U14
Alchemilla alpina-Sibbaldia procumbens dwarf-herb community

Synonymy
Alchemilla-Sibbaldia nodum McVean & Ratcliffe 1962.

Constant species
Agrostis capillaris, *Alchemilla alpina*, *Deschampsia cespitosa*, *Galium saxatile*, *Nardus stricta*, *Omalotheca supina*, *Sibbaldia procumbens*, *Thymus praecox*, *Viola palustris*, *Polytrichum alpinum*.

Rare species
Cerastium alpinum, *Euphrasia frigida*, *Minuartia sedoides*, *Sagina saginoides*, *Sibbaldia procumbens*, *Aulacomnium turgidum*, *Hypnum hamulosum*, *Moerckia blyttii*.

Physiognomy
The *Alchemila alpina-Sibbaldia procumbens* community has a very low and often somewhat open turf in which mat- and cushion-forming herbs, tussocky grasses and moss patches provide the most distinctive elements. The composition can be quite diverse, but *Alchemilla alpina* and the nationally rare *Sibbaldia procumbens* are constant throughout and are usually among the most abundant species, with *Thymus praecox* also very common and of locally high cover. Occasionally, too, the velvety cushions of *Silene acaulis* can be found, but the general scarcity of this plant here is one good distinguishing feature separating this vegetation from the rather similar carpets of the *Festuca-Alchemilla-Silene* community, where it is the typical dominant. Among the grasses, *Nardus stricta*, *Agrostis capillaris*, *Festuca ovina/vivipara* and *Deschampsia cespitosa* (including some obvious ssp. *alpina*) are all found very frequently, usually growing as scattered tussocks but together often making a sizeable contribution to the cover. *D. cespitosa* in particular can attain considerable abundance here and, where it thickens up, this may presage a switch to more species-rich stands among the related *Deschampsia-Galium* community. *Anthoxanthum odoratum*, *Deschampsia flexuosa* and *Agrostis canina* also occur quite commonly, though with only modest local abundance, and there is often a little *Carex bigelowii* and *Luzula spicata* with occasional *C. pilulifera* and *Juncus trifidus*.

Scattered through the sward are frequent plants of *Omalotheca supina*, *Viola palustris*, *Euphrasia officinalis* agg. (including the rare *E. frigida*) and *Galium saxatile*, the constancy of the last being another good difference from the *Festuca-Alchemilla-Silene* community. *Selaginella selaginoides*, by contrast, is not quite so common as in that more generally calcicolous vegetation, and *Saxifraga oppositifolia*, which is rather frequent there, is hardly ever found in the *Alchemilla-Sibbaldia* community. Quite common here, though, are *Potentilla erecta*, *Polygonum viviparum*, *Cerastium fontanum*, *Ranunculus acris*, *Thalictrum alpinum*, *Huperzia selago* and *Minuartia sedoides*; and there is sometimes also a very little *Salix herbacea* and *Vaccinium myrtillus*, but dwarf- or sub-shrubs are not a characteristic feature here. Very occasionally, too, there can be found plants of *Campanula rotundifolia*, *Rumex acetosa*, *Luzula multiflora* *Alchemilla glabra*, *A. filicaulis* ssp. *vestita*, *Saxifraga stellaris*, *S. hypnoides*, *Diphasium alpinum*, *Trollius europaeus*, *Armeria maritima* and *Botrychium lunuria*. The community also provides one locus for the rare Arctic-Alpines *Cerastium alpinum* and *Sagina saginoides*.

