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## H21

# *Calluna vulgaris*-*Vaccinium myrtillus*-*Sphagnum capillifolium* heath

### Synonymy

*Vaccineto-Callunetum hepaticosum* McVean & Ratcliffe 1962, Birks 1973; *Vaccinium-Sphagnum-Hymenophyllum wilsonii* nodum Prentice & Prentice 1975; *Herberta adunca-Calluna vulgaris* Association Birse 1984.

### Constant species

*Blechnum spicant*, *Calluna vulgaris*, *Deschampsia flexuosa*, *Potentilla erecta*, *Vaccinium myrtillus*, *Dicranum scoparium*, *Hylocomium splendens*, *Hypnum cupressiforme* s.l., *Plagiothecium undulatum*, *Pleurozium schreberi*, *Rhytidadelphus loreus*, *Sphagnum capillifolium*.

### Rare species

*Anastrophyllum donianum*, *A. joergensenii*, *Bazzania pearsonii*, *Campylopus setifolius*, *Colura calyptrifolia*, *Mastigophora woodsii*, *Myurium hochstetteri*, *Plagiochila carringtonii*, *Scapania ornithopodioides*.

### Physiognomy

The *Calluna vulgaris*-*Vaccinium myrtillus*-*Sphagnum capillifolium* heath has a mixed canopy of sub-shrubs, usually 3–5 dm tall, with a damp layer of luxuriant bryophytes. *Calluna vulgaris* is usually the dominant ericoid, although *Vaccinium myrtillus* is also constant and *Empetrum nigrum*, almost always ssp. *hermaphroditum*, is present in many stands, and each of these can show modest abundance. *Erica cinerea* occurs quite frequently, although it becomes distinctly patchy in the most humid situations occupied by this vegetation, and there is occasionally some *V. vitis-idaea*. In its general composition, then, the canopy is like that of much *Calluna*-*Vaccinium* heath, although *E. nigrum* ssp. *nigrum* tends to be the predominant crowberry there and, more importantly, regeneration after burning plays a large part in determining the floristics and structure of the sub-shrub element, and the associated flora, at any particular time. With the *Calluna*-*Vaccinium*-*Sphagnum* heath, on the other hand, fire is highly inimical to the

distinctive composition of the richest stands and, though this vegetation sometimes experiences light grazing, treatments are not of consequence in maintaining its characteristic features. Other sub-shrubs figure very occasionally, with sometimes a little *Arctostaphylos uva-ursi*, *A. alpinus* or *Juniperus communis* ssp. *nana*, but the general scarcity of these species helps separate the community from the *Calluna*-*Juniperus* heath, a vegetation type of rather similar geographical range and particular habitat requirements.

As in the *Calluna*-*Vaccinium* heath, *Deschampsia flexuosa* and *Potentilla erecta* are both very common among the associates, although they are usually present here as sparse, scattered individuals. More distinctively in this heath, there is constant *Blechnum spicant* and frequent records for *Solidago virgaurea* and *Listera cordata*, the last Northern Montane plant providing one of the floristic links between this community and our native pine and related juniper and birch woods. Other common vascular species are few. *Molinia caerulea* and *Scirpus cespitosus* occur occasionally, giving some continuity with the wet heaths with which this vegetation is often found, and there are scarce records for *Nardus stricta*, *Agrostis canina*, *A. capillaris*, *Festuca vivipara*, *Carex pilulifera*, *C. binervis* and *Galium saxatile* but, even in more open parts of the canopy, these never thicken up enough to give the community the look of a grass-heath. In contrast to related vegetation at higher altitudes, notably the *Vaccinium*-*Racomitrium* heath, *Carex bigelowii* is at most occasional here.

More important than any of these, however, are the bryophytes which form an extensive and lush carpet, becoming especially copious where there is a break in the sub-shrub cover. Constant throughout are bulky hypnaeous mosses such as *Hypnum cupressiforme* s.l., *Rhytidadelphus loreus*, *Pleurozium schreberi* and *Hylocomium splendens*, with *Plagiothecium undulatum*, *Dicranum scoparium* and *D. majus* also very common, but particularly distinctive here is the high frequency and local abundance of *Sphagnum capillifolium*. Other *Acutifolia*

*Sphagna* have also sometimes been recorded, including *S. quinquefarium*, *S. russowii* and *S. girgensohnii*, and *S. tenellum* too can be found occasionally, and together these serve as a good diagnostic feature to separate the community from more bryophyte-rich stands of the *Calluna*-*Vaccinium* heath.

