The Flow Country

The peatlands of Caithness and Sutherland

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9 Mire features of note in Caithness and Sutherland

One of the striking features about the peatlands of Caithness and Sutherland is the contrast between the apparent uniformity of the terrain when seen from a distance, particularly from a car or train window, and the bewildering maze of patterns, pool types and other surface features which it is possible to encounter when walking across such terrain. Even then, it is quite possible to walk within a few metres of a huge, complex pool system and not realise this, because the low-lying nature of such patterns, the very flat nature of most bog expanses and the consequent lack of high vantage points make it almost impossible to obtain an extensive view of the bog surface and its patterns from ground level. It is ironic that a habitat which is characterised by wide vistas and unobstructed views should itself be so difficult to see. Despite these problems, or perhaps because of them, two particular structural features which have so far received little attention in the published literature, and therefore deserve special mention, were identified during the course of the survey.

Ladder fens

The limited view of the overall arrangement of surface features on a bog can make it particularly difficult during field survey to obtain an accurate idea of the pattern type. It does not require a great deal of extra height to overcome this problem -20-30 m above the central part of the bog often suffices - but there are many practical difficulties in obtaining reasonably standardised views from the relatively low altitudes required to resolve the smaller elements of surface pattern. Without doubt the most effective means of recording this type of information is through the use of aerial photographs, but the most standardised, clearest and most comprehensive cover is that of the Ordnance Survey, which, unfortunately, is taken from too high an altitude for complete resolution of all important features. A more useful scale was adopted for the complete aerial photo-coverage of Britain carried out immediately post-war by the Royal Air Force, but the quality of image is sometimes poor.

Nevertheless, it was during the course of routine searches through the RAF photo-coverage that a particular arrangement of mire patterns was encountered in Sutherland which did not fit easily into any type previously described in the literature for Britain. The aerial photographs showed a system in which the ridges and pools were quite markedly straight and parallel, as opposed to showing the more typically arcuate trend of ombrotrophic linear patterning. In addition the areas always appeared to lie within a slight zone of seepage (see example in Figure 7).

In Caithness and Sutherland, the peatlands are predominantly of the blanket bog mesotope, but typically aggregated into large and often complex macrotopes. In places there are numerous small areas of soligenous and valley mire, adjoining or mixed with the blanket bogs. During the vegetation survey in the field following the initial selection of sites from aerial photographs, a number of patterned surfaces were encountered which did not fall easily within the class of ombrotrophic mire, as they were dominated by *Molinia caerulea, Carex rostrata* and occasionally *Carex lasiocarpa.* The vegetation was typical of the soligenous areas which characterise the mire margins of ombrotrophic bogs, but the structure of the patterns was much more formal than that generally found in soligenous conditions. It was instead the strip-ridge pattern characteristic of ombrotrophic mires, with long, narrow ridges lying at right angles to the obvious direction of water seepage. Water clearly passed down through the system from one pool to the next, but the lack of a central watercourse meant that such movement must be either through or over the ridges.

Re-examination of the aerial photographs for these sites confirmed that the areas of unusual, parallel patterning noted during the initial aerial photographic search and these strongly patterned *Molinia-Carex* mires were in fact the same.

The similarity of these patterns and general hydromorphology to the *aapa* mires of Fennoscandia is quite striking. However, the overall vegetation and scale of patterning are somewhat different.

Stratigraphic work, by one of the present writers (D J Charman), to determine the origin and developmental history of these systems has only just begun, but examination of several such sites during the course of the Caithness and Sutherland survey has already revealed what may be different stages in the development of a ladder fen.

Ladder fen development

The range of soligenous sites examined which show various stages of linear ridge formation suggests that ladder fens may originate from single-channelled poor fens which lie between two lenses of peat or a lens of peat and an outcrop of mineral ground. As the peat builds up beneath the area of poor fen and the gradient thus becomes shallower, the watercourse becomes increasingly meandering, not unlike a mature lowland river. Eventually the peat builds up to a point where the gradient is sufficiently low, and the rate of water flow thus sufficiently reduced, to allow the peat ridges caused by the wide meanders to grow right across the watercourse. Thereafter,

