M2
Sphagnum cuspidatum/recurvum bog pool community

Synonymy
Sphagnetum pools Rankin 1911*a*; *Sphagnetum* regeneration complex, Stages 1 & 2 Tansley 1939; *Sphagnum* lawn Poore & Walker 1958, Sinker 1962, Green & Pearson 1968; *Sphagnum cuspidatum-Eriophorum angustifolium*, *Sphagnum recurvum-Vaccinium oxycoccos* & *Sphagnum recurvum-Erica tetralix* Noda, Normal Series Tallis 1973; *Sphagnum flexuosum* noda 16-19 Daniels 1978; *Sphagnum cuspidatum* pool community Bignal & Curtis 1981 *p.p.*; *Sphagno tenelli-Rhynchosporetum albae* Dierssen 1982.

Constant species
Erica tetralix, *Eriophorum angustifolium*, *Drosera rotundifolia*, *Sphagnum cuspidatum/recurvum*.

Rare species
Andromeda polifolia, *Carex magellanica*, *Sphagnum pulchrum*.

Physiognomy
The *Sphagnum cuspidatum/recurvum* community is typically dominated by extensive soft wet carpets of *Sphagnum cuspidatum* and/or *S. recurvum* with, very locally, *S. pulchrum* (e.g. Sinker 1962, Ratcliffe 1977). In marked contrast to the bog pools of more oceanic parts of Britain, *S. auriculatum* is rare here. There is occasionally a little *S. tenellum*, *S. magellanicum* or *S. papillosum* and, where the community forms the pool and wet hollow component of patterned mire surfaces, these species generally represent a clear transition to the drier surrounds. Quite often, however, this kind of vegetation occurs as more extensive lawns where the differentiation of these structural elements is ill-defined. Other bryophytes are scarce but there can be occasional patches of *Polytrichum commune* or *Aulacomnium palustre* or scattered shoots of leafy hepatics like *Gymnocolea inflata*, *Odontoschisma sphagni* or *Mylia anomola* in the *Sphagnum* carpet.

Vascular plants typically occur as scattered individuals of low total cover but *Eriophorum angustifolium* and *Erica tetralix* are both constant throughout, the former often extending into deeper pools, the latter more confined to drier areas. *Drosera rotundifolia* is very frequent and *Narthecium ossifragum* occurs occasionally. As in the *Sphagnum auriculatum* bog pools, *Rhynchospora alba* can be quite abundant around pool margins but it is very much more common in one particular sub-community here. A little more evenly distributed and especially distinctive of this kind of Rhynchosporion vegetation is the Continental Northern *Andromeda polifolia*, the national distribution of which largely coincides with the range of this community and the type of Erico-Sphagnion mire within which it forms the wetter element.

There can also be some sedges but, though these may have some measure of local abundance, they do not occur as consistent physiognomic dominants. *Carex limosa* is sometimes found and it also seems best to include here bog pool vegetation where *C. curta* and/or *C. magellanica* occur in species-poor carpets of *Sphagnum cuspidatum* and *S. recurvum*. *C. rostrata* is very occasional and some stands may be transitional to the *Carex rostrata-Sphagnum* community where this sedge is dominant in a poor-fen assemblage in which *Polytrichum commune*, *Agrostis canina* ssp. *canina* and *Carex nigra* are characteristic associates. Some of the now extinct English stations of *Scheuchzeria palustris* seem to have been in stands of the *Sphagnum cuspidatum/recurvum* community (Sledge 1949, Sinker 1962, Green & Pearson 1977).

Sub-communities

***Rhynchospora alba* sub-community:** *Sphagnetum* pools Rankin 1911*a*; *Sphagnetum* regeneration complex, Stages 1 & 2 Tansley 1939; *Sphagnum cuspidatum* pool community Bignal & Curtis 1981 *p.p. Sphagnum cuspidatum* is the typical dominant in the carpet here or, very locally, *S. pulchrum*, with no *S. recurvum*. Among the

vascular plants, *Rhynchospora alba* and *Andromeda* join *Eriophorum angustifolium* and *Erica tetralix* as constants on the pool surrounds and, with frequent *Drosera rotundifolia*, there can be occasional *D. anglica* or *D. intermedia*. *Myrica gale* occurs in some stands.