*Racomitrium lanuginosum* becomes more frequent at higher altitudes but, even then, it is not generally abundant here, as it is in the *Vaccinium*-*Racomitrium* heath. Other bryophytes recorded occasionally throughout are *Ptilium crista-castrensis*, another particular link with the woodlands of the region, *Breutelia chrysocoma* and *Thuidium tamariscinum*, *Frullania tamarisci* and *Ptilidium ciliare*. But the most spectacular enrichment of this element of the flora comes from oceanic liverworts, for this community is one of those vegetation types which, in particular habitats, provides a major locus for Ratcliffe's (1968) 'mixed northern hepatic mat'. Species such as *Scapania gracilis*, *Mylia taylori* and *Diplophyllum albicans* can, indeed, be found throughout the *Calluna*-*Vaccinium*-*Sphagnum* heath but, in one of the sub-communities, many other more specifically Atlantic species can be found growing together in vegetation which is unique among heather-dominated communities.

Compared with the bryophytes, lichens make a fairly insignificant contribution to the cover. *Cladonia impexa* is the only species which occurs commonly throughout, with *C. gracilis* occasional, and, although *C. uncialis* and *C. arbuscula* become more frequent at higher altitudes, their abundance is generally not very great.

### Sub-communities

***Calluna vulgaris*-*Pteridium aquilinum* sub-community:** *Vaccinium*-*Sphagnum*-*Hymenophyllum wilsonii* nodum Prentice & Prentice 1975. *Calluna* is generally a strong dominant in this taller and more species-poor kind of *Calluna*-*Vaccinium*-*Sphagnum* heath, in which hepatics in particular are sparsely represented. Among the other sub-shrubs, *V. myrtillus* is very common, with *E. cinerea* and *V. vitis-idaea* also occurring occasionally, but *E. nigrum* ssp. *hermaphroditum* is rather local: it figures among stands on Hoy, for example (Prentice & Prentice 1975), but is quite absent in some other places, particularly where this kind of vegetation extends to its lowest altitudes. Other vascular plants occur sparsely, but distinctive here is the fairly common occurrence of scattered fronds of *Pteridium aquilinum* with occasional *Oxalis acetosella*, *Viola riviniana* and *Luzula sylvatica*.

Bryophytes can have fairly high cover, but the carpet consists almost entirely of the constants of the community, with *Dicranum majus* and, to a lesser extent, *Plagiothecium undulatum* showing preferential frequency. *Sphagnum capillifolium* is sometimes replaced by *S.*

*girgensohnii* or *S. russowii* and there is occasional *Thuidium tamariscinum*, *Calypogeia muellerana* and *Lophozia ventricosa*. Very occasionally, there can be records for *Hymenophyllum wilsonii* and a few of the oceanic hepatics, but these are no more than fragmentary assemblages compared with the richness of the other sub-community.

***Mastigophora woodsii*-*Herbertus aduncus* ssp. *hutchinsiae* sub-community:** *Vaccineto-Callunetum hepaticosum* McVean & Ratcliffe 1962, Birks 1973; *Herberta adunca*-*Calluna vulgaris* Association Birse 1984. In this sub-community, *Calluna* is still usually the most abundant sub-shrub, but the canopy is generally shorter and more mixed than above, with *Empetrum nigrum* ssp. *hermaphroditum* in particular playing a more frequent and sometimes abundant role and *V. uliginosum* figuring occasionally. Other vascular associates are few and even plants such as *Blechnum spicant* and *Listera cordata* can become rather patchy here.