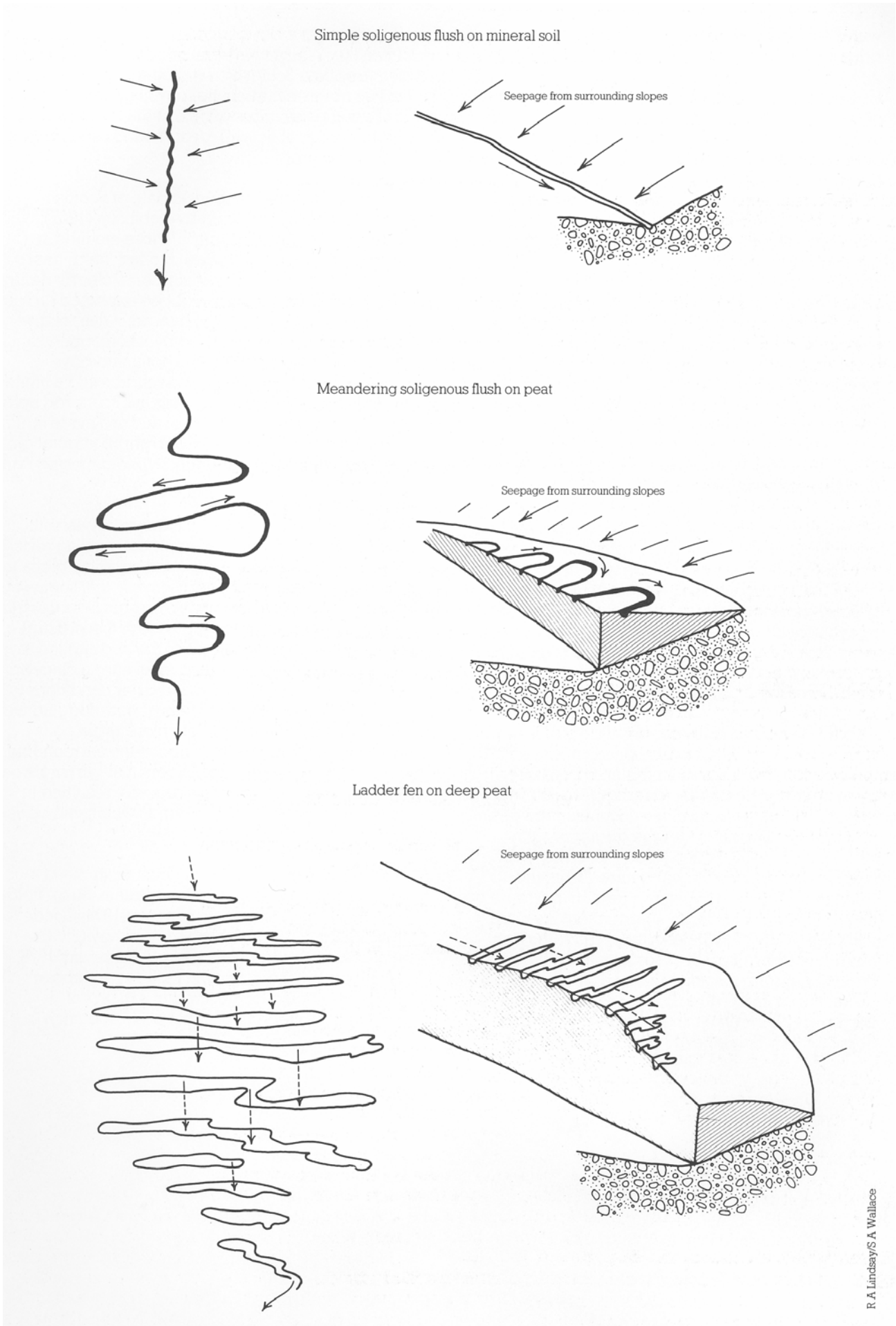


Figure 31 Suggested sequence of ladder fen development (see text)

water movement is by seepage over and through the ridges (see Figure 31).

However, this type of site is so little studied, and the observations above are so tentative, that an authoritative picture of the developmental history of ladder fens must await the detailed results of work at Southampton University.

In September 1986 the International Mire Conservation Group visited two ladder fens during the course of their Second Field Symposium. The Group considered that, though the type has affinities with the *aapa* mires of Fennoscandia and the ribbed fens of central Canada, it is more closely related to the oceanic ladder fens of eastern Canada (Dr Stephen Zoltai pers. comm,), whilst being a distinct type in its own right. IMCG members called for the few examples identified to be given the highest conservation status.

Caithness peat-mounds

Although the majority of structural features are so low-lying that they do not stand out from the overall expanse of the bog surface, one type of structure has given rise to occasional comment in the literature precisely because it is so strikingly obvious even from a considerable distance. It is probable that these structures have not attracted more attention before now because they are so easily mistaken for small outcrops of *Calluna* -covered mineral ground.

Goode & Lindsay (1979) describe the structure and vegetation of so-called peat-mounds from Lewis in the Outer Hebrides. Similar features have been recorded from Shetland (Spence 1974; Goode & Field 1973), but none of these accounts provides a satisfactory explanation for the origins of such structures. Zoltai & Pollett (1983) describe "peat-mounds", as opposed *to palsa* mires, from the Canadian Mid-Arctic Wetland Region, but these are, like them, associated with a permanent ice-core. Ruuhijärvi (1960, 1983) describes structures from Finnish northern boreal mires which are essentially large *Sphagnum fuscum* hummocks but which are distinct from *palsa* mires in lacking an ice core. Dierssen (1982) relates these to Icelandic *thufa* described by Schunke (1977) and gives an illustration of a Norwegian example (Dierssen 1982, Plate 80). Whilst these are clearly much smaller features than Scottish peat-mounds, which may rise to two or three metres, the physiognomic similarity between *palsa* mires (which attain the same or a higher order of height), peat-mounds and *thufa* is as yet unexplored.