Mosses are often quite numerous and sometimes abundant among the patchwork of vascular plants. *Polytrichum alpinum* is the only constant overall, but *Racomitrium fasciculare* and *R. canescens* are both very common and the latter especially can have high cover. When these species are present with a little *Oligotrichum hercynicum*, which is occasional here, the vegetation can come close to certain kinds of late snow-bed, but *R. heterostichum* and *Polytrichum sexangulare* are both scarce. In other stands, hypnaceous species such as *Rhytidiadelphus loreus*, *R. squarrosus*, *Hylocomium splendens* and *Pleurozium schreberi* are fairly conspicuous, giving strong continuity with more chionophi-

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lous *Deschampsia-Galium* vegetation. Then, there are frequent records for *Pogonatum urnigerum* and *Racomitrium lanuginosum* with occasional *Rhytidiadelphus triquetrus*, *Ctenidium molluscum*, *Dicranum scoparium* and *Pohlia nutans*. The rare montane mosses *Hypnum hamulosum* and *Aulacomnium turgidum* are also sometimes found here.

Hepatics are fewer in number and rarely of any appreciable cover, but *Nardia scalaris* and *Barbilophozia floerkii* occur quite often and there is sometimes also a little *Ptilidium ciliare* and *Diplophyllum albicans*. Lichens are typically sparse with just very occasional *Cetraria islandica*, *Cladonia pyxidata* and *C. arbuscula*.

Habitat

The *Alchemilla-Sibbaldia* community is characteristic of intermittently irrigated ground, watered usually by snow-melt or snow-bed springs and often with some measure of disturbance by solifluction, at high altitudes throughout the Scottish Highlands. It is best developed over calcareous substrates, but does not depend ultimately on high soil base-status for its distribution and usually occurs on incipiently podzolised profiles, extending on to some quite poor rocks where the only enrichment comes from flushing waters.

This is a vegetation type of the low- and middle-alpine zones on Scottish mountains, although its altitudinal spread over these upper slopes is quite considerable, ranging from around 600 to well over 1000 m. Generally, however, the climate is cold throughout the year, with mean temperatures towards the higher ground rising above 5 °C for only five months (Elkington 1964). All the stands fall within the 21 °C mean annual maximum isotherm (Conolly & Dahl 1970) and over this area the mean July temperature is usually within the range 11–15 °C (Coker 1966). The winters are characteristically bitter and, though rainfall is rather variable across the distribution of the community, at these altitudes much of the winter precipitation is received as snow, with at least 60 days observed fall annually (Manley 1940), and with drifts persisting long in sheltered and shaded situations. The redistribution of moisture, both regionally and locally, which is associated with the accumulation of snow, is of great importance for the maintenance of the *Alchemilla-Sibbaldia* community. In the western Highlands, where precipitation is often over 2400 mm yr^{-1} with more than 220 wet days annually (*Climatological Atlas* 1952, Ratcliffe 1968), this dependence on snow-melt is not so absolute and irrigation comes sometimes from intermittent springs and seepage lines fed by the heavy rainfall. Generally, though, this kind of vegetation marks out hollows and corries, often with a northerly or easterly aspect, which catch and hold appreciable amounts of snow, more than accumulates over the chionophilous sub-shrub heaths of the low-alpine zone, but not as much as lies really long on the middle-alpine snow-beds. And, in the eastern Highlands, where annual precipitation is only around 1600 mm with just 180 wet days yr^{-1}, local persistence of snow on cold, sunless slopes is vital in giving the community an important outpost in a region that would be otherwise too dry.