***Sphagnum recurvum* sub-community:** *Sphagnum* lawn Poore & Walker 1958, Sinker 1962, Green & Pearson 1968; *Sphagnum cuspidatum-Eriophorum angustifolium*, *Sphagnum recurvum-Vaccinium oxycoccos* & *Sphagnum recurvum-Erica tetralix* Noda, Normal Series Tallis 1973; *Sphagnum flexuosum* noda 16–19 Daniels 1978. *Sphagnum recurvum* is a constant companion here to *S. cuspidatum* and is often the more abundant of the two species. *Rhynchospora alba* is typically absent and *Andromeda* is much reduced but *Eriophorum angustifolium*, *Erica tetralix* and *Drosera rotundifolia* maintain their high frequency and *Vaccinium oxycoccos* appears as a good preferential. In some cases, these species form the bulk of the cover in quite well-defined bog pools but elsewhere this sub-community occurs as extensive lawns with a somewhat enriched flora. Then, *S. recurvum* can be an overwhelming dominant in the carpet with *S. cuspidatum* largely confined to very wet depressions and *S. papillosum* marking out low hummocks. *Polytrichum commune* and *Aulacomnium palustre* can occur sporadically in the slightly drier areas, together with some *Eriophorum vaginatum* and *Calluna vulgaris*. *Molinia caerulea* may be locally prominent. This kind of patterning is well seen in the *Sphagnum* lawns described by Green & Pearson (1968) and among the wetter noda in Tallis's (1973*a*) Normal Series from Cheshire basin mires.

Habitat

The *Sphagnum cuspidatum/recurvum* community is typically found in pools and lawns on very wet and base-poor, though not always highly oligotrophic, raw peats on ombrogenous and topogenous mires in the less oceanic parts of Britain. It has been much reduced by the widespread drainage and cutting of such mires but it can readily colonise shallow flooded workings and seems to have expanded its coverage in sites where there has been some enrichment of the waters.

This kind of Rhynchosporion vegetation is characteristic of areas where the annual precipitation is generally between 800 and 1200 mm (*Climatological Atlas* 1952) with around 140–180 wet days yr^{-1} (Ratcliffe 1968). Its range coincides closely with that of the *Erica-Sphagnum* mire and it typically forms the pool and wet hollow and lawn element in that community on lowland raised bogs, on locally raised areas within low-altitude blanket mires and in base-poor basin mires, replacing the *Sphagnum auriculatum* pools of the *Scirpus-Eriophorum* mire in moving away from the very wet far west of Britain. The less oceanic pair of communities is well represented on raised mires in mature river valleys running into Cardigan Bay and along the Welsh borders, in the Solway estuaries and through Dumfries & Galloway and Strathclyde, where there are widespread transitions to low-altitude blanket mire (Ratcliffe 1977, Bignal & Curtis 1981). Locally raised areas of *Erica-Sphagnum* bog with *Sphagnum cuspidatum/recurvum* pools also characterise the Border Mires in Northumberland. Fragments of raised mire also persist in the Shropshire–Cheshire Plain but, in this area, the communities are best seen in numerous small basin mires some of which have a *schwingmoor* structure (e.g. Lind 1949, Poore & Walker 1959, Sinker 1962, Green & Pearson 1968, 1977, Tallis 1973*a*). The *Sphagnum cuspidatum/recurvum* community can also be found marking out soligenous areas within the *Narthecio-Sphagnetum* mire of valley bogs, as at Dersingham Bog in Norfolk.

The floristic differences between the two kinds of Rhynchosporion pool are not very great. Some important species, like *Sphagnum cuspidatum*, *Eriophorum angustifolium*, *Rhynchospora alba* and *Drosera rotundifolia* are well represented in both, and other less common species, like *Carex limosa* and the rarer sundews, may owe their preferential survival in one or the other community to accidents of local destruction of the habitat with drainage and reclamation. But the great scarcity here of *Sphagnum auriculatum* and the occurrence of *Andromeda* through most of the range of the *Sphagnum cuspidatum/recurvum* community seem to provide real distinctions. With the somewhat lower rainfall here, there may be a greater tendency for the *Sphagnum* carpet to dry out in late summer, and the pH range of the substrates is a little more towards the acid end, at pH3–4, than in the *Sphagnum auriculatum* pools, but whether such differences are critical is uncertain.