The most detailed account to date of Scottish peat-mounds is provided by Robinson (1987), who describes the stratigraphy of three mounds in eastern Caithness. The peat mound "field" near Keiss, Caithness, does not support a clearly defined area of *dubh lochain* as might be expected on such a gently-contoured plateau. Instead, it has relatively deep peat which is covered by a homogeneous blanket bog vegetation type dominated by *Eriophorum vaginatum*, dwarf shrubs and a limited range of *Sphagna.* The mounds are scattered across this otherwise smooth plateau and are made striking by the luxuriance of their dwarf shrub vegetation, beneath which are generally hypnoid mosses rather than *Sphagna.*

Robinson (1987) explores a number of possible mechanisms for their development, but suggests that they may be a result of localised ponding, climatic change and fire. From his discovery that some of the mounds have a tightly matted layer of *Eriophorum* and *Sphagnum* towards the base of the structures, he proposes that certain areas of the bog surface were able to remain waterlogged even after a climatic shift around 5000 BP which led drier conditions to prevail. These localised areas of waterlogging were, he suggests, able to promote more rapid peat growth and therefore rose above the surrounding bog surface. Robinson considers that burning would then have accentuated this process, resulting in development of the high mounds which can be seen today.

The area around Keiss is the best example of a peat-mound "field" in mainland Britain. Such "fields" are also found in Shetland (Spence 1974; Goode & Field 1978; NCC unpublished), Orkney (NCC unpublished) and Lewis (Goode & Lindsay 1979; NCC unpublished), but the mounds at Keiss are unusual in being located within a matrix of remarkably vigorous blanket bog vegetation.

10 Analysis of vegetation communities

Although the survey was essentially concerned with ombrotrophic vegetation, a number of fen systems were sampled in the course of the work. In addition, the transitional types, such as ladder fens, were recorded in some detail. Thus a certain proportion of the overall data-set describes minerotrophic vegetation.

This report does not discuss the minerotrophic vegetation in any detail, because a more comprehensive review of Scottish fens is required before their status can be assessed. The provisional communities are presented here in tabular form for completeness, but, other than ladder fens, will not be further commented on.

The vegetation analysis derived a total of 33 ombrotrophic vegetation types, with two more for ladder fens, which together can be grouped into 13 broad categories. These can be grouped into five structural types, reflecting the small-scale structures of the mire surface discussed in Chapters 1 and 2.

Tables 3a and 3b are synoptic tables showing the communities identified from the analysis, based on the quadrat data for plant species collected during the survey. The communities are described according to species constancy rather than abundance as is usual in such phytosociological tables.

The five structural types are -

- thin peat communities;
- peat-mounds/high hummocks;
- *Sphagnum-rich* hummocks and ridges;
- runnels and damaged mire;
- hollows and pools.

Each vegetation type is compared below to plant communities described by Dierssen (1982) and by Proctor &Rodwell (1986).

1 Thin peat communities

Where mineral ground protrudes through areas of deeper peat, a number of characteristic communities can be found, including the rare *Arctous alpinus-Calluna vulgaris* dry heath. However, where ground is essentially still wet and forms an integral component of the blanket mire hydrological unit, a wet heath community characterised by *Juncus squarrosus* is common.

Vegetation group 1 - thin peat

Community 1 -*Juncus squarrosus* community

Ericetum tetralicis (see Dierssen 1982); M15/15d-*Sphagnum compactum* wet heath, *Juncus squarrosus-Dicranum scoparium* sub-community (Proctor & Rodwell 1986)

This community becomes more common towards the west of the Flow Country, where even slopes receive sufficient rainfall and run-off to form wet heath over thin peat. The community is also characteristic of peat-cuttings where the subsoil has almost been exposed, leaving just a thin peat covering. In time, under such conditions, the wet heath component could be expected to succumb to *Sphagnum* colonisation and redevelopment of peat.

Juncus squarrosus is a major component, but not entirely constant, and the community is sometimes found as a low, thinly scattered *Calluna* sward beneath which is a bryophyte carpet of *Plagiothecium undulatum, Pleurozium schreberi, Rhytidiadelphus squarrosus* and feeble growths of *Sphagnum cuspidatum. Carex nigra* is also found in such conditions, this last and the previous species pointing to the essentially flushed nature of the community.

2 Peat-mounds/high hummocks

This structural type merges with the previous one because the communities which characterise peat-mound summits are similar to some of those found on moist, bryophyte-rich hill slopes. On mire systems proper, the communities are restricted to the very highest levels of the microtopography or appear where the mire has suffered extensive lowering of the water table.

The other major category within this broad type is the highest of the bryophyte hummocks, namely the *Racomitrium lanuginosum* hummock. On undamaged mire it forms the highest element unless peat-mounds are present, whilst on damaged sites it is characteristic of dried-out hummocks or the summits of erosion hags.

Vegetation group 2 - Bryophyte-rich slopes and peat-mounds

Community *2-Empetrum nigrum-Hylocomium splendens-Sphagnum rubellum*

Ml9c - *Calluna vulgaris-Eriophorum vaginatum* blanket mire, *Vaccinium vitis-idaea-Hylocomium splendens* sub-community (Proctor & Rodwell 1986).