The effects of the moderately long snow-lie, the sporadic irrigation from melt-waters and springs, and a certain amount of amorphous solifluction over what are often quite steep slopes, are clearly seen in the flora here. In the first place, the ground is too snow-bound, moist and unstable to support the mixtures of sub-shrubs, grasses and hypnaceous mosses typical of the chionophilous bilberry and crowberry heaths, whose differential species are generally no more than occasional. On the other hand, the typical bryophytes of the really late snow-beds, and the sodden ground immediately around their springs, are also poorly represented. On the positive side, conditions are such as to favour those more diminutive Arctic-Alpines that are readily crowded out from other moderately chionophilous swards where *Nardus*, *Carex bigelowii* or *Deschampsia cespitosa* attain high cover. Each of these can become abundant over slopes that are more or less equally snow-bound to those here and they remain common, even locally prominent, in the *Alchemilla-Sibbaldia* community, but it is the frequency of more competition-sensitive plants like *Sibbaldia*, *Omalotheca supina* and *Luzula spicata* that gives the vegetation its really distinctive character. *Sibbaldia* in particular appears very well adapted to the environment here (Coker 1966). It is probably restricted in its occurrence among high-montane vegetation by vulnerability to shading by taller herbage but it makes especially vigorous growth on the kind of sheltered and moist, but free-draining, ground favoured by this community. It begins its round of root growth as the soil thaws and puts out its first shoots beneath the snow in April to June. Indeed, though it can grow and fruit readily in the generally harsh climate, it needs some protection from late frosts for this first foliage. Moreover, its horizontal rootstock is not unduly affected by churning and solifluction and, if periodic drying-out of the ground kills off older leaves, new rosettes can be readily produced when conditions again become favourable.

Even when growing well, *Sibbaldia* and *Alchemilla alpina* produce a rather lax turf, among which other plants can root between the rhizomes and shortly-creeping stocks and, as well as *O. supina* and *L. spicata*, Arctic-Alpines such as *Juncus trifidus*, *Salix herbacea*, *Saxifraga stellaris*, and the rare *Cerastium alpinum* and *Sagina saginoides* are all able to take advantage of the open conditions. For *Thymus praecox*, too, the combination of lack of competition and the free-draining, even if moist, character of the ground, is a congenial one

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(Pigott 1955), though this vegetation usually marks its limit of snow tolerance.

Compared with the *Festuca-Alchemilla-Silene* community, however, the occurrence of stricter calcicoles is not typical of the *Alchemilla-Sibbaldia* swards. *Selaginella* occurs fairly often, but other species, even quite undemanding ones such as *Polygonum viviparum*, *Thalictrum alpinum*, *Saxifraga hypnoides* and *Silene acaulis*, are infrequent, and *Saxifraga oppositifolia* is rare. Indeed, it is the scarcity of these last two, together with the constancy of the calcifuge *Galium saxatile* here, that provides the best indicator of the different edaphic preferences of the two communities. The *Alchemilla-Sibbaldia* vegetation certainly occurs commonly over calcareous substrates such as the Dalradian mica-schists of the Breadalbane Mountains: in fact, it tends to be rather more extensively developed on rocks of this kind than on the harsher siliceous materials, and there is some suggestion that *Sibbaldia* itself is not entirely indifferent to soil base-status over much of the range of the community (McVean & Ratcliffe 1962). But both the plant and this vegetation extend more widely in geological and edaphic terms than the *Festuca-Alchemilla-Silene* swards and it is the ultimate dependence on snow-lie rather than base-status which maintains the *Alchemilla-Sibbaldia* community on substrates which would be unsuitable for the more calcicolous dwarf-herb vegetation. Thus, stands can be found on quartzites, acidic schists and granite, this last being especially important as a parent material for the community in its Cairngorm localities (Roger 1956). Very occasionally, the community even extends on to the highly impoverished sandstones and granulites of the western Highlands, though the kind of vegetation which McVean & Ratcliffe (1962) appended to their nodum as a *Potentilla erecta* facies is probably best transferred to the *Carex-Racomitrium* heath.

On the poorer substrates, flushing probably plays a crucial role in ameliorating the oligotrophic character of the soils but, even over the calcareous rocks, high rainfall tends to leach the profile. The soils are quite varied in structure, sometimes amounting to little more than accumulations of humus over shattered rock debris, but there are generally signs of incipient podzolisation and surface pH is usually between 4.5 and 5.5. Although drainage is typically free, there is sometimes a little gley mottling below.

Zonation and succession

The *Alchemilla-Sibbaldia* community is a widespread, though usually not very extensive, element among suites of more chionophilous vegetation of the low- to middle-alpine zones throughout the Highlands. The associated communities vary somewhat according to differences in regional climate, but the most important factors influencing the disposition and extent of the vegetation types are the duration of snow-lie, the pattern of drainage of melt or flushing waters, the stability of the ground and the base-richness of the soils. Some stands may be influenced by grazing, but this is essentially a climax community.

