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## M33

### *Pohlia wahlenbergii* var. *glacialis* spring *Pohlietum glacialis* McVean & Ratcliffe 1962

#### Synonymy

*Pohlia* 'glacialis' spring Ratcliffe 1964; *Pohlia albicans* var. *glacialis* spring Ratcliffe 1977.

#### Constant species

*Deschampsia cespitosa*, *Saxifraga stellaris*, *Pohlia ludwigii*, *P. wahlenbergii* var. *glacialis*.

#### Rare species

*Alopecurus alpinus*, *Cerastium cerastoides*, *Epilobium alsinifolium*, *Phleum alpinum*, *Pohlia ludwigii*, *P. wahlenbergii* var. *glacialis*.

#### Physiognomy

*Pohlia wahlenbergii* var. *glacialis* can be found as an infrequent and low-cover associate in a variety of vegetation types of wet ground through the uplands of north-western Britain but, in the *Pohlietum glacialis*, it dominates in spongy carpets, often of quite small extent, but exceptionally covering up to 200 m<sup>2</sup>, of a bright apple-green colour that makes the stands readily recognisable from a distance. Few other bryophytes occur with any frequency and none is consistently abundant. There is commonly a little *P. ludwigii* and *Philonotis fontana* sometimes attains a measure of prominence, though typically it is of nothing like such high cover as in the *Philonoto-Saxifragetum*. Other bryophytes recorded occasionally are *Hygrohypnum luridum*, *Bryum weigelii*, *Calliergon stramineum*, *Scapania undulata*, *S. uliginosa*, *Dicranella palustris* and *Marchantia alpestris*.

In this carpet, vascular plants are few in number and typically of low cover. Only *Deschampsia cespitosa* (presumably ssp. *alpina* at the high altitudes characterised by this community) and *Saxifraga stellaris* are constant, but the rare Arctic-Alpine *Cerastium cerastoides* is quite often found and there can also be some *Stellaria alsine*, *Chrysosplenium oppositifolium*, *Epilobium anagallidifolium*, *Veronica serpyllifolia* var. *humifusa* and *Rumex acetosa*. Other rare plants which find an occasional locus here are *Epilobium alsinifolium*, *Alopecurus alpinus* and *Phleum alpinum*.

#### Habitat

The *Pohlietum* is strictly confined to spring-heads associated with the late snow-beds of the higher reaches of the Scottish Highlands, where there is vigorous irrigation by cold, oligotrophic waters.

Although *P. wahlenbergii* var. *glacialis* occurs in small amounts over quite a wide range of altitudes through the uplands of north Wales, Cumbria and Scotland, it is found with the kind of dominance characteristic here only within the high-montane zone, at altitudes generally above 850 m, where mean annual maximum temperatures do not exceed 21 °C (Conolly & Dahl 1970). Within this area, which includes the central and north-western Highlands of Scotland, the community is further restricted to situations where snow lies longest. Precipitation is heavy throughout the region, with more than 1600 mm annually (*Climatological Atlas* 1952) and, with the bitter winter temperatures at higher altitudes, much of this falls as snow, persisting long everywhere but especially so over north- and east-facing slopes. The majority of the stands of the *Pohlietum* are from such aspects and the community is especially well developed in association with those extensive late snow-beds found in the great sunless amphitheatres of the corries in the Cairngorms, Ben Alder and Creag Meagaidh in the central Highlands and, further north-west, in the Affric-Cannich hills and on Beinn Dearg.

Typically, in these localities and at other sites where the community occurs less extensively, as on Beinn Laoigh, Bidean nam Bian, around Lochnagar and in the Monar Forest (Ratcliffe 1977), the rocks from which the springs emerge are acidic and calcium-poor, usually schists, granulites and grits of the Moine series, granites or lavas and agglomerates. So the flushing waters, and the often sloppy, ill-structured mixtures of mineral and organic matter held beneath the moss carpet, are base-poor and oligotrophic. And it is these general climatic and edaphic features which determine the overall character of the community, with its cold-tolerant plants such as *Deschampsia cespitosa*, *Stellaria alsine*, *Chrysosplenium oppositifolium* and *Philonotis fontana*, and defi-

nite montane species like *Saxifraga stellaris*, *Cerastium cerastoides*, *Epilobium anagallidifolium* and *Bryum weigelii*. This much, and the noticeable lack of calcicolous plants, the *Pohlietum* shares with the *Philonoto-Saxifragetum*.

The difference between the two kinds of spring vegetation is best seen among the bryophyte element where there is a switch from dominance by *Philonotis fontana*, *Dicranella palustris* and *Scapania undulata* to *Pohlia wahlenbergii* var. *glacialis* and *P. ludwigii*. All these species are capable of luxuriant growth in vigorous oligotrophic springs, but the latter two become prevalent where the water temperatures are lower: not all cold springs have the *Pohlietum* but, in those which do, the water temperature is consistently below 4 °C (McVean & Ratcliffe 1962). The *Philonoto-Saxifragetum* has a much broader geographical range than the *Pohlietum*, its mean altitude is some 300 m lower and, though it can be found in springs fed by melting snow, its association with that habitat is by no means as exclusive as with the *Pohlietum*.

