (BGS, 2013).

Last Glacial Maximum.

It is now believed that the entire region was submerged beneath ice during the LGM judging by evidence of lee-side joint-block removal, glacially transported tor blocks and stripping of blockfields at elevations of up to 1200 m in the Cairngorms (Hall and Glasser, 2003; Phillips et al., 2006). A powerful topographically-controlled ice stream sourced in the western Grampian Highlands was centred on Upper Strathspey (Hall and Sugden, 1987; Merritt et al., 2013), as evidenced by severely ice-plucked rocks on the western valley flanks overlooking Newtonmore and Kingussie, extensive blankets of till on the valley-sides and mega-roche moutonnée features such as Creagan a' Choin (Fig. 125) and Ordan Shios [NN 715 969], 3 km south of Newtonmore. These particular features, which are clearly visible to the east of the A9 trunk road, appear to have tails of sediment stretching south-westwards in the former up-ice direction and are commonly mistaken for crag-and-tails. Strathspey ice flowed against the Cairngorm massif, where it was fended off by local ice (Hall et al., 2016), but probably penetrated eastwards into the catchment of the River Dee between the Cairngorms and the Gaick (Barrow et al., 1913; Smith et al., 2011).

Most indicators suggest that ice flowed north-eastwards along the axis of the Strathspey at least as far as Grantown-on-Spey (Young, 1974, 1975a, b, 1977a, 1978), as for example at the **roche moutonnées visitor site** at Dulnain Bridge. These features are aligned with flow-set 47 identified by Hughes et al. (2014) (Fig. 10). However, evidence for strong northward flow had been identified in the lower Dulnain valley (Young, 1977b), where excellent large-scale crag-and-tails may be seen north of Creag Coille na Maoile [NH 937 283, to the east of the B9007 road leading from Duthill towards Lochindorb (Fig. 126). Another prominent crag-and tail [NH 881 285], east of Carn Iain Ruaidh, was also clearly formed by the northward flowing ice. These and other south to north-orientated streamlined features indicate that a topographically-unconstrained corridor of relatively fast-flowing ice extended northwards across the **Middle Findhorn Valley** towards the Inner Moray Firth (Merritt et al., 2013) (Fig. 11). Ice flowed through the Beum a' Chlaidheimh breach, at c. 360 m OD, and subsidiary breaches the Dulnain/Spey - Findhorn catchment divide. This northward-flowing ice produced streamlined subglacial landforms of time-transgressive flow-set 34 (Hughes et al., 2014) (Fig. 10). In contrast, the NEXTMap imagery reveals that the landscape to the east of the Lochindorb corridor has experienced relatively little glacial modification, suggesting that local, sluggish, cold-based ice was centred over this part of the East Grampians, which includes the middle reaches of the Strathspey downstream of Grantown (Fig. 11). Considering the

elevation of the Beum a' Chlaidheimh breach and adjacent summits on the divide, flow-set 34 is likely to have shut down not too long after deglaciation of the Cairngorm tops commenced at c. 21.3 ka (Phillips et al., 2006).

Tills in the area

The superficial tills plastered across the Dulnain/Findhorn interfluvium are dominated by local psammitic and semipelitic rock types (Walden and Auton, 1999) with some more far travelled erratics brought from the south, including grey granodiorite. These tills are assigned to the *Beinn an Uain Till Formation* (Central Grampian Glacigenic Subgroup) (Fig. 19) (see **Dalcharn and Allt Odhar**). Reddish brown sandstone-rich diamict of the underlying Athais Till Formation (Inverness Glacigenic Subgroup) crops out on the flanks of the Middle Findhorn Valley, such as in the valley of the Allt Breac [NH 8480 3859; 8487 3864], near the **Daless Viewpoint**, where it overlies clast-supported gelifractate formed prior to the LGM (Auton, 1990a; Fletcher et al., 1996).

Sandstone-rich tills are not known to the south of the Dulnain-Findhorn divide. However, an interesting section occurs at Foregin [NH 8670 2560] (Fig. 11), 4 km north-west of Carrbridge, where the uppermost of three units comprises of pale orange brown, extremely compact diamict with sheared layers of glacitectorite and a sharp, planar base. The till mostly contains clasts of schistose psammite, semipelite, pink granite and porphyry, but includes sparse red, micaceous sandstone. The underlying unit comprises pale yellowish brown to grey, extremely compact gravelly diamict that contains relatively more grey porphyritic granodiorite (from the south). The basal unit comprises up to 6.5 m of orange brown, extremely iron-stained and cemented diamict. A single ice-scratched cobble of coarse red sandstone was observed within the basal till, which also crops out upstream at [NH 8665 2595], where it comprises moderate yellowish brown to rusty orangey brown, very stiff, fissile diamict with many decomposed clasts. Clasts of red sandstone are relatively common, together with far-travelled white and fawn-coloured quartzites. The basal till unit is tentatively assigned to the pre-LGM *Suidheig Till Formation* on account of the degree of weathering and the presence of sandstone clasts (see **Dalcharn, Allt Odhar and Clava**).