The bryophytes, on the other hand, are extremely well developed with a strikingly consistent enrichment from numerous species. Among the mosses, all the community constants occur frequently, with *Rhytidiadelphus loreus*, *Hylocomium splendens* and *Sphagnum capillifolium* being moderately abundant and, with the shift to higher altitudes here, *R. lanuginosum* becomes more common. But it is the hepatics that catch the eye most obviously, especially where, between the bushes and among the boulders over which this vegetation is often developed, they form soft but bulky patches, each often a pure mass of shoots, variously tinged yellow, orange, red, brown or purple. Some widespread species, like the sub-Atlantic *Scapania gracilis* and *Anastrepta orcadensis*, the western British *Mylia taylori* and *Bazzania tricenata*, and the North Atlantic *Pleurozia purpurea* and *Diplophyllum albicans*, occur very commonly, together with occasional records for *Dicranodontium uncinatum*, *Tritomaria quinquedentata* and *Plagiochila spinulosa*. But most distinctive are the rarer North Atlantic liverworts *Mastigophora woodsii*, *Plagiochila carringtonii*, *Scapania ornithopodioides*, *Bazzania pearsonii* and, towards higher altitudes, the more montane *Anastrophyllum donianum* (with *A. joergensenii* at a very few sites) and *Scapania nimbosa*. These last two are, in fact, rather more characteristic of the *Vaccinium*-*Racomitrium* heath, into which many of these same species run on in abundance, whereas here an additional constant member of the hepatic suite is *Herbertus aduncus* ssp. *hutchinsiae*. Indeed, with *Mastigophora woodsii*, this is often the most abundant liverwort forming conspicuous bright orange cushions. On Skye, this kind of vegetation also provides a locus for *Colura calyptrifolia* and the rare mosses *Myurium hochstetteri* and *Campylopus setifolius* (Birks 1973).

### Habitat

The *Calluna-Vaccinium-Sphagnum* heath is highly characteristic of fragmentary humic soils developed in situations with a cool but equable climate and consistently shady and extremely humid atmosphere. It is almost wholly confined to low to moderate altitudes through the oceanic mountains of north-west Scotland, and is there very much restricted to steep, sunless slopes of north-west to easterly aspect, often with rock outcrops and blocky talus, among which crevices provide an additional measure of shade. The vegetation is sometimes lightly grazed, but burning is very damaging, and recovery probably extremely slow.

The general floristic features of the community reflect the relatively mild regional climate. For the most part, this is a vegetation type of the sub-alpine zone along the north-western seaboard of Scotland (Poore & McVean 1957, McVean & Ratcliffe 1962), extending down almost to sea-level on Skye (Birks 1973) and not often penetrating much above 500 m. Summers are characteristically cool in this part of Britain, with mean annual maximum temperatures generally less than 22°C even at lower altitudes (Conolly & Dahl 1970), but the winters are fairly mild, with sea-level February minima above freezing, fairly few frost days and annual accumulated temperatures very much like those throughout the upland fringes of the country (*Climatological Atlas* 1952, Page 1982). These conditions account for the rather muted montane character of the flora here, with Arctic-Alpines like *V. vitis-idaea*, *E. nigrum* ssp. *hermaphroditum* and *C. bigelowii* of only occasional or rather uneven representation throughout, and hypnaceous mosses rather than *R. lanuginosum* providing the most consistent element among the cryptogams.

And, of course, there is the dominance among the subshrubs of *Calluna*, rather than *V. myrtillus* and/or *E. nigrum* ssp. *hermaphroditum*: the altitude at which this switch in abundance occurs in more sheltered situations in the north-west Highlands, at around 600 m, corresponds roughly to the upper limit of the *Calluna-Vaccinium-Sphagnum* heath (Ratcliffe 1968). Above this level, increased snow-cover becomes inimical to the vigour of heather (Gimingham 1960) and the community is replaced by the *Vaccinium-Racomitrium* heath. The *Mastigophora-Herbertus* sub-community represents a transition to such low-alpine vegetation, penetrating to the highest levels attained by the *Calluna-Vaccinium-Sphagnum* heath, with a mean altitude in available samples of around 400 m. The *Calluna-Pteridium* sub-community, on the other hand, is characteristic of lower slopes, with a mean altitude some 200 m less and, with its more sporadic Arctic-Alpines, increased frequency of *Blechnum spicant* and *E. cinerea*, and preferential occurrence of *Pteridium aquilinum* it shows floristic continuity with the kind of oceanic sub-shrub vegetation seen in the *Calluna-Erica* heath.

Even in such situations, however, the luxuriance of the carpet of hypnaceous mosses and the frequent presence among them of various *Sphagna*, help maintain a distinction and is testimony to the high ground and atmospheric humidity here even on the steep slopes characteristically occupied by this community, which are almost always greater than 25° and often up to 45°. The profiles beneath the *Calluna-Vaccinium-Sphagnum* heath are typically fragmentary, sometimes little more than a thin layer of bryophyte remains insulating the vegetation from the mineral substrate, sometimes a thicker accumulation of peat over and between the rock fragments, and, since the bedrocks are characteristically pervious, the soils are free-draining, but the consistently wet climate keeps them, and the atmosphere, permanently moist.