#### Zonation and succession

The *Pohlietum* is typically found with a very distinctive suite of vegetation types of late snow-beds, variation among which can be related partly to the wetness of the ground. It is sometimes the only kind of spring in such situations, but other related communities sometimes occur with it where the irrigating waters become less frigid or vigorous.

*Pohlietum* springs can vary considerably in size, shape and numbers, but they generally occur towards the base of snow-beds, giving way sharply above to vegetation of more freely-draining ground, which may not be fully exposed by the melting snow until early summer. Here, the *Polytrichum-Kiaeria* community is very characteristic, providing a further locus for *Saxifraga stellaris* but otherwise showing little floristic continuity with the *Pohlietum* even in those patches where there is intermittent irrigation by melt-water or rain. Often, too, there are stands of the *Salix-Racomitrium* community on moister soils with much solifluction. Then, around these, on ground with less extensive snow-lie, there can be zones of the *Deschampsia-Galium* community and the *Carex-Racomitrium* and *Carex-Polytrichum* montane heaths.

With increasing distance from the spring-head, where

snow-lie is not so long and the irrigating waters a little warmer, though still flowing vigorously, the *Pohlietum* may give way to the *Philonoto-Saxifragetum* along the melt-water rills and on the flushed ground around. Here, continuity among the herbs and some of the associated bryophytes is considerable, though there is the marked shift in dominance in the ground carpet. Where water-flow is considerably reduced, there can also be flushed banks of the *Sphagno-Anthelietum julaceae*.

In patterns such as these, the *Pohlietum* forms an integral part of a complex of vegetation types associated with one of our most extreme habitats. Particularly fine suites of the communities can be seen in the Cairngorms, on the upper slopes of Ben Alder and Aonach Mor, in the Creag Meagaidh corries and on the high slopes of the Affrich hills, all in Inverness and on Beinn Deargh and Am Faachagach in Ross.

#### Distribution

The community occurs widely but very locally through the central and north-western Scottish Highlands.

#### Affinities

Although Dixon (1954), in his description of what he knew as *Webera albicans* var. *glacialis*, noted the tendency of this moss to form striking patches around high-montane springs, these stands were not systematically described until the survey of McVean & Ratcliffe (1962). Dahl (1956), however, had already noted the similarity of this kind of Scottish vegetation to cold springs described by him and others (e.g. Samuelsson 1934, Nordhagen 1943, Vigerust 1949) from the Norwegian mountains. There, his *Mniobryo-Epilobietum* was likewise dominated by *P. wahlenbergii* var. *glacialis* (once known also as *Mniobryum wahlenbergii*) and shared some of the same associates, notably *Saxifraga stellaris* and *Cerastium cerastoides*, although in Norway *Epilobium anagallidifolium* is replaced by *E. hornemannii*.

As McVean & Ratcliffe (1962) noted, there is considerable qualitative similarity between the *Pohlietum* and the *Philonoto-Saxifragetum*, and they followed Scandinavian workers in locating both communities in the same Mniobryo-Epilobion alliance. More recent revisions of the Montio-Cardaminetia would place them together in the Montio sub-alliance of the Cardamino-Montio.

## Floristic table M33

<i>Pohlia wahlenbergii</i> var. <i>glacialis</i>	V (6–10)
<i>Deschampsia cespitosa</i>	V (1–4)
<i>Saxifraga stellaris</i>	IV (2–3)
<i>Pohlia ludwigii</i>	IV (2–4)
<i>Cerastium cerastoides</i>	III (1–3)
<i>Philonotis fontana</i>	III (1–7)
<i>Chrysosplenium oppositifolium</i>	III (2–4)
<i>Stellaria alsine</i>	III (3)
<i>Epilobium anagallidifolium</i>	III (3)
<i>Hygrohypnum luridum</i>	II (2–3)
<i>Bryum weigelii</i>	II (1–3)
<i>Calliergon stramineum</i>	II (6)
<i>Scapania undulata</i>	II (1–2)
<i>Scapania uliginosa</i>	II (1–4)
<i>Marchantia polymorpha</i>	II (2–4)
<i>Veronica serpyllifolia</i>	II (2)
<i>Rumex acetosa</i>	II (1)
<i>Drepanocladus exannulatus</i>	I (2–4)
<i>Poa annua</i>	I (2–3)
<i>Dicranella palustris</i>	I (2–6)
<i>Scapania nemorosa</i>	I (4)
<i>Sphagnum squarrosum</i>	I (3)
<i>Festuca rubra</i>	I (2)
<i>Montia fontana</i>	I (4)
<i>Agrostis capillaris</i>	I (3)
Number of samples	10
Number of species/sample	10 (5–22)
Vegetation cover (%)	96 (75–100)
Altitude (m)	992 (868–1083)
Slope (°)	23 (0–35)