In the valley of the Allt a' Chuil, west of Moy (Fig. 12) (BGS, 1997), another weathered till has been found overlain by weathered gravel, which is in turn overlain by fresh psammite-rich till. Both weathered deposits contain abundant clasts of pale reddish brown sandstone and conglomerate together with pebbly cross-bedded psammite, porphyritic granite and felsite. This assemblage of rock types is known to occur only in Stratherrick and in the Great Glen, indicating that the sandstone-rich till was laid down by ice that flowed east-north-eastwards from those localities. However, the weathered state of the clasts suggests that in this instance the flow-event occurred during a pre-LGM, or more likely pre-Devensian glaciation. It is worth mentioning that a section [NH 7685 3169] upstream reveals 15 m of loose gravel within the splendid *Allt a'Chuil Esker*. This feature relates to relatively early, ice-directed drainage that was constrained to flow north-eastwards across the topographical grain (Young, 1980). The esker links with a suite of interlinked channels and eskers traceable across the north-central Grampian Highlands (Young, 1977, 1978).

Regional pattern of deglaciation following the LGM.

At a particular stage in deglaciation the ice sheet became too thin to flow over the Dulnain-Findhorn divide and the ice-stream that formed flow-set 34 switched off and decayed. Ice thinned and eventually Dulnain/Strathspey ice appears to have parted from Great Glen/Moray Firth ice roughly along the axis of the **Middle Findhorn Valley**, which subsequently witnessed widespread ponding. The initial retreat of Dulnain/Strathspey ice can be traced south-eastwards from the vicinity of **Banchor** (Fig. 12) judging by the distribution of parallel sets of ice-marginal channels typical of those formed at slowly receding ice margins in contemporary polar environments (Ó Cofaigh et al., 1999, 2003; Benn and Evans, 2010). A particularly prominent belt of such features crosses the B9007 road at [NH 941 317], from where they can be explored on foot. These features can be traced east-north-eastwards towards Carn nan Gabhar (Fig. 127) and appear to be relatively 'fresher' than those lying to the north. They probably record a major glacial reorganisation in the region that resulted in the establishment of a vast outlet glacier within Strathspey, upstream of the vicinity of Grantown-on-Spey (Merritt et al., 2013). At first the meltwater issuing from the Carn nan Gabhar channels flowed northwards, laying down outwash sand and gravel around Loch Mhic Leòid [NJ 008 347] (Fig. 12), but later circumnavigated the retreating ice margin to flow via the Derraid Channel towards Strathspey (Fig. 127).

Lobes of the 'Strathspey Outlet Glacier' penetrated into the Abernethy Forest and the Loch Garten, Rothiemurchus and Glenmore depressions (Young, 1974, 1975b, 1977a, Hall et al., 2016). Recent surveying (BGS, 2013) indicates that widespread ice-marginal ponding occurred around its margins with the deposition of glaciofluvial fans and deltas at elevations of 300-350 m OD. There is abundant evidence in the form of ice-marginal glacial drainage channels for the retreat of the glacier from the southern flanks of the catchment divide (Young, 1977b), progressing up-valley past Aviemore (Young, 1977a), Glen Feshie (Young, 1975a), and into uppermost Strathspey (Young, 1978). The marginal channels are characteristically intimately associated with low morainic ridges that are curved in plan view, asymmetric in cross profile, and commonly occur in anastomosing flights across hillsides. The higher channels truncate, or feed into, lower ones, indicating that they formed progressively as the ice margin retreated. Some shallow gradient ice-marginal channels pass into steeper sub-marginal 'chutes' directed towards valley trunks. One-sided channels form benches on steeper slopes, and isolated flights of short channels commonly loop into the hillside. Some channels link with eskers, such as around Loch nan Stuirteag [NH 8825 2615] (Fig. 127), suggesting that the features were formed by meltwater flowing at, or closely within the margins of an actively receding, polythermal outlet glacier.