This community is typical of both peat-mound summits and bryophyte-rich hill slopes. From a

Structural type	1	2					3						
Vegetation group number	1	2		3			4				5		
Surface pattern zone		T		T4/T3/T1			T3/T2				T2/T1		
Community number	1	2	3	4	5	6	7	8	9	10	11	12	13
Species name													
Juncus squarrosus	IV												
Carex nigra	III												
Luzula spp.	I												
Juncus effusus	I												
Polytrichum juniperinum	I												
Sphagnum recurvum	I												
Hylocomium splendens		III											
Rhytidiadelphus squarrosus	I	II											
Rhytidiadelphus loreus		IV	I										
Pleurozium schreberi	II	V	IV				III						
Hypnum cupressiforme		IV	III						II	I			
Empetrum nigrum		IV	IV	I									
Hypogymnia physodes		II	I						I				
Rubus chamaemorus			II										
Calluna vulgaris	III	V	V	IV	V	V	V	V	V	V	IV	IV	IV
Erica cinerea	I			I	II								
Cladonia arbuscula		II	II	II	I								
Cladonia impexa	II	IV	IV	III	V	V	V	III	IV	V	I	III	IV
Racomitrium lanuginosum	II		I	V	V	IV	IV		II	II		I	
Trichophorum cespitosum	I	II	I	III	IV	IV	IV	III	IV	IV	III	III	V
Potentilla erecta					IV	III					II		
Molinia caerulea					V	III	III				IV	I	
Lycopodium selago				II		II							
Sphagnum fuscum			I				V						
Pedicularis sylvatica					II								
Mylia taylorii									I				
Sphagnum imbricatum								V	II				
Cladonia uncialis	I		I	III	II	IV			II	III	II	I	IV
Mylia anomala			I					II	II				
Eriophorum vaginatum		IV	IV	II			IV	IV	IV	II	II	III	II
Sphagnum rubellum	I	IV	III				III	V	V	IV	IV	IV	II
Sphagnum papillosum			I				IV	II	III	II	V	IV	
Narthecium ossifragum	I		II		II	V	IV	IV	IV	IV	IV	IV	IV
Erica tetralix		IV	III	III	III	IV	V	IV	V	IV	IV	IV	IV
Drosera rotundifolia	II	II	III	I	V	V	V	IV	II	III	IV		
Sphagnum tenellum		II	II			I	III	II	IV	III	II	II	II
Odontoschisma sphagni			I						IV	II			
Pleurozia purpurea	I					III	III		I	II	I	I	
Myrica gale			I			I				I	II	II	III
Arctostaphylos uva~ursi													
Polygala serpyllifolia											I		
Sphagnum magellanicum	I								I				
Betula nana			I										
Eriophorum angustifolium	III	IV	IV	III	II	IV	IV	IV	V	V	III	IV	IV
Sphagnum subnitens			I					II	II			I	
Aulacomnium palustre		IV	I										
Bare peat	III		I	III		III	III			II		II	V
Campylopus atrovirens													
Cerex panicea					I								II
Sphagnum compactum													IV
Lepidozia setacea									III				
Schoenus nigricans													
Carex pauciflora										I			
Drosera anglica			I			I		II	II	II	I	III	III
Sphagnum pulchrum													
Sphagnum cuspidatum	III						I			I			
Rhynchospora alba													
Carex limosa													
Eleocharis multicaulis													
Drosera intermedia	I												
Rhynchospora fusca													
Sphagnum auriculatum													
Menyanthes trifoliata									I				
Utricularia vulgaris													

Table 3a

Synoptic table showing the structural types, vegetation groups, surface pattern zones associated with them, and plant communities in which the listed species occur. The Roman numerals indicate the level of percentage constancy displayed by species in each community: V - 100-81 %; IV - 80-61 %; III - 60-41 %; II - 40-21 %; I - 20-1 %.

							4			5									
6					7		8			9					10			11	12
Tl					Tl		T1/TA2			Al					A2			A2/A	A4
14	IS	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
IV II I III	IV IV	IV II III II IV	IV III II II III III III	IV	II II IV	V V	III I II IV III I I	II V	V	III		II	IV				II		
	III II V IV																		
III III V	IV IV IV II II II V IV	II IV III IV III	III IV II II II	III IV III		V V IV	III II I I II	V III	V				V IV V	III		II		I	
III III	IV III	V	V IV V	IV	V V IV II V	IV	IV III I II I II	IV	IV	III	II II	V	V	V V		V IV	II	III I	
	II II		V II IV IV	IV IV			II I	II	V	V II II III	V	V III	V	IV IV II V	III V II	IV IV III II	III IV III V	V II IV II I	V

