M12
Carex saxatilis mire
Caricetum saxatilis McVean & Ratcliffe 1962

Synonymy
Carex saxatilis sociation Poore 1955*b*; *Carex saxatilis* mire McVean & Ratcliffe 1962: *Calliergono sarmentosi-Caricetum saxatilis* Dierssen 1982.

Constant species
Carex demissa, *C. saxatilis*, *Eriophorum angustifolium*, *Polygonum viviparum*, *Thalictrum alpinum*, *Aneura pinguis*, *Drepanocladus revolvens*, *Hylocomium splendens*, *Scapania undulata*.

Rare species
Alchemilla filicaulis ssp. *filicaulis*, *Carex atrofusca*, *C. microglochin*, *C. saxatilis*, *C. vaginata*, *Juncus biglumis*, *J. castaneus*, *Kobresia simpliciuscula*.

Physiognomy
Carex saxatilis occurs at low frequency in a variety of wetter vegetation types at high altitudes but here it is typically dominant in a kind of montane mire which has a distinctive assemblage of associates. The sward is generally low, less than 20 cm tall, and often rather open with patchy exposures of soil. Sedges as a group figure quite prominently: apart from *C. saxatilis*, *C. demissa*, *C. echinata* and *C. nigra* are very frequent and each can be abundant and *C. dioica* and *C. pulicaris* also occur occasionally. Such species provide considerable continuity with other more calcicolous mires like the *Pinguiculo-Caricetum* and lower-altitude stands of the *Carici-Saxifragetum* but, in contrast to those communities, *C. panicea* is very scarce here and *C. bigelowii* is fairly consistent, particularly in grassier transitions to the surrounding swards. As in high-altitude stands of the *Carici-Saxifragetum*, open stony patches in the vegetation provide a niche for the very rare Arctic-Alpine sedges, *C. atrofusca* and *C. microglochin*. *C. vaginata* has also been recorded in this community.

Apart from *Eriophorum angustifolium*, a frequent species here which can attain covers of over 10%, almost all the other herbs occur as sparse, scattered individuals. *Selaginella selaginoides* and *Pinguicula vulgaris*, both of which are very common, emphasise general similarities with our other calcicolous flushes, but more characteristic are the Arctic-Alpines *Thalictrum alpinum*, *Polygonum viviparum* and *Juncus triglumis*. All these can occur in more montane stands of the *Carici-Saxifragetum*, together with *Saxifraga oppositifolia* and *S. stellaris*, which are scarce to occasional here, but *S. aizoides* itself is not frequent in the *Caricetum saxatilis* and, when it does occur, it is typically of low cover. Also rather distinctive is the presence of certain poor-fen herbs like *Viola palustris*, *Caltha palustris* and *Agrostis canina* ssp. *canina*. Other vascular species recorded occasionally include *Leontodon autumnalis*, *Euphrasia officinalis* agg. (including *E. scottica*), *Geum rivale*, *Huperzia selago*, *Ranunculus acris*, *Rumex acetosa*, *Alchemilla glabra* and the rare *A. filicaulis* ssp. *filicaulis*. Then, in some stands, particularly on steeper slopes, the sward can have a distinctly grassy look, with more frequent records and slightly higher covers for *Deschampsia cespitosa*, *Nardus stricta*, *Festuca rubra* and *F. vivipara*. Finally, the very rare *Juncus castaneus* and *J. biglumis* can be found in more open areas in this community.

Bryophytes compose an important element of the vegetation though, apart from *Drepanocladus revolvens*, the cover of individual species is usually low. This moss, together with frequent *Aneura pinguis* and occasional *Bryum pseudotriquetrum*, *Blindia acuta* and *Campylium stellatum*, provides a further floristic link with the *Carici-Saxifragetum* and *Pinguiculo-Caricetum* and, as there, spring and rill bryophytes such as *Cratoneuron commutatum* and *Philonotis fontana* can sometimes be found. *Calliergon trifarium*, a montane moss which otherwise occurs mainly in the *Carici-Saxifragetum*, is also occasional here. More peculiar is the high frequency of *Hylocomium splendens*, typically only as scattered single shoots but nonetheless a rather unexpected moss to find in this kind of vegetation, and of *Scapania undulata*: other *Scapania* spp., like *S. uliginosa* and *S. irrigua*, are also sometimes present. Then, there is occa-