The Beum a' Chlaidheimh is only one of several breaches in the Dulnain-Findhorn divide that provided pathways for meltwater during deglaciation, the most prominent being **Slocht Mòr** [NH 836 256], at 401 m OD (Fig. 11). Meltwater flowing south-eastwards cut a deep channel within this narrow breach that is followed by the railway, beginning just the north of the Slocht summit. This impressive channel has been partially filled to take the re-aligned A9 trunk road, from which it may be observed (with caution!). The feature carried a large volume of meltwater from ice that was situated to the north of the regional divide, which contrasts with the other breaches to the east, including Beum a' Chlaidheimh, where meltwaters flowed northwards across the

watershed into an area largely vacated by ice. It is clear that at first meltwaters flowed eastwards from the Slocht towards Beum a' Chlaidheimh at the margin of Dulnain/Strathspey ice whilst it slowly retreated down the south-facing slopes of the divide. Meltwater must have entered the Dulnain Valley via the Slocht for some time as the main Slocht channel (used by the railway) descends and curves into the valley towards Carrbridge.

As Dulnain/Strathspey ice retreated southwards from the divide an extensive suite of ice marginal channels, benches and boulder-strewn lateral moraine ridges formed sequentially along its steep, southeast-facing slopes. For example, a high-level suite of lateral moraines lying at about 430 m OD in the sector drained by the Allt Ruighe Magaig links with an impressive complex of deep, winding and branching channels that have been cut into the southern spur of Creag na h-Iolaire to the east [NH 915 292] (Fig. 128). The channels were cut sequentially as the ice retreated southwards. Eventually meltwater created a deep channel across the col [NH 897 264] that separates the spur of Creag na h-Iolaire from Tom Mór to the south.

Meltwaters flowed through the Beum a' Chlaidheimh at an earlier stage, together with two higher breaches to the west that occur on either side of Cnoc an Lamhaich [NH 931 309], cutting deep, winding, 'leeside' drainage channels. These features start at the watershed and descend northwards with interlocking spurs, suggesting that they were functioning when ground to the north of the watershed was essentially ice free. An esker that winds northwards towards Beum a' Chlaidheimh (BGS, 2013) was probably created by subglacial meltwaters converging on the col. The esker provides a convenient viewpoint [NH 9353 2945] to view and interpret the landscape, including the mega crag-and-tail landforms to the south-east (Fig. 126) and an ice-marginal meltwater channel associated with a prominent lateral moraine ridge that descends obliquely across the south-eastern slopes of Carn Mheadhoin and Carn Allt Laoigh to the west. The latter features were formed when the highest col adjacent to Cnoc an Lamhaich first became free of ice. These channels link with a suite of ice marginal channels, benches and associated block and boulder-strewn lateral moraines that arc around the embayment in the mountain rim called Glas-choire [NH 908 279]. These features probably were created whilst the main Beum a' Chlaidheimh meltwater outlet was operational. On subsequent retreat of Dulnain/Strathspey ice, meltwaters flowed eastwards via a deep, winding, peat-filled channel [NH 943 295] now drained by the Rychraggan Burn.

To the east of the B9007 road, the upper catchments of the Achnahannet Burn and the Allt Tarsuinn include wide expanses of low, heather-clad hummocks and ridges of gravelly material. The highest ground on the watershed is formed of rugged, ice-scoured psammite with many elongate, peat-filled, ice-scoured depressions showing that ice flowed northwards, funnelling through a breach in the divide that links the valleys of the Allt Tarsuinn and Féith a' Mhor-fhir [NH 965 305], at c. 345 m OD. As at Beum a' Chlaidheimh, subglacial meltwaters flowing northwards towards this breach formed an esker, some 600 m long (Fig. 127). Eventually Dulnain/Strathspey ice retreated southwards from the watershed and a suite of ice marginal channels and associated ridges of blocky boulder moraine formed at its retreating margin, notably in the vicinity of the ruined shieling at [NH 953 286]. Meltwaters were firstly constrained

to flow north-eastwards via a network of channels that link with the prominent 'Shleanaferan Channel' (Fig. 127). Later, as ice retreated farther, meltwater was first able to flow south-eastwards towards Lower Achnahannet via a channel now occupied by the Rychraggan Burn, and then southwards towards Keanloch [NJ 9645 2625] via a channel now occupied by the Allt nan Coileach-dubha. The Rychraggan channel is closely associated with a morainic ridge at Tom Eirigh [NH 957 278], which has a steep ice-contact slope on its southern side.

The Shleanaferan Channel is a deep, sinuous, steep-sided, peat-filled feature that connects with channels within the upper reaches of the Achnahannet valley, to the west, and Glenbeg, to the east. Glenbeg originated as a major ice-marginal drainage channel (Fig. 127). The Shleanaferan Channel represents the main conduit within a system of channels and related widespread glaciofluvial features that extends up into a breach (Tobar Alain) in the regional divide [NH 999 309] at about 340 m OD. The deposits are mainly well stratified, sandy and micaceous and may reach 40 m in thickness locally. Clearly meltwater flowed over the col towards Lochindorb for a considerable time to deposit the sequence whilst Dulnain/Strathspey ice was pinned against the watershed.