Community number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Species name															
Carex rostrata	III	III			II	IV	II	IV	IV	V	V		IV	V	
Potamogeton polygonifolius		**II**	V	IV		**II**	IV	II	V	V			II		II
Menyanthes trifoliata	IV	II		III		**II**		V	III	V	V	V			
Equisetum fluviatile			**II**			**II**			III	III	**III**	V	III	V	
Ranunculus flammula		II		**III**		II		V	II	IV		II	V	V	
Potentilla palustris				II				IV	V	V	V	V	III	V	
Carex limosa		III	**III**			II	V		IV	IV	V				
Carex panicea			III	IV	**II**	II	II			V					
Eriophorum angustifolium	III	V	'II	IV	**III**	III		II							
Erica tetralix	V	**III**	III	**II**	IV										
Sphagnum recurvum			**II**		III	IV				II		V			
Carex lasiocarpa	II	V	**II**			II	III								
Carex demissa			II	V	V			II						**III**	
Scorpidium scorpioides				II	V				**III**	IV			III		
Sphagnum auriculatum	II		V	II		II				III					
Narthecium ossifragum	V		V		V	II									
Pedicularis sylvatica	II			**II**				IV						IV	
Pinguicula vulgaris	II		II		II	**II**									
Sphagnum papillosum	V		V			IV					III				
Potentilla erecta	II		**II**		II	III									
Myrica gale	III	V	IV			IV									
Trichophorum cespitosum	III	II	III		II										
Molinia caerulea	V	IV			IV			II							
Myosotis scorpioides								II		II		V		V	
Calluna vulgaris	IV	**II**			II	II									
Drepanocladus revolvens				**II**	**III**			II	II						
Drosera anglica		**III**	V		V	V									
Caltha palustris												II	II	V	
Polygala serpyllifolia	II		**II**			II									
Juncus bulbosus		II			II			II							
Carex nigra			II					II	II						
Eleocharis multicaulis			V			**III**	**II**								
Drosera rotundifolia	III		II			**III**									
Sphagnum cuspidatum			**III**			IV									
Drosera intermedia		**II**		II											
Calliergon giganteum										II		II			
Hydrocotyle vulgaris										II			IV		
Empetrum nigrum			**II**			II									
Juncus articulatus				II					II						
Carex curta			**II**								V				
Chamaenerion angustifolium										III			II		
Eriophorum vaginatum				III			**II**								
Campylium stellatum					II					III					
Juncus kochii										II			**III**		
Mnium hornum										II				V	
Utricularia vulgaris			II			II									
Juncus acutiflorus												II		V	
Carex echinata			II			III									
Cardamine pratensis												II		V	
Galium palustre													III		
Succisa pratensis				II											
Sphagnum rubellum	III														
Polytrichum commune			**II**												
Racomitrium lanuginosum			**II**												
Filipendula ulmaria														V	
Odontoschisma sphagni				II											
Eleocharis quinqueflora					III										
Mnium punctatum														IV	
Salix spp.										III					
Bare peat	II														
Schoenus nigricans					III										
Sphagnum contortum				III											
Utricularia spp.										**II**					
Calliergon cordifolium														V	
Equisetum palustre				II											
Sphagnum subnitens						II									
Philonotis fontana														III	
Bryum pallens										II					

Table 3b

Synoptic table showing the provisional fen plant communities identified from analysis of the survey data, including two for ladder fens, in which the listed species occur. The Roman numerals indicate the level of percentage constancy displayed by species in each community: V - 100-81 %; IV - 80-61 %; III - 60-41 %; 11-40-21%; 1-20-1%.

distance the community is characterised by its dwarf shrub sward, which may appear *Calluna*-dominated. However, on closer inspection *Empetrum nigrum* will generally be found as a codominant. Beneath this dwarf shrub layer, the dense bryophyte carpet is characterised by *Hylocomium splendens, Pleurozium schreberi, Hypnum cupressiforme, Sphagnum rubellum, Rhytidiadelphus loreus* and sometimes *Dicranum scoparium.*

A particular variant of this community occurs around the margins of some larger *dubh lochain* in Caithness. Where waterfowl, particularly Greenland white-fronted geese *Anser albifrons flavirostris* or teal *Anas crecca,* roost on the pools or breed on the margins, a bryophyte-rich halo forms a striking feature around the pool margin. The halo is dominated by *Aulacomnium palustre* but with many of the characteristic species of this community. A similar feature has been noted in Shetland, around pools used extensively by great skuas *Stercorarius skua.*

Community 3 - ***Empetrum-hypnoid*** **mosses**

This is a community more restricted to hill slopes, generally those which have been more regularly burnt, as indicated by the absence of *Hylocomium splendens. Rhytidiadelphus squarrosus* replaces *R. loreus,* and both *Hypnum cupressiforme* and *Sphagnum rubellum* are somewhat reduced. This is the only community in which cloudberry *Rubus chamaemorus* is recorded, although it is common on the high peat plateaux of the Highlands. The community represents, along with Community 2, the typical peat-dominated vegetation of relatively undamaged catchment slopes.

Vegetation group 3 - *Racomitrium* hummocks/hags

Community 4 - ***Racomitrium lanuginosum-Cladonia***

Erico-Sphagnetum magellanici, subass. *Cladonia uncialis, Racomitrium lanuginosum* phase; M17b - *Scirpus cespitosus-Eriophorum vaginatum* blanket mire, *Cladonia* subass.

This is typical of the highest erosion hags throughout the two Districts, with a mat of *Racomitrium* capped by a sward of *Cladonia* species, although the absence of *Molinia caerulea* tends to mean that the type is commoner in the east. Bare peat is a common component of the surface.

Community 5 - ***Racomitrium-Molinia*** **hummocks and hags**

Pleurozio-Ericetum tetralicis, subass. *Racomitrium lanuginosum;* M15c-*Scirpuscespitosus-Erica tetralix,* subass. *Cladonia*

Racomitrium hummocks are more common in the western part of Caithness and in Sutherland because they occur on both natural and damaged mires, whereas in most of Caithness they are almost exclusively restricted to eroding mires (see Chapter 10). *The Racomitrium-Molinia* community is therefore also common in the west, but is largely absent from Caithness. It occurs as vigorous hummocks capped by oceanic indicators such as *Potentilla erecta* and *Pedicularis sylvatica,* together with *Molinia caerulea,* or as the summits of heavily eroded hags, where *M. caerulea* and P. *erecta* are joined *by Erica cinerea.*

Community 6 - ***Racomitrium-Pleurozia purpurea***

Pleurozio-Ericetum tetralicis, fac. *Molinia;* Ml 7a-*Scirpus cespitosus-Erica tetralix* blanket mire, subass. *Drosera rotundifolia-Sphagnum*

In central and western parts of the region, *Racomitrium* does not only occur as a hummock-former; it also grows as a loose mat on low ridges, where it characteristically mixes with *Pleurozia purpurea, Trichophorum cespitosum, Narthecium ossifragum* and *Molinia caerulea.* The type is similar in appearance to other undamaged low ridge communities and should not be confused with the mats of *Racomitrium* which dominate the surface of certain badly damaged sites. The associated species of these latter sites indicate clearly that they belong to Community 4 or 5.