It is this consistency of humidity, rather than the total amount of rainfall, that is of prime importance in determining the distribution and composition of the community. Annual precipitation through the range of the *Calluna-Vaccinium-Sphagnum* heath varies quite considerably, from not much more than 1600 mm through the mountains of Sutherland to over 3200 mm around Beinn Eighe (*Climatological Atlas* 1952), but everywhere in its extent through the north-west Highlands the community experiences more than 220 wet days yr<sup>-1</sup> (Ratcliffe 1968). Moreover, this kind of vegetation is best developed on slopes which have an aspect between north-west and east, and where the angle of inclination is such as to reduce insolation to a minimum. The characteristic habitat for the *Calluna-Vaccinium-Sphagnum* heath is thus over the lower slopes of the deep, sunless corries that are etched into the northern faces of mountains like Beinn Eighe and Liathach, An Teallach, Foinaven, the peaks of the Monar and Letterewe Forests, the hills of Skye and, on Orkney, the Enegars cliffs (Birks 1973, Prentice & Prentice 1975, Ratcliffe 1977). And the rocks of which many of these mountains are made up, Torridonian sandstone, quartzites or Old Red Sandstone, typically weather to blocky talus, among which the vegetation benefits from additional shade and shelter.

It is in the *Mastigophora-Herbertus* sub-community that the influence of these factors is seen most clearly. This is the kind of *Calluna-Vaccinium-Sphagnum* heath more strictly confined to higher altitudes in the north-west Highlands where summer temperatures are lower and the input from orographic rain much greater, and more closely associated there with the distinctive topography. As Ratcliffe (1968) showed, its most striking feature, the 'mixed northern hepatic mat', is strongly favoured by the particular combination of climatic conditions characteristic of such sites, though we are not really any closer now to understanding which factors are of importance to which members of this distinctive assemblage. Certainly, a very humid climate is a major

requirement for the group as a whole, and especially for the North Atlantic species, though, even among them, Ratcliffe (1968) noted some gradation of sensitivity to atmospheric dryness: *M. woodsii*, *H. aduncus* ssp. *hutchinsiae*, *Scapania nimbosa* and *Bazzania pearsonii* seemed to be among the most sensitive, being quickly lost in moving into less favourable habitats in the west and extending least far towards the drier east of the country. And heavy shade may make a vital but indirect contribution to maintaining the required levels of humidity by helping reduce evaporation to negligible levels, although for some species sensitivity to insolation itself might help confine them to the kind of habitat characteristic of this heath. Then, there is the impact of temperature which, for the North Atlantic species, probably exerts its effect through the low summer maxima typical of this part of Britain, even at lower altitudes. Again, however, specific tolerances probably vary. The prominence of *H. aduncus* ssp. *hutchinsiae* in this community, for example, reflects its preference for the warmer conditions typical of moderate elevations: it does not extend much beyond 600 m in the north-west Highlands and is largely absent from the hepatic mat which runs on to higher altitudes in the *Vaccinium-Racomitrium* heath. *Scapania nimbosa*, on the other hand, and *Anastrophyllum donianum* and the very local *A. joergensenii*, are more tolerant of the cooler conditions at altitudes above the limit of the *Calluna-Vaccinium-Sphagnum* heath, although they are often associated there with the shelter provided by fairly lengthy snow cover (Ratcliffe 1968). Such protection does, in fact, allow various members of the hepatic mat to survive in parts of eastern Scotland which would otherwise be too dry in summer and too cold in winter, but such persistence is not in association with this community.

The *Calluna-Pteridium* sub-community can be seen as comprising vegetation occurring in sites which are generally favourable to the development of damp heath rich in hypnaceous mosses and with the characteristic Sphagna of the community, but which, in one particular or another, cannot support the full suite of hepatics. Summer warmth and a drier climate at lower altitudes in the north-west Highlands, on Orkney and in those far-flung localities in Galloway and the Lake District where this vegetation can be found, could play a part here, and there are stands which are not so closely tied to the shadier aspects. It is also possible that this sub-community includes *Calluna-Vaccinium-Sphagnum* heath that has suffered from burning.

McVean & Ratcliffe (1962) noted that even the very precisely-defined habitat demanded by the *Mastigo-phora-Herbertus* sub-community was more widespread than the vegetation itself, which appeared to have been much reduced by fire and grazing. Even where burned stands had a good regenerating cover of sub-shrubs, the hepatics had seldom reappeared in any abundance, a

carpet of mosses developing instead (Ratcliffe 1968), and where grazing hindered the regrowth of the bushes there was the further problem of increased insolation and evaporation.