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Figures



Figure 124. The Beum a' Chlaidheimh Breach in the Dulnain-Findhorn divide, looking north from [NH 935 300].



Figure 125. Creagan a' Choin, an example of a mega roche moutonnée in Strathspey as seen looking south-east from the A9 trunk road south of Newtonmore [NN 703 957].



Figure 126. A suite of mega crag-and-tail features forming Creag Coille na Maoile, looking south-east from a viewpoint at [NH 934 298] south of Beum a' Chlaidheimh.

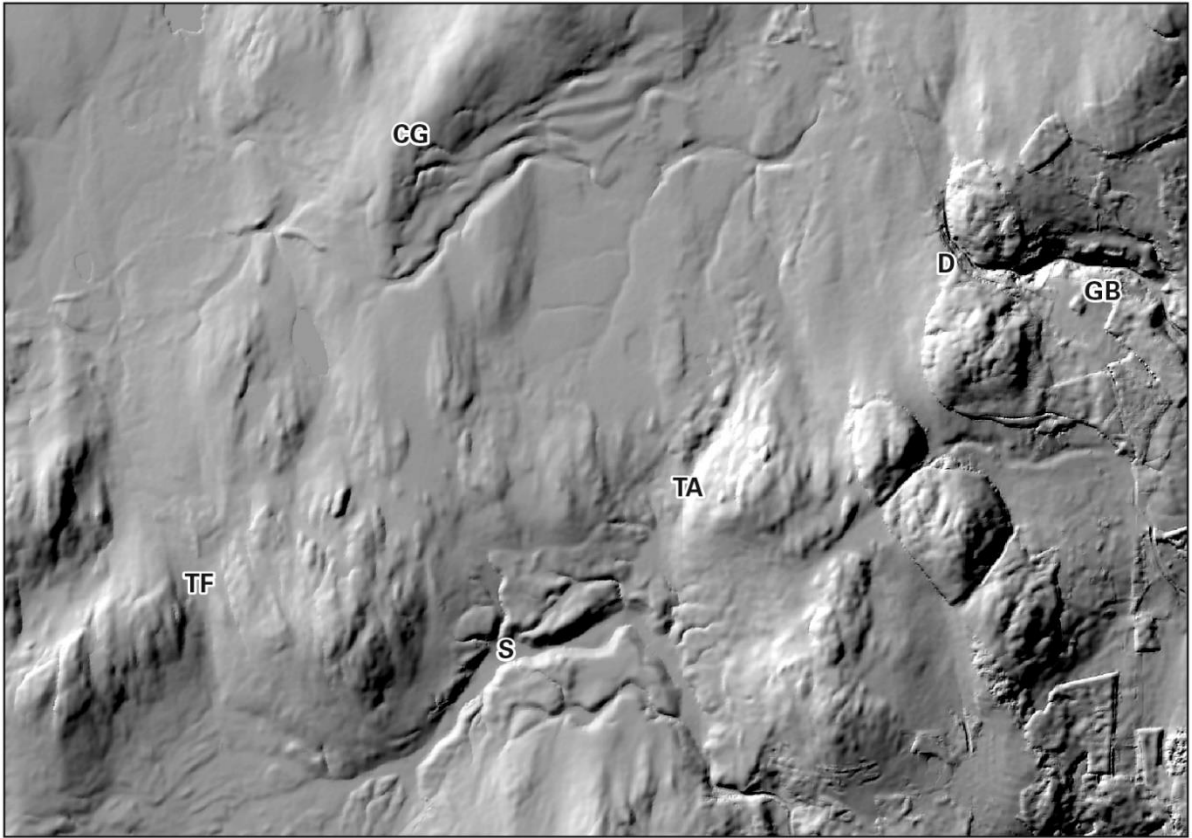


Figure 127. Hill-shaded surface model built from Intermap Technologies NEXTMap Britain elevation data showing breaches in the Dulnain/Findhorn divide 5 km to the north of Dulnain Bridge. CG, Carn nan Gabhar channels; D, Derraid Channel; GB, Glen Beg; S, Shleanaferan Channel; TF, Tarsuinn - Féith a' Mhor-fhir breach; TA, Tobar Alain breach.



Figure 128. One of a flight of ice-marginal channels cut into the southern spur of Creag na h-Iolaire, [NH 917 285] looking north-eastwards towards Beum a' Chlaidheimh.