3 ***Sphagnum-rich,*** **hummocks and ridges**

The majority of communities within this category are characteristic of undamaged mires. The term "hummocks and ridges" is taken to mean all those parts of the mire surface which lie above the water table, other than erosion hags and peat-mounds. The structural type can be subdivided into five main vegetation types based largely on the dominant species of *Sphagnum.* Each of these can then be divided on the basis of characteristic species complements, to give a total of 14 community types, making this the richest of the major structural divisions. Such variety is not surprising in view of the fact that the bulk of niche partition for the blanket mire vegetation must occur within this structural span.

Vegetation group 4 –*Sphagnum* hummocks

Community 7 -*Sphagnum fuscum* hummocks

Erico-Sphagnetum magellanici, subass. typical, phase *Sphagnum fuscum;* M18b -*Erica tetralix-Sphagnum papillosum,* subcomm. *Empetrum nigrum-Cladonia*

Although *Sphagnum fuscum* is very local on a national scale, it occurs relatively frequently throughout the Flow Country. It is more commonly found in the west and is thus often associated with *Molinia caerulea. Eriophorum vaginatum* is a common associate in Caithness, and *Drosera*

rotundifolia is a constant associate throughout the range. Some hummocks are low-growing or have lower slopes which extend across wet (T1) low ridge, allowing species such as *Pleurozia purpurea* and *Sphagnum tenellum* to form communities.

Community 8 - *Sphagnum imbricatum* hummocks

Erico-Sphagnetum magellanici, subass. typical, phase *Sphagnum imbricatum;* Ml7a - *Scirpus cespitosus-Eriophorum vaginatum* blanket mire, subcomm. *Drosera rotundifolia-Sphagnum*

This community is more central and eastern in its distribution, as reflected by the absence of *Molinia caerulea* and *Racomitrium lanuginosum* as associates. It is almost always accompanied by a greater or lesser proportion of *Sphagnum rubellum* and *Drosera rotundifolia* and is often capped by an open sward of *Cladonia impexa. Eriophorum vaginatum* is also a common feature of these hummocks.

Community 9 - *Sphagnum rubellum-Odontoschisma sphagni*

Erico-Sphagnetum magellanici; Ml7a - *Scirpus cespitosus-Eriophorum vaginatum* blanket mire, subcomm. *Drosera rotundifolia-Sphagnum*

Representing one of the typical communities found in the Flow Country, this occurs as a mixed mosaic of *Sphagna* beneath a dwarf shrub sward. There are no clear *Sphagnum* hummocks, but instead a generally high ridge formation of a somewhat dry nature, as indicated by the presence of *Hypnum cupressiforme* within the mixed *Sphagnum* carpet. In the survey this category is commonly used for the T2 high ridge level wherever more striking features are absent.

Community 10 - Mixed *Sphagna*

Erico-Sphagnetum magellanici; Ml7a - *Scirpus cespitosus-Eriophorum vaginatum* blanket mire, subcomm. *Drosera rotundifolia-Sphagnum*

This community represents high *Sphagnum rubellum* hummocks. Other *Sphagnum* species are generally represented only by scattered *S. tenellum. Cladonia* species are common, particularly C. *impexa,* whereas *Eriophorum vaginatum* is surprisingly sparse.

Vegetation group 5 - *Sphagnum*-rich high/ low ridge

Community 11 -*Sphagnum papillosum-Molinia* ridge

Erico-Sphagnetum magellanici, subass. *Cladonia,* var. *Molinia;* M17a- *Scirpus cespitosus-Eriophorum vaginatum* blanket mire, subcomm. *Drosera rotundifolia-Sphagnum*

Typical of central and western parts, this represents the characteristic *Sphagnum papillosum* ridge over much of western Scotland. The mixture of *Potentilla erecta, Molinia caerulea* and *Myrica gale* emphasises the oceanic nature of the community.

Community 12 - *Sphagnum-Ehophorum vaginatum* ridge

Pleurozio-Ericetum tetralicis; Ml8a-*Erica tetralix-Sphagnum papillosum* mire, subcomm. *Sphagnum magellanicum-Andromeda polifolia*

This is the eastern and southern equivalent of the previous community, largely lacking the oceanic indicators but with significantly increased *Eriophorum vaginatum.* The type is common throughout Caithness, but it is also found on many mires across southern Scotland and northern England.

Community 13-*Sphagnum compactum* ridge

Ericetum tetralicis; M16 -*Erica tetralix-Sphagnum compactum* wet heath

This occurs where *Sphagnum-hch* mire has been affected by burning and the majority of *Sphagnum* species have been lost. The link between this type and true wet heath/valley mire is indicated by the relative abundance of *Myrica gale,* which appears to be encouraged by mineralisation of the peat after burning.