On active, patterned surfaces of more undisturbed raised and basin mires, the community is typically represented by the *Rhynchospora* sub-community. As in blanket mire systems, the sharpness of such patterning is very varied. Some mires, like Cors Goch Glan Teifi (Tregaron Bog) in Dyfed, have pronounced hummock/hollow systems with the *Rhynchospora* sub-community occupying clearly-defined shallow pools and the margins of deeper ones (Godwin & Conway 1939, Tansley 1939); in other sites, as at Cors Fochno (Borth Bog), also in Dyfed, and at Glasson Moss, on the Solway (Ratcliffe 1977), the undulations are of lower amplitude and stands less well delineated. These pool and hollow systems have not been subject to the kind of developmental studies pursued in mires with the *Sphagnum auriculatum* community but they often show similar patterning and could presumably arise in the same way.

The *Sphagnum recurvum* sub-community can occur in similar situations to the *Rhynchospora* sub-community

but it is more localised in its distribution and seems to be consistently associated with some measure of enrichment of the mire waters. It can thus pick out bog pools in which there is some natural soligenous influence and can be found in seepage areas in the laggs of raised mires and in some lowland valley bogs. But it is especially characteristic of and locally extensive in the numerous small basin mires of the Shropshire–Cheshire Plain (Lind 1949, Poore & Walker 1959, Sinker 1962, Green & Pearson 1968, Tallis 1973*a*) where it seems to have spread secondarily over solid and *schwingmoor* peats as a result of eutrophication of the waters (Sinker 1962, Green & Pearson 1968, 1977, Tallis 1973*a*). An abundance of *S. recurvum* in these mires (and possibly the reduction in *R. alba*) has been clearly correlated with raised total cation content, especially of potassium, and it is possible that this enrichment originates from fertiliser run-off or drift from the agricultural land which closely hems in these sites (Tallis 1973*a*, Green & Pearson 1977). Such lawns often have a fairly even or only gently-undulating surface, but in some sites seem to have extended from existing well-defined hollows or to have subsequently developed hummocks (Tallis 1973*a*).

Throughout its range, the extent of the mire vegetation in which this community occurs has been greatly reduced by reclamation or deep peat extraction, such that small and much-modified fragments often now remain within predominantly agricultural landscapes (Sinker 1962, Tallis 1973*a*, Ratcliffe 1977, Bignal & Curtis 1981). Frequently, and particularly in small and isolated sites, the *Sphagnum cuspidatum/recurvum* community persists in impoverished form. However, this kind of vegetation seems readily able to colonise shallow peat cuttings and, in some places, as on Whixall and Wem Moss in Shropshire, such situations provide the bulk of the wetter element of the mire surface (Sinker 1962, Ratcliffe 1977).

Zonation and succession

The *Sphagnum cuspidatum/recurvum* community is typically found as the pool, wet hollow or lawn component in the *Erica-Sphagnum* mire, grading to drier flat and hummock vegetation with increasing height above the water-table. There is some evidence that such patterns may represent cyclical regeneration complexes but such succession may be extremely slow and, on drained mires, the community may remain as a fragment of the previously active surface or in artificial pools among run-down wet heath and woodland.

A typical zonation on an active raised mire runs from the *Rhynchospora* sub-community through the *Sphagnum-Andromeda* sub-community of the *Erica-Sphagnum* mire on the flats to the *Empetrum-Cladonia* sub-community on the hummock sides and tops. In the *Sphagnum* carpet, there is a switch from *S. cuspidatum* to *S. papillosum*, *S. tenellum* and *S. magellanicum* and thence to *S. capillifolium*. Among the vascular plants, *Rhynchospora* continues only a little way on to the flats, forming a fringe to the pools, but *Drosera rotundifolia* and, especially noticeable on these mires, *Andromeda* maintain their frequency in the transition to the *Sphagnum-Andromeda* sub-community of the mire. *Eriophorum angustifolium* and *Erica tetralix* also remain very common and are joined by *Eriophorum vaginatum*, *Calluna* and *Scirpus cespitosus* and these five species contribute the bulk of the vascular cover on the flats and hummocks. The clarity of the sequence and the relative contributions of the different elements vary considerably according to the degree of structural patterning on the mire surface but the general transition is well seen in the series of noda characterised by Bignal & Curtis (1981) from Strathclyde mires and illustrated diagrammatically in Godwin & Conway's (1939) classic study of Cors Goch Glan Teifi.