Through much of its range, the *Alchemilla-Sibbaldia* vegetation occurs in association with the *Polytrichum-Kiaeria* or *Salix-Racomitrium* late snow-beds and the permanent springs of the *Pohlietum glacialis*, three extremely chionophilous communities whose overall distributions are roughly coincident with this. Sometimes the patterns are quite well defined with the snow-beds occupying the centres of hollows or the most sheltered and shaded slopes of corries, and patches of the *Pohlietum* marking the spring heads with the *Alchemilla-Sibbaldia* vegetation over the irrigated ground below and around these, and sometimes running up behind where a cornice of snow is held around the corrie rim. In other cases, where snow persists patchily over a slope, with sporadic flushing over uneven ground between and below the late beds, the mosaics may be more complex and the elements less sharply delineated. Typically, the *Polytrichum-Kiaeria* and *Salix-Racomitrium* communities are distinguished by an abundance of more chionophilous mosses like *K. starkei*, *P. sexangulare*, *Oligotrichum hercynicum* and *Racomitrium heterostichum* which are hardly ever extensive in the *Alchemilla-Sibbaldia* swards. However, prominent patches of *R. fasciculare* may occur throughout the zonation and such characteristic species as *Alchemilla alpina*, *Omalotheca supina* and *Luzula spicata*, even *Sibbaldia* on occasion, can run on with high frequency and local abundance over the more snow-bound ground.

Quite often, too, and particularly towards the lower limits of the *Alchemilla-Sibbaldia* community in the low-alpine zone, the moderately chionophilous *Nardus-Carex* grass-heath is found with this vegetation, meltwater from its snow cover frequently providing the source of irrigating waters. Here, the abundance of *Nardus* and *C. bigelowii*, more locally of *Scirpus cespitosus*, sometimes with a carpet of *R. lanuginosum* or hypnaceous mosses, will usually serve as a marker of the boundaries. Less easy to differentiate in many cases is the *Deschampsia-Galium* community which increasingly towards the west occupies at least some of the low- and middle-alpine slopes covered by fairly long-lying snow or irrigated by melt from it. Where *D. cespitosa* is strongly dominant in such vegetation, as is quite often the case on less snow-bound ground, the two communities are usually distinct, but there is strong floristic continuity between them and less luxuriant *Deschampsia-Galium* swards can grade smoothly into *Alchemilla-Sibbaldia* vegetation where irrigation becomes somewhat more sporadic and the soils rather less stable.

Mosaics of all these communities, together with fern-

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dominated stands of the *Cryptogramma-Athyrium* snow-bed on stretches of block scree, are very characteristic of the upper snow-bound slopes of the Fannich and Affric–Cannich hills, Beinn Dearg, and to a lesser extent of the Monar Forest, though there the more chionophilous elements tend to be fragmentarily developed. Northwards from this part of Scotland, moss-dominated stands of the *Deschampsia-Galium* community tend to occupy the latest snow-beds and around Letterewe and Ben More Assynt *Alchemilla-Sibbaldia* vegetation can be found on irrigated ground around these, grading to the centre with an increase in hypnaceous mosses and a loss of less chionophilous herbs. Beyond here, however, the community becomes of very patchy occurrence on the mountains of the far north-west.

Moving south across the Great Glen into the central Highlands broadly similar patterns to those described above can be seen on Bidean Nam Bian, Ben Alder and Creag Meagaidh, though to the east of here, the *Deschampsia-Galium* vegetation tends to be replaced in the sequences by the *Carex-Polytrichum* sedge-heath, the swards of which are usually quite distinct from the *Alchemilla-Sibbaldia* community. The *Alchemilla-Sibbaldia* vegetation itself continues to be well represented even into the drier east-central Highlands, where it is an important element in the varied and extensive suites of chionophilous vegetation over the northern slopes of the Cairngorms.