### Zonation and succession

The *Calluna-Vaccinium-Sphagnum* heath is a very local sub-alpine element in the oceanic zonation characteristic of the north-west Highlands, grading above to more montane sub-shrub communities and moss-heaths, and often passing below to wet-heath and mire vegetation. At higher altitudes, variations in exposure and snow-lie affect the patterns of communities, while at lower elevations there is increased influence of burning and grazing. Floristically, the *Calluna-Vaccinium-Sphagnum* heath is very close to certain kinds of woodland and, though there is rarely now any spatial continuity between the vegetation types, it is possible that clearance is responsible for their wide altitudinal separation, and that, in some situations, this is not a climax community.

The usual approach to stands of the *Calluna-Vaccinium-Sphagnum* heath is across tracts of *Scirpus-Eriophorum* bog or, on higher altitude terraces, the *Calluna-Eriophorum* bog, with a zone of *Scirpus-Erica* wet heath marking the transition to the more steeply-sloping ground where the peat cover thins and becomes better drained. The boundary between this last vegetation type and the *Calluna-Vaccinium-Sphagnum* heath running up on to the rocky ground in such zonation, is generally clear, particularly where large amounts of *Molinia* or *Scirpus* figure in the wet heath. In some cases, though, the communities can come quite close: the *Vaccinium* sub-community of the *Scirpus-Erica* wet heath has very frequent and sometimes prominent sub-shrubs and a ground layer in which hypnaceous mosses are as common and abundant as Sphagna, and it can grade fairly imperceptibly into the *Calluna-Pteridium* sub-community here. Alternatively, there may be a transition zone of Typical *Calluna-Erica* heath between the ombrogenous vegetation and the *Calluna-Vaccinium-Sphagnum* heath. Such patterns are well seen around the base of the corries on An Teallach and on Foinaven (Ratcliffe 1977).

In such situations, heather can remain a prominent feature of the vegetation cover to moderately high altitudes. On the shady and damp slopes where the *Calluna-Vaccinium-Sphagnum* heath is found, the community generally marks its upper limit of real vigour, increasing snow-lie over the higher talus and cliff bases being marked by a shift to the *Vaccinium-Racomitrium* heath, the *Bazzania-Mylia* sub-community of which shares many of the same hepatics as the *Mastigo-phora-Herbertus* sub-community here. Laterally, both vegetation types may fragment over rocky ground, becoming restricted to ledges and crevices, or being replaced there by tall-herb vegetation of the *Luzula-*



*Vaccinium* or *Luzula-Geum* communities, with the more species-poor examples of which these heaths show considerable floristic continuity, among both the vascular associates and the bryophytes. Liathach and some of the Letterewe crags show this kind of feature.

Towards these higher altitudes, variation in exposure becomes a major factor in determining the kinds of zonation in which the community is found. Over steep banks or in hollows where snow lies longer, the *Calluna-Vaccinium-Sphagnum* heath can be replaced by the *Hylocomium-Rhytidiadelphus* sub-community of the *Vaccinium-Deschampsia* heath or the *Plagiothecium-Anastrepta* sub-community of the *Vaccinium-Rubus* heath, in both of which there is a continuing strong contribution from hypnaceous mosses, with occasional, locally abundant Atlantic hepatics, beneath a bilberry or crowberry canopy. The transitions to the *Vaccinium-Rubus* heath can be especially smooth: indeed, McVean & Ratcliffe (1962) included some of this vegetation in their *Vaccineto-Callunetum* as a *suecicosum* facies. But the constancy of *Cornus suecica* and *Rubus chamaemorus* and occasional occurrence of *Eriophorum vaginatum* in the more chionophilous community will usually serve as a distinction and, though species such as *A. orcadensis*, *Bazzania tricenata* and *Diplophyllum albicans* remain reasonably frequent, the integrity of the more strictly Atlantic assemblage becomes fragmented. The same is true of the *Vaccinium-Deschampsia* heath, too, although additionally with the passage to this vegetation type, there is an increase in the frequency of grasses, notably *Nardus*, *Agrostis canina*, *A. capillaris* and *F. ovina*. This can presage a shift to the *Nardus-Carex* community of later snow-beds in which the hepatics are very fragmentarily represented. Mosaics of these vegetation types can be seen over the higher slopes of An Teallach and in the hills of the Letterewe and Monar Forests (Ratcliffe 1977).