Essentially similar sequences can be found where the community occurs within the *Erica-Sphagnum* mire on solid and *Schwingmoor* peats in basins, notably in the Shropshire–Cheshire Plain, though here it is now most often represented by the *Sphagnum recurvum* sub-community which tends to be the dominant element in extensive lawns with rather poor internal structural differentiation. A range of zonations with different degrees of clarity is well described in Tallis's (1973*a*) survey of these sites and the general predominance of *S. recurvum* throughout such sequences is clearly seen in published profiles of Clarepool Moss (Sinker 1962) and Wybunbury Moss (Green & Pearson 1968).

At least some of the hummock/hollow complexes in which this community is found, on active mire surfaces developed under undisturbed conditions, may represent regeneration complexes of the kind described by Osvald (1923; see also Godwin & Conway 1939, Tansley 1939), though stratigraphical evidence suggests that the cyclical pattern of replacement is probably very slow, proceeding over centuries. In such situations, the *Rhynchospora* sub-community is probably the more natural kind of *Sphagnum cuspidatum/recurvum* bog pool with the *Sphagnum recurvum* sub-community playing a minor role and particularly associated with areas of soligenous influence. With increased disturbance and modest eutrophication of mire surfaces, however, the latter sub-community has become more frequent, not only in scattered flooded peat workings, but also more extensively where mires have been subject to increased input of enriched waters from surrounding land. In the basin mires of Shropshire and Cheshire, this seems to have been a fairly recent process attendant upon agricultural improvement of the surrounding land and, in some cases, the decay of old drainage systems on the mires (Sinker 1962, Green & Pearson 1968, 1977, Tallis

1973*a*). At some sites, renewed growth of the *Sphagnum* carpet under such conditions has caused a reversion from the heath and woodland of the once-drained surfaces.

Where drainage has proceeded without this kind of interruption, the *Sphagnum cuspidatum/recurvum* bog pools have been progressively reduced with conversion of the mire surface to Ericion tetralicis wet heath. Fragments may remain within tracts of the *Scirpus-Erica* or *Ericetum tetralicis* wet heaths, generally dominated by mixtures of *Molinia*, *Scirpus* or ericoids (e.g. Sinker 1962, Tallis 1973*a*) or among developing woodland, usually birch- or pine-dominated stands of the *Betula-Molinia* woodland, on the drying peats (e.g. Sinker 1962, Green & Pearson 1968, Ratcliffe 1977).

Distribution

The *Sphagnum cuspidatum/recurvum* bog pools occur within the *Erica-Sphagnum* mire and its degraded derivatives throughout its range from Wales, up through the Borders and south-west Scotland with some far-flung localities in north-east Scotland. The *Rhynchospora* sub-community is more widely distributed on active, undisturbed raised mires, the *Sphagnum recurvum* sub-community more restricted to soligenous areas occurring also with local abundance, in disturbed basin mires.