The other striking kind of zonation which is best seen in the central Highlands involves transitions between the *Alchemilla-Sibbaldia* community and other more calcicolous vegetation types of moderately snow-bound slopes and irrigated ground. The *Festuca-Alchemilla-Silene* community in particular is very close in its floristics and physiognomy and is most often found with *Alchemilla-Sibbaldia* vegetation over the limestones and calcareous mica-schists of the Breadalbane Mountains. It is distinctly more calcicolous in its total flora, though it is often the abundance of less demanding species like *Silene acaulis* and *Minuartia sedoides* that provide the most obvious indication of its extent, with *Sibbaldia* taking their place on moving into the *Alchemilla-Sibbaldia* community. And environmentally, it is the longer duration of snow lie that determines the shift to the latter vegetation type. Quite often the sequence continues into stands of the distinctive montane flush vegetation of the *Caricetum saxatilis* on waterlogged ground in hollows or around permanent *Cratoneuron-Festuca* springs. Continuously irrigated slopes can have rich stands of *Deschampsia-Galium* grassland and where more inaccessible banks or ledges occur the dwarf-herb stands can pass to the luxuriant *Luzula-Geum* or *Dryas-Silene* communities or dripping *Saxifraga-Alchemilla* vegetation. Freedom from grazing often mediates the shift to tall-herb assemblages and the *Alchemilla-Sibbaldia* swards may sometimes experience some cropping and trampling. Ultimately, though, it is climatic and edaphic conditions which maintain the community as a climax.

Distribution

The *Alchemilla-Sibbaldia* community occurs widely through the Scottish Highlands.

Affinities

As defined here, the community is an expanded but essentially similar vegetation type to the *Alchemilla-Sibbaldia* nodum of McVean & Ratcliffe (1962), the first authors to provide a description of this kind of assemblage. With the more comprehensive account of related communities that is available now, the syntaxon retains its integrity as a close relative of the *Festuca-Alchemilla-Silene* dwarf-herb vegetation, though its relationship to the *Deschampsia-Galium* swards is perhaps a little closer than in McVean & Ratcliffe (1962). Nonetheless, it is probably best placed among the more herb-rich communities of the Salicetalia herbaceae which Gjaerevøll (1956) gathered into a Ranunculo-Anthoxanthion alliance to separate them from the moss-dominated late snow-beds. The nearest equivalents described from Scandinavia are the *Alchemilletum alpinae* of Rondane (Dahl 1956) and the *Sibbaldietum procumbentis* which Gjaerevøll (1956) characterised from various parts of Norway. These occur in the kind of irrigated situations commonly occupied by our *Alchemilla-Sibbaldia* community, while similar vegetation in Gjaerevøll's (1956) *Anthoxantho-Deschampsietum flexuosae* marks out the snow-cornice habitat in which the Scottish swards are sometimes found.

Floristic table U14

Alchemilla alpina	V (1–6)	*Thymus praecox*	IV (1–6)
Sibbaldia procumbens	V (1–8)	*Omalotheca supina*	IV (1–4)
Nardus stricta	V (1–4)	*Viola palustris*	IV (1–3)
Deschampsia cespitosa	V (1–6)		
Agrostis capillaris	V (1–6)	*Euphrasia officinalis* agg.	III (1–3)
Galium saxatile	V (1–4)	*Anthoxanthum odoratum*	III (1–3)
Polytrichum alpinum	IV (1–3)	*Festuca ovina/vivipara*	III (1–4)

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Floristic table U14 (*cont.*)