sionally some *Rhytidiadelphus loreus*, *R. squarrosus*, *Racomitrium lanuginosum*, *Dicranum scoparium*, *Polytrichum alpinum* and poor-fen bryophytes such as *Polytrichum commune*, *Calliergon sarmentosum*, *C. stramineum* and *Drepanocladus exannulatus*. There can also be some small patches of Sphagna including *S. auriculatum*, *S. capillifolium*, *S. recurvum*, *S. subnitens*, *S. girgensohnii* and *S. warnstorfii*. The total cover of these species is never high but their presence, together with certain of the herbs, can make some stands look transitional to Caricion nigrae mires. Other bryophytes of restricted range recorded here are *Tayloria lingulata*, *Cinclidium stygium*, *Barbilophozia lycopodioides* and *Tritomaria polita*.

Habitat

The *Caricetum saxatilis* is strictly confined to the margins of high-montane flushes irrigated with base-rich and calcareous waters and perhaps influenced by long snow-lie.

C. saxatilis is an Arctic-Subarctic species whose British range falls almost entirely within the 21 °C mean annual maximum isotherm (Conolly & Dahl 1970), an area which takes in the higher peaks, generally over 750 m, in the southern and central Scottish Highlands, with more far-flung localities further to the north-west, and which also includes most of the British stations for the Arctic-Alpine *Thalictrum alpinum* and *Juncus triglumis* and, less exclusively, for *Polygonum viviparum*, all frequent here. Each of these species occurs in a variety of vegetation types in this region of inhospitable climate and they can sometimes be found together in other communities of springs and dripping banks, but only in the *Caricetum saxatilis* do they coincide consistently with the dominance of *C. saxatilis* and the other frequent species of this mire.

The distribution of the community is considerably less extensive than that of these Arctic-Alpine components, being further confined by the often local occurrence of flushes in more calcareous substrates in the high-montane region. *C. saxatilis* is, in fact, tolerant of a wide range of base-status in wetter soils (McVean & Ratcliffe 1962, Jermy *et al.* 1982) but the *Caricetum saxatilis* is strongly centred on the more lime-rich Dalradian meta-sediments, especially the calcareous mica-schists of Breadalbane, with its north-western stations on calcareous rocks of the Moine or Lewisian series. Even then, some sites where the community might be expected, like Caenlochan, have the sedge but not this kind of mire (McVean & Ratcliffe 1962, Huntley 1979).

Yet, though this is the most calcicolous of the montane mires, more so than the *Carex-Sphagnum warnstorfii* mire which sometimes penetrates to these altitudes, and much more so than the *Carex-Sphagnum russowii* mire, which has a very similar altitudinal range, some of its most frequent species are not calcicoles. *Thalictrum alpinum*, *Juncus triglumis* and *Selaginella selaginoides*, together with *Aneura pinguis*, *Drepanocladus revolvens* and the rare preferential *Calliergon trifarium*, are broadly calcicolous, but *Polygonum viviparum* not so obviously so above 800 m and exacting Arctic-Alpine calcicoles are much more characteristic of vegetation like the *Festuca-Alchemilla-Silene* and *Dryas-Silene* communities and the *Salix-Luzula* scrub. The soils here, though continuously irrigated, are not of especially high pH, ranging from 4.6 to 6.3 (Poore 1955*b*, McVean & Ratcliffe 1962). Direct snow-melt, rather than lateral flushing, may also provide much of the soil moisture: most of the stands encountered face north or east and Poore (1955*b*) noted that snow lay over the vegetation long into the spring. A chionophilous element is not prominent in the community but snow-melt may have an effect by diluting base-enrichment or even induce sufficient surface-leaching to allow the good representation of non-calcicolous species. With the combination of flushing, snow-melt, cryoturbation and solifluctional flow, even over gentler slopes, the profiles are typically unstructured, raw gleys, silty in texture or, where there is more organic matter, humic. Continual instability is important in maintaining open, stony areas where the rare Arctic-Alpine sedges and rushes find a niche.