Affinities

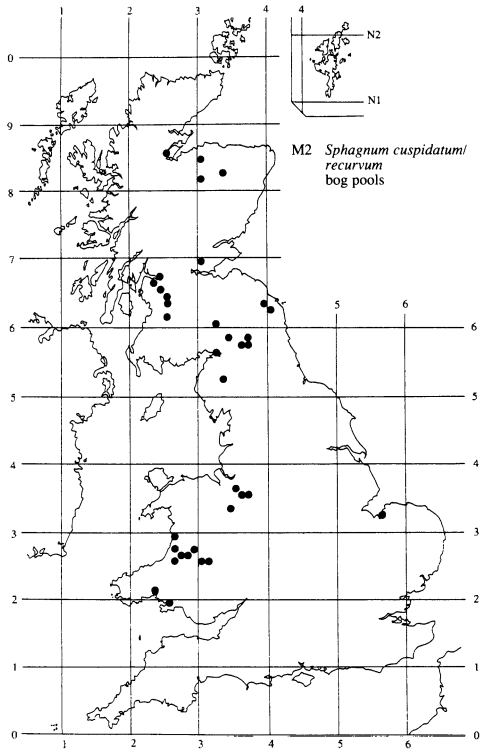
As with the *Sphagnum auriculatum* community, this kind of vegetation has sometimes been included as the pool component within more broadly-defined Erico-Sphagnion mires (e.g. Rankin 1911*a*, Tansley 1939, Godwin & Conway 1939) and to have attracted attention as a distinct unit mainly in the '*Sphagnum* lawns' of the *Sphagnum recurvum* sub-community (Poore & Walker 1959, Sinker 1962, Green & Pearson 1968). Its affinities with the Rhynchosporion are very clear and essentially the same vegetation occurs throughout northern Europe, from Norway down through Germany and The Netherlands into northern France (Westhoff & den Held 1969, Dierssen 1982). The *Drosera anglica-Rhynchospora fusca* Gesellschaft recorded from Ireland by Braun-Blanquet & Tüxen (1952) appears to be at most a local variant of this kind of vegetation.

Floristic table M2

	a	b	2
Eriophorum angustifolium	V (3–9)	V (1–9)	V (1–9)
Sphagnum cuspidatum	V (3–10)	III (2–7)	III (2–10)
Erica tetralix	IV (3–4)	III (1–6)	IV (1–6)
Drosera rotundifolia	III (1–3)	III (2–3)	III (1–3)
Rhynchospora alba	V (1–8)		II (1–8)
Andromeda polifolia	IV (1–4)	II (1–2)	II (1–4)
Drosera anglica	II (2–4)		I (2–4)
Sphagnum pulchrum	II (1–10)		I (1–10)
Myrica gale	II (1–7)		I (1–7)
Menyanthes trifoliata	I (3)		I (3)
Drosera intermedia	I (2)		I (2)
Sphagnum magellanicum	I (3)		I (3)
Cephalozia lunulifolia	I (2)		I (2)
Cephalozia connivens	I (1)		I (1)
Cladonia impexa	I (2)		I (2)
Cladonia uncialis	I (1)		I (1)
Sphagnum recurvum		V (2–10)	III (2–10)
Vaccinium oxycoccos		V (1–5)	III (1–5)
Calluna vulgaris	I (1–2)	III (1–6)	III (1–6)
Eriophorum vaginatum	I (1–4)	III (4–5)	III (1–5)
Sphagnum papillosum	I (3–7)	III (1–10)	II (1–10)
Polytrichum commune		II (3–4)	I (3–4)
Aulacomnium palustre		II (1–3)	I (1–3)
Empetrum nigrum nigrum		I (5)	I (5)

Agrostis canina canina		I (3)	I (3)
Carex magellanica		I (2–5)	I (2–5)
Carex rostrata		I (2–8)	I (2–8)
Carex curta		I (3)	I (3)
Polytrichum alpestre		I (1)	I (1)
Deschampsia flexuosa		I (1)	I (1)
Molinia caerulea		I (3–5)	I (3–5)
Sphagnum palustre		I (2)	I (2)
Sphagnum tenellum	II (2–4)	I (1)	I (1–4)
Gymnocolea inflata	II (4–6)	I (2)	I (2–6)
Odontoschisma sphagni	I (1–5)	II (1–2)	I (1–5)
Mylia anomola	I (1–4)	II (1–3)	I (1–3)
Narthecium ossifragum	I (3–4)	I (1–4)	I (1–4)
Number of samples	11	21	32
Number of species/sample	8 (3–15)	8 (4–12)	8 (3–15)
Herb height (cm)	20 (10–25)	24 (12–60)	22 (10–60)
Herb cover (%)	52 (4–100)	45 (4–95)	50 (4–100)
Bryophyte cover (%)	89 (35–100)	94 (70–100)	91 (35–100)
Altitude (m)	70 (10–430)	77 (45–440)	74 (10–440)
Soil pH	3.6 (3.3–4.4)	3.3 (3.1–3.7)	3.5 (3.1–4.4)

a *Rhynchospora alba* sub-community
b *Sphagnum recurvum* sub-community
2 *Sphagnum cuspidatum/recurvum* bog pools (total)



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