Some continuity among the hepatics can also be seen in those few places where the *Calluna-Vaccinium-Sphagnum* heath is contiguous with the *Calluna-Juniperus* heath, a community best developed on cool, shady slopes of moderate altitudes where the ground is blown clear of snow in winter. It is especially associated with fields of frost-shattered Cambrian quartzite and is well seen on Foinaven around the steeper ground which has a mosaic of dry and damp heather vegetation (Ratcliffe 1977).

Shifts from the sheltered slopes carrying the *Calluna-Vaccinium-Sphagnum* heath on to ground which is much more exposed to strong winds usually see a sharp replacement of the community by such dwarfed subshrub vegetation as the *Calluna-Racomitrium* or *Calluna-A. alpinus* heaths, in which heather can attain considerably higher altitudes and where *R. lanuginosum* is the predominant component of the often extensive moss carpet. Such transitions can be seen over the

windswept lips of corries and cliffs and over lateral transitions to exposed spurs, as on Foinaven (Ratcliffe 1977) and above the Enegars cliffs on Hoy (Prentice & Prentice 1975), where they can mark a shift to summit moss-heath and fell-field communities.

Towards the upper end of its altitudinal limit, the *Calluna-Vaccinium-Sphagnum* heath appears to form a natural component of vegetation patterns controlled largely by variations in local climate and soils. On lower ground, however, it extends into the zone of communities that have often been strongly affected by various kinds of treatment. Where the surrounding heaths have been burned and grazed, for example, the transition to neighbouring communities is often sharpened up by a biotically-related dominance of heather in either the *Calluna-Erica* or *Scirpus-Erica* heaths or, conversely, by a virtual elimination of dwarf-shrubs in Nardo-Galion swards of various kinds, to which the *Vaccinium-Deschampsia* heath can form an intermediate, or *Molinia*-dominated wet heath. Although the damp slopes over which the *Calluna-Vaccinium-Sphagnum* heath occurs are protected somewhat against the ravages of fire by the moistness of the ground and vegetation, it seems certain that the extent of the community has been fragmented and reduced by burning (McVean & Ratcliffe 1962). Ratcliffe (1968) suggested that its original range extended throughout the north-west Highlands, from Ben Hope in the far north to Glencoe and perhaps Ben Cruachan in Argyll, with widespread representation, too, from Jura and Mull right through the Hebrides and round to Orkney and Shetland, in many of which localities it is now extremely scarce or unknown. There is also the possibility that, before the extensive clearance that has characterised the western Highlands, the *Calluna-Vaccinium-Sphagnum* heath could be found among tracts of native pine forest. There is considerable floristic similarity between the community and the field and ground layers of the *Scapania* sub-community of the *Pinus-Hylocomium* woodland, something that is seen very well in the upper reaches of the forest remnants of Coille na Glas-Leitire above Loch Maree, although here, as in other more fragmentary examples, there is now an altitudinal gap between the woodland and the heath in the higher corries above.

### Distribution

The community occurs widely but locally through the north-west Highlands and on Skye, with outlying localities on Orkney, in south-west Scotland and the Lake District. The *Mastigophora-Herbertus* sub-community is more restricted in its range, being confined to the more shaded and humid habitats in north-west Scotland.

### Affinities

The *Calluna-Vaccinium-Sphagnum* heath takes in McVean & Ratcliffe's (1962) *Vaccineto-Callunetum*

*hepaticosum*, under which head they provided the first description of this kind of vegetation, and unites it with less floristically peculiar stands of bryophyte-rich heath, including samples from Birks (1973) and Prentice & Prentice (1975) from along the fringes of its range. The *Vaccineto-Callunetum suecicosum* of McVean & Ratcliffe (1962) is here transferred to the *Vaccinium-Rubus* heath, where it is united with their *Vaccinetum chionophilum*.

In Ireland, the characteristic assemblage of Atlantic hepatics seen here is found in association with *Calluna*, *V. myrtillus* and *D. flexuosa* in what Mhic Daeid (1976) called the *Herberteto-Polytrichetum alpini*, a community of steep, sheltered slopes in the Kerry and Connemara

mountains where, in the warmer climate, the upper altitudinal limit of some of the liverworts is pushed to beyond 1000 m (Ratcliffe 1968). Apart from this parallel, however, heather-dominated vegetation of this extreme oceanic kind is not known from elsewhere. Birks (1973) considered it sufficiently distinct to warrant the erection of a new alliance within the Nardo-Callunetea, though, like Prentice & Prentice (1975), he placed it provisionally in the Myrtilion. To emphasise the close floristic (and perhaps seral) relationship to pine forest, McVean & Ratcliffe (1962) preferred to locate their *Vaccineto-Callunetum hepaticosum* in the Vaccinio-Piceion. On balance, a position among the Myrtilion heaths, or an equivalent alliance, seems better.