Zonation and succession

The *Caricetum saxatilis* typically occurs as small stands bordering rills or more strongly-irrrigated soligenous mires. It is possible that grazing prevents colonisation by Arctic-Alpine willows, though in the extreme environment characteristic here, the community is probably a climatic climax.

Towards the lower end of its altitudinal range, the *Caricetum saxatilis* overlaps considerably with the *Carici-Saxifragetum* and it can often be found as a fringing zone to this mire, giving way around to the *Festuca-Alchemilla-Silene* dwarf-herb community or, at its lowest stations, to the *Festuca-Agrostis-Alchemilla* or *Festuca-Agrostis-Thymus* grasslands. *Dryas-Silene* vegetation can also figure among these zonations on rocky banks and, on dripping crags close to the source of irrigation, the *Saxifraga-Alchemilla* community. Such sequences are very characteristic of the Breadalbane area and more isolated localities in the north-west Highlands.

At the very highest altitudes, the *Carici-Saxifragetum* may be absent from the flushes, when the *Caricetum saxatilis* gives way directly to the spring or rill vegetation, usually some kind of *Cratoneuron-Festuca* or *Cratoneuron-Carex nigra* flush. It can also occur in close association with some of the more calcicolous snow-bed communities.

As with the other kinds of calcicolous flushes, the

Caricetum saxatilis can sometimes be found within a markedly less calcicolous context, marking out very local areas of base-enrichment. Then, it can occur with the *Carex-Sphagnum russowii* mire, in water-tracks more remote from the source of flushing, and give way laterally to montane Nardo-Galion grasslands with *Nardus stricta*, *Juncus squarrosus* and *Deschampsia cespitosa*.

Distribution

The community is of fairly widespread, though distinctly local, occurrence through the southern and central Scottish Highlands, with scattered localities in north-west Scotland.

Affinities

No new samples have been added to those published by Poore (1955*b*), McVean & Ratcliffe (1962) and Birse (1980) and the definition of the community largely confirms McVean & Ratcliffe's (1962) diagnosis. The community in part replaces the *Pinguiculo-Caricetum* in mildly calcareous flush sequences at high altitudes though it shows some affinities with Caricion nigrae poor fens and is placed in that alliance by some authors (Dierssen 1982). With its striking Arctic-Alpine element, it is also close to the Caricion bicolori-atrofuscae mires described from Scandinavia, like the *Carex saxatilis-Drepanocladus intermedius* sosiadjon of Nordhagen (1943). There, however, *Carex vaginata* and/or *C. atrofusca* and *Juncus biglumis* and/or *J. castaneus* become very frequent and Arctic-Alpine willows occur commonly. On balance, it may be best to consider the *Caricetum saxatilis* as one of the most montane of our Caricion davallianae communities.