Vegetation group 6 - *Sphagnum magellanicum* low ridge

Community 14 -*Sphagnum magellanicum-S. subnitens*

Erico-Sphagnetum magellanici; *Erica tetralix-Sphagnum papillosum* mire, subcomm. *Sphagnum magellanicum-Andromeda polifolia*

This occurs as two variants, the first of which is found in valley mires and seepage lines, where *Sphagnum magellanicum* and-S". *subnitens* form a mosaic of oligotrophic hummocks within a more minerotrophic community. *Sphagnum tenellum* is a minor component of this type but is almost always present. The second variant is found on ombrotrophic mires, more usually in the west than in the east, and tends to occur as small stretches of ridge which support a mosaic *of Sphagnum subnitens, S. magellanicum* and *S. tenellum,* always within a few centimetres of the water table. It is thus characteristic of low-relief mire patterns.

Community 15 -*Sphagnum magellanicum-S. rubellum* ridge

Erico-Sphagnetum magellanici; M 18a -*Erica tetralix-Sphagnum papillosum* mire, subcomm. *Sphagnum magellanicum-Andromeda polifolia*

Although closely allied to the second variant of the preceding community, this community is represented by a marked association between *Sphagnum magellanicum, S. rubellum* and *Cladonia impexa.* This is the typical community for *S. magellanicum* when it is free of extreme oceanic influences.

Community 16 - *Sphagnum-Arctostaphylos-Betula nana* dwarf shrub mire

Narthecio-Sphagnetum papillosi, phase *Arctostaphylos uva-ursi;* M19c(i) - *Calluna vulgaris-Eriophorum vaginatum* blanket mire, subcomm. *Vaccinium vitis-idaea,* var. *Betula nana*

Of all the communities recorded in the region, this is perhaps the most characteristic. Although the dwarf shrubs *Betula nana* and *Arctostaphylos uva-ursi* are found in other habitats in Britain, their occurrence together on a *Sphagnum-rich* mire system is almost unique to the region. The *Sphagnum* carpet is generally *S. papillosum,* though *S. magellanicum* is a common but scattered component.

Community 17 - *Sphagnum papillosum-Carex pauciflora*

Erico-Sphagnetum magellanici, subass. *Cladonia uncialis,* var. *Molinia*

In places where limited erosion has left the higher ridge areas with only restricted *Sphagnum* cover, being now dominated by Community 4 or 5, but the A2/A3 pools retain some water, this community may be found. It is most common in central parts and is not recorded from eastern Caithness. A vigorous growth of *Sphagnum papillosum* over areas of wet, bare peat at the T1/A2 margin is often accompanied by a short sward of *Carex pauciflora.* The type appears to be quite consistent and is accompanied by *Molinia,* emphasising its somewhat western trend.

Community 18 - *Rhynchospora alba-Sphagnum* low ridge

Sphagno tenelli-Rhynchosporetum albae, subass. *Sphagnum tenellum;* M18a-*Erica tetralix-Sphagnum papillosum* mire, subcomm. *Sphagnum magellanicum-Andromeda polifolia*

In the west of Sutherland and extending into the terrain associated with the Moine Thrust, conditions clearly become markedly oceanic. This community is typical of mires in these western parts, with an abundance of *Rhynchospora alba* and *Pleurozia purpurea* and a marked absence of dwarf shrubs.

Vegetation group 7 - Hyperoceanic mire vegetation

Community 19 - *Campylopus atrovirens* low ridge

Pleurozio-Ericetum tetralicis, fac. *Molinia,* var. typical; Ml7 -*Scirpus cespitosus-Eriophorum vaginatum* blanket mire

This community is more typical of the hyperoceanic Hebrides. Goode & Ratcliffe (1977), Goode & Lindsay (1979) and Lindsay *et al.* (1983) describe it from Lewis and Mull, where it forms a characteristic component of the low-relief microtopography. It is recorded from a small number of sites in Caithness and Sutherland, but its distribution appears to be enhanced by severe burning.

Community 20 - *Schoenus-Molinia* mire

Pleurozio-Ericetum tetralicis, subass. typical, var. typical; *Schoenus nigricans-Narthecium ossifragum* mire

The distribution of *Schoenus nigricans* is discussed in the next chapter. The ombrotrophic community which it characterises was only recorded from a single site in the extreme north-west, by Loch Laxford. On this site, it takes up a position within the Tl zone, which is in contrast to its habit on Islay, where it occurs in both the Tl zone and as high as T2 tussocks.

4 Runnels and damaged mire

Vegetation group 8 - Runnels and damaged mire

Community 21 - *Carex panicea* damaged mire

Scapanio gracilis-Narthecietum ossifragi; M15 - *Scirpus cespitosus-Erica tetralix* wet heath

Throughout the majority of the Flow Country, *Carex panicea* is an indicator of damage when it occurs on unflushed peats. The range of vegetation types from which *C panicea* mire is derived is diverse, but by the time *C. panicea* has become a significant component, very few other species remain. Bare peat is a common component, becoming increasingly so with the severity of damage sustained.