## Floristic table H21

	a	b	21
<i>Calluna vulgaris</i>	V (4–10)	V (6–10)	V (4–10)
<i>Vaccinium myrtillus</i>	V (1–5)	V (1–4)	V (1–5)
<i>Deschampsia flexuosa</i>	V (1–4)	V (1–3)	V (1–4)
<i>Rhytidiadelphus loreus</i>	IV (1–4)	V (1–4)	V (1–4)
<i>Pleurozium schreberi</i>	IV (1–4)	V (1–4)	V (1–4)
<i>Hylocomium splendens</i>	IV (1–8)	V (1–6)	V (1–8)
<i>Hypnum cupressiforme</i> s.l.	IV (1–6)	V (1–4)	V (1–6)
<i>Dicranum scoparium</i>	IV (1–5)	IV (1–3)	IV (1–5)
<i>Plagiothecium undulatum</i>	V (1–4)	III (1–4)	IV (1–4)
<i>Blechnum spicant</i>	IV (1–3)	III (1–4)	IV (1–4)
<i>Sphagnum capillifolium</i>	III (1–8)	V (1–6)	IV (1–8)
<i>Potentilla erecta</i>	III (1–3)	IV (1–4)	IV (1–4)
<i>Dicranum majus</i>	IV (1–3)	III (1–4)	III (1–4)
<i>Pteridium aquilinum</i>	III (1–3)		II (1–3)
<i>Thuidium tamariscinum</i>	II (1–4)	I (1)	II (1–4)
<i>Oxalis acetosella</i>	II (1–3)		I (1–3)
<i>Luzula sylvatica</i>	II (1–4)		I (1–4)
<i>Viola riviniana</i>	II (1–3)		I (1–3)
<i>Calypogeia muellerana</i>	II (1–3)		I (1–3)
<i>Lophozia ventricosa</i>	II (1–3)		I (1–3)
<i>Sphagnum girgensohnii</i>	I (1–5)		I (1–5)
<i>Sphagnum russowii</i>	I (1–8)		I (1–8)
<i>Scapania gracilis</i>	II (1)	V (1–4)	III (1–4)
<i>Mylia taylori</i>	II (1–4)	V (1–4)	III (1–4)
<i>Racomitrium lanuginosum</i>	I (1–3)	V (1–6)	III (1–6)
<i>Bazzania tricrenata</i>	I (1)	V (1–4)	III (1–4)
<i>Pleurozia purpurea</i>		V (1–4)	II (1–4)
<i>Cladonia uncialis</i>		V (1–3)	II (1–3)
<i>Diplophyllum albicans</i>	II (1–4)	IV (1–4)	II (1–4)
<i>Empetrum nigrum hermaphroditum</i>	II (1–4)	IV (1–6)	II (1–6)
<i>Anastrepta orcadensis</i>	I (1–3)	IV (1–4)	II (1–4)
<i>Mastigophora woodsii</i>	I (1–3)	IV (1–6)	II (1–6)

Floristic table H21 (cont.)