Floristic table M12

Carex saxatilis	V (5–9)
Drepanocladus revolvens	IV (2–6)
Hylocomium splendens	IV (1–3)
Thalictrum alpinum	IV (1–4)
Polygonum viviparum	IV (1–3)
Scapania undulata	IV (1–4)
Aneura pinguis	IV (1–3)
Eriophorum angustifolium	IV (3–5)
Carex demissa	IV (1–4)
Selaginella selaginoides	III (1–3)
Carex echinata	III (1–6)
Juncus triglumis	III (2–3)
Festuca ovina	III (1–3)
Caltha palustris	III (1–4)
Viola palustris	III (1–2)
Nardus stricta	III (2–4)
Carex bigelowii	III (1–5)
Agrostis canina canina	III (1–4)
Pinguicula vulgaris	III (1–3)
Carex nigra	III (1–5)
Deschampsia cespitosa	III (3–5)
Rhytidiadelphus loreus	II (1–2)
Festuca rubra	II (1–4)
Blindia acuta	II (1–3)
Bryum pseudotriquetrum	II (1–5)
Calliergon sarmentosum	II (1–7)
Polytrichum commune	II (1–3)
Saxifraga aizoides	II (2–3)
Calliergon trifarium	II (2–5)
Agrostis capillaris	II (2–3)
Saxifraga stellaris	II (2)
Carex dioica	II (1–4)
Philonotis fontana	II (1–2)
Dicranum scoparium	II (1)
Festuca vivipara	II (1–3)
Racomitrium lanuginosum	II (1–3)
Leontodon autumnalis	II (1–3)
Euphrasia officinalis agg.	II (1–3)
Polytrichum alpinum	II (1–2)
Taraxacum officinale agg.	II (1–2)
Huperzia selago	II (1–2)
Cratoneuron commutatum	II (3–6)
Campylium stellatum	II (1–3)
Juncus castaneus	II (1–3)
Carex pulicaris	II (2–3)
Geum rivale	I (1–2)
Alchemilla filicaulis filicaulis	I (1–2)
Ranunculus acris	I (1–3)
Rhytidiadelphus squarrosus	I (1–2)
Rumex acetosa	I (1–3)
Fissidens osmundoides	I (1–3)
Equisetum palustre	I (3)
Scorpidium scorpioides	I (1–3)
Saxifraga oppositifolia	I (1–2)
Scapania uliginosa	I (1–2)
Drepanocladus exannulatus	I (2–3)
Alchemilla glabra	I (1–2)
Rhizomnium pseudopunctatum	I (1)
Sphagnum auriculatum	I (2–6)
Rhytidiadelphus triquetrus	I (1)
Cinclidium stygium	I (1)
Riccardia multifida	I (1)

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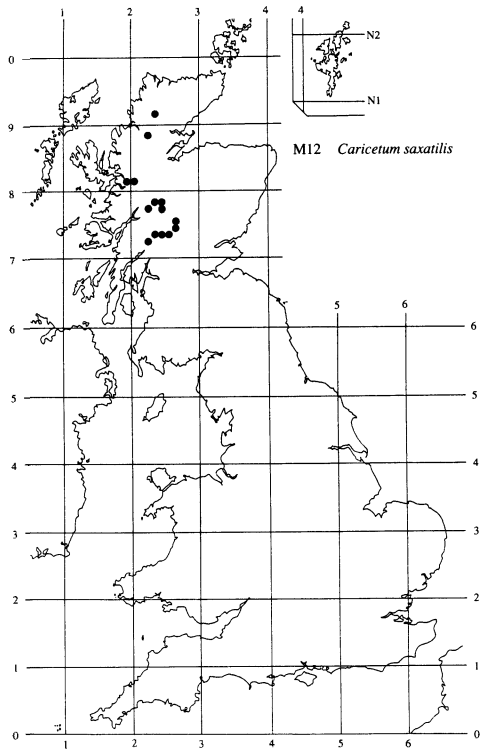
Salix herbacea	I (1)
Calliergon stramineum	I (1)
Armeria maritima	I (2)
Marsupella emarginata emarginata	I (1–6)
Epilobium anagallidifolium	I (1–2)
Luzula multiflora	I (1)
Sphagnum capillifolium	I (1)
Sphagnum girgensohnii	I (1–4)
Cerastium fontanum	I (1)
Sphagnum recurvum	I (1–2)
Carex vaginata	I (3)
Narthecium ossifragum	I (2)
Potentilla erecta	I (1–2)
Anthelia julacea	I (2)
Juncus articulatus	I (1)
Alchemilla alpina	I (1)
Luzulu spicata	I (3)
Tofieldia pusilla	I (1)
Carex atrofusca	I (1–2)
Pellia endiviifolia	I (2)
Carex panicea	I (1–2)
Cladonia arbuscula	I (1–2)
Sphagnum subnitens	I (1–2)
Sphagnum warnstorfii	I (1–4)
Mnium hornum	I (3)
Alopecurus alpinus	I (1)
Fissidens adianthoides	I (1)
Jungermannia obovata	I (1–2)
Scapania irrigua	I (2)
Barbilophozia lycopodioides	I (2)
Carex curta	I (2)

Number of samples	24
Number of species/sample	26 (9–42)
Vegetation height (cm)	16 (10–20)
Vegetation cover (%)	81 (20–100)
Altitude (m)	966 (716–1052)
Slope (°)	12 (1–38)



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