Selaginella selaginoides	III (1–3)
Carex bigelowii	III (1–4)
Racomitrium fasciculare	III (1–4)
Luzula spicata	III (1–3)
Pogonatum urnigerum	III (1–4)
Racomitrium canescens	III (1–8)
Hylocomium splendens	II (1–6)
Rhytidiadelphus loreus	II (1–4)
Deschampsia flexuosa	II (1–4)
Potentilla erecta	II (1–4)
Racomitrium lanuginosum	II (1–4)
Rhytidiadelphus squarrosus	II (1–4)
Pleurozium schreberi	II (1–3)
Polygonum viviparum	II (1–4)
Nardia scalaris	II (1–4)
Cerastium fontanum	II (1–3)
Huperzia selago	II (1–3)
Oligotrichum hercynicum	II (1–4)
Barbilophozia floerkii	II (1–5)
Vaccinium myrtillus	II (1–3)
Agrostis canina	II (1–6)
Carex pilulifera	II (1–4)
Dicranum scoparium	II (1–3)
Ranunculus acris	II (1–3)
Thalictrum alpinum	II (1–4)
Silene acaulis	II (1–8)
Pohlia nutans	II (1–4)
Minuartia sedoides	II (1–7)
Juncus trifidus	II (1–4)
Luzula multiflora	I (1–3)
Ptilidium ciliare	I (1–3)
Campanula rotundifolia	I (1–3)
Cetraria islandica	I (1–3)
Salix herbacea	I (1–4)
Rumex acetosa	I (1–3)
Cerastium alpinum	I (1–2)
Alchemilla glabra	I (1–4)
Racomitrium heterostichum	I (1–4)
Rhytidiadelphus triquetrus	I (1–6)
Diplophyllum albicans	I (1–3)
Ctenidium molluscum	I (1–4)
Saxifraga oppositifolia	I (1–3)
Cladonia pyxidata	I (1–3)
Sagina saginoides	I (1–3)
Saxifraga stellaris	I (1–3)
Trollius europaeus	I (1–2)
Diphasium alpinum	I (1–3)
Festuca rubra	I (1)
Carex pilulifera	I (1–2)
Alchemilla filicaulis vestita	I (1–3)
Cladonia arbuscula	I (1–3)
Achillea millefolium	I (1–3)
Drepanocladus uncinatus	I (1–5)
Leontodon autumnalis	I (1–3)
Hypnum callichroum	I (1–3)
Armeria maritima	I (1–3)
Botrychium lunaria	I (1–2)
Saxifraga hypnoides	I (1–3)
Racomitrium aquaticum	I (1–2)
Cladonia bellidiflora	I (1–3)
Lophozia sudetica	I (1–4)
Andreaea alpina	I (1)
Polytrichum piliferum	I (1–3)
Blechnum spicant	I (1–3)
Number of samples	27
Number of species/sample	30 (15–52)
Vegetation height (cm)	5 (1–10)
Vegetation cover (%)	92 (50–100)
Altitude (m)	888 (640–1116)
Slope (°)	16 (3–60)

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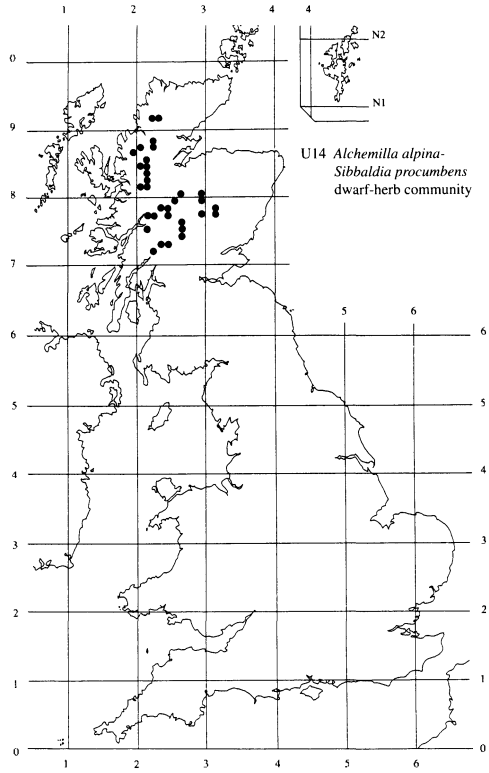

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