	a	b	21
<i>Herbertus aduncus hutchinsiae</i>	I (1–4)	IV (1–5)	II (1–5)
<i>Scapania ornithopodiodes</i>		IV (1–4)	II (1–4)
<i>Cladonia arbuscula</i>	I (1–3)	III (1–4)	II (1–4)
<i>Anastrophyllum donianum</i>		III (1–4)	II (1–4)
<i>Plagiochila carringtonii</i>		III (1–4)	II (1–4)
<i>Dicranodontium uncinatum</i>		III (1–3)	II (1–3)
<i>Tritomaria quinquedentata</i>	I (1–3)	II (1–3)	I (1–3)
<i>Plagiochila spinulosa</i>	I (1–3)	II (1–4)	I (1–4)
<i>Vaccinium uliginosum</i>		II (1–4)	I (1–4)
<i>Bazzania pearsonii</i>		II (1–4)	I (1–4)
<i>Scapania nimbosea</i>		II (1–3)	I (1–3)
<i>Nowellia curvifolia</i>		I (1–3)	I (1–3)
<i>Erica cinerea</i>	III (1–4)	III (1–4)	III (1–4)
<i>Solidago virgaurea</i>	II (1–3)	III (1–3)	III (1–3)
<i>Cladonia impexa</i>	II (1–3)	III (1–4)	III (1–4)
<i>Listera cordata</i>	III (1–3)	II (1–3)	III (1–3)
<i>Vaccinium vitis-idaea</i>	II (1–4)	II (1–3)	II (1–4)
<i>Ptilium crista-castrensis</i>	II (1–4)	II (1–3)	II (1–4)
<i>Sphagnum quinquefarium</i>	II (1–8)	II (1–3)	II (1–8)
<i>Breutelia chrysocoma</i>	II (1–4)	I (1–4)	II (1–4)
<i>Carex bigelowii</i>	I (1–3)	II (1–3)	II (1–3)
<i>Cladonia gracilis</i>	I (1–3)	II (1–3)	II (1–3)
<i>Scirpus cespitosus</i>	I (1–3)	II (1–3)	II (1–3)
<i>Molinia caerulea</i>	I (1–3)	II (1–4)	I (1–4)
<i>Melampyrum pratense</i>	I (1–3)	II (1–3)	I (1–3)
<i>Sphagnum tenellum</i>	I (1–4)	II (1–4)	I (1–4)
<i>Frullania tamarisci</i>	I (1–3)	II (1–3)	I (1–3)
<i>Nardus stricta</i>	I (1–3)	II (1–3)	I (1–3)
<i>Agrostis canina</i>	I (1–3)	I (1–2)	I (1–3)
<i>Carex pilulifera</i>	I (1–3)	I (1–3)	I (1–3)
<i>Agrostis capillaris</i>	I (1–3)	I (1–3)	I (1–3)
<i>Galium saxatile</i>	I (1–3)	I (2)	I (1–3)
<i>Ptilidium ciliare</i>	I (1–3)	I (2–3)	I (1–3)
<i>Festuca vivipara</i>	I (1–3)	I (1–3)	I (1–3)
<i>Carex binervis</i>	I (1–3)	I (1–3)	I (1–3)
<i>Campylopus paradoxus</i>	I (1–3)	I (1)	I (1–3)
<i>Barbilophozia floerkii</i>	I (1–3)	I (1–3)	I (1–3)
<i>Sphaerophorus globosus</i>	I (1–3)	I (1–3)	I (1–3)
<i>Sorbus aucuparia</i> seedling	I (1–3)	I (1–3)	I (1–3)
<i>Dryopteris filix-mas</i>	I (1)	I (1–3)	I (1–3)
<i>Hypericum pulchrum</i>	I (1–3)	I (1–3)	I (1–3)
<i>Succisa pratensis</i>	I (1–3)	I (1–3)	I (1–3)
<i>Arctostaphylos uva-ursi</i>	I (1–3)	I (1)	I (1–3)
<i>Cladonia bellidiflora</i>	I (1–3)	I (1)	I (1–3)
<i>Cladonia pyxidata</i>	I (1–3)	I (1)	I (1–3)
<i>Hylocomium umbratum</i>	I (1–3)	I (1–3)	I (1–3)

<i>Kurzia pauciflora</i>	I (1–3)	I (1–3)	I (1–3)
<i>Hymenophyllum wilsonii</i>	I (1–3)	I (1)	I (1–3)
<i>Kurzia trichoclados</i>	I (1–3)	I (1–2)	I (1–3)
<i>Juniperus communis nana</i>	I (1–3)	I (1–3)	I (1–3)
<i>Dactylorhiza maculata</i>	I (1–3)	I (1)	I (1–3)
Number of samples	28	23	51
Number of species/sample	24 (10–46)	36 (26–42)	29 (10–46)
Vegetation height (cm)	46 (30–75)	32 (6–75)	40 (6–75)
Vegetation cover (%)	95 (30–100)	98 (80–100)	96 (30–100)
Altitude (m)	199 (15–570)	399 (122–640)	289 (15–640)
Slope (°)	38 (3–90)	29 (3–45)	34 (3–90)

- a *Calluna vulgaris*-*Pteridium aquilinum* sub-community  
b *Mastigophora woodsii*-*Herbertus aduncus hutchinsiae* sub-community  
21 *Calluna vulgaris*-*Vaccinium myrtillus*-*Sphagnum capillifolium* heath (total)