Community 22 - *Narthecium* runnel or overflow

Narthecio-Sphagnetum papillosi; M21a/M15b/M3

This represents a feature commented on by both Goode (1970) and Goode & Lindsay (1979) in areas of patterning in western regions, termed "overflows" or "runnels". The vegetation of these features, which are formed when water flows over a ridge to a pool further downslope, is characteristically *Sphagnum*-poor. The growth form of *Trichophorum cespitosum* under such conditions is not the tussock form, but instead it occurs as stands of individual stems grouped in an open sward. The most striking aspect of such features is the dominance of *Narthecium ossifragum.*

Community 23 - Microbroken mire

Sphagno tenelli-Rhynchosporetum albae, subass. typical

Where areas of patterning have been damaged but are not yet broken down into deep gullying, the anastomosing network of shallow channels between raised, dry erosion 'islands' has a tendency to collect and hold shallow areas of water. This network is generally colonised by an intimate mixture of *Sphagnum cuspidatum* and *S. tenellum,* sometimes with an open sward of *Trichophorum cespitosum.* The type is easily recognised from its morphology and species composition and is common throughout the two Districts.

5 Hollows and pools

The range of physical structure provided by pool formation gives a significantly larger range of niches for vegetation types to occupy than mire systems further south in Britain. Even so, the range of vegetation types derived from the analysis for the aquatic element of the microtopography is relatively limited. In the east, *Sphagnum cuspidatum* is almost exclusively the constant, whereas towards the west, where nutrient conditions become less extreme, a wider range of vegetation types is found.

Vegetation group 9 - *Sphagnum cuspidatum.* carpets (Al)

This type represents the bright green-yellow swards which cover shallow treacherous depressions in the mire surface. The type also occurs as dense mats around the margins of deeper open-water pools, but in both cases the Al 'carpet' is distinguished from a looser, floating matrix of *Sphagnum* because the individual plants in a carpet are permanently bound in place. It is unusual to see surface water within an Al carpet, but the structure is clearly an aquatic element in the microtopography.

Community 24-5. *cuspidatum-Eleocharis multicaulis*

Eleocharitetum multicaulis, subass. *Sphagnum auriculatum;* M2-*Sphagnum cuspidatumlrecurvum* bog pool community

A type common in Caithness but also found abundantly in the Halladale catchment, its appearance is very similar to *Scheuchzeria-Sphagnum balticum* carpets in Fennoscandia. It is a very simple community, with few other species recorded. The type is not common in the rest of Britain, mainly, as far as can be determined, because eastern mires which would be expected to favour it have been extensively drained.

Community 25 - Pure *S. cuspidatum* carpets

Eriophorum angustifolium community, subcomm. *Sphagnum cuspidatum]* M2- *Sphagnum cuspidatumlrecurvum* bog pool community

This is a type characteristic of Caithness rather than Sutherland. It occurs as Al hollows with a pure *S. cuspidatum* carpet extending throughout all or most of the hollow. It closely resembles carpets of *Sphagnum balticum,* a species which adopts the same habit in central and northern Europe. These pure *Sphagnum* carpets are typical of bog hollows further south in Britain and are recorded as far south as Esgyrn Bottom in Pembrokeshire and East Dart Head on Dartmoor.

Community 26 - Typical *Sphagnum cuspidatum* carpets

Eriophorum angustifolium community, subcomm. *Sphagnum cuspidatum;* M2 - *Sphagnum cuspidatumlrecurvum* bog pool community

Found from east to west coasts, the community is recognised by its mosaic of *Menyanthes trifoliata, Drosera anglica, Eriophorum angustifolium* and occasional *Narthecium ossifragum* within the *S. cuspidatum* carpet.

Community 27 - *Sphagnum pulchrum* carpets

Erico-Sphagnetum magellanici, subass. *Sphagnum pulchrum;* M18- *Erica tetralix-Sphagnum papillosum* blanket mire

Few mire species are entirely restricted to the transition zone between the terrestrial and aquatic phases within the microtopography. *Rhynchospora alba* and *Drosera anglica* are perhaps the commonest examples, but, of the *Sphagna,* only *Sphagnum pulchrum* is actually restricted to this zone within mire patterns. The distribution of this species is discussed in the next chapter, but its characteristic vegetation assemblage in Caithness and Sutherland is not markedly different from that in its other British stations (Ratcliffe & Walker 1958; Goode & Ratcliffe 1977).

Community 28-*Sphagnum cuspidatum-Carex limosa*

Caricetum limosae, subass. *Sphagnum cuspidatum]* M2 - *Sphagnum cuspidatumlrecurvum* bog pool community

Carex limosa occurs only rarely on the mire expanse in Caithness, and it is therefore excluded from a major part of the Al hollow distribution. However, in central and western parts of the Sutherland plain this variant is found on some mires. The type is not found south of the Highland Boundary Fault, apart from an isolated outpost on the Silver Flowe in Dumfries and Galloway.

Vegetation group 10 - Mud-bottom hollow (A2) communities

This type covers a number of communities

characteristic of what is generally an oceanic feature in Britain. Of the three identified, only two are widespread in Caithness and Sutherland.

Community 29 - *Eleocharis multicaulis* mud-bottom hollows

Eleocharitetum multicaulis, subass. *Sphagnum auriculatum;* Ml -*Sphagnum auriculatum* bog pool community

The relatively firm substrate of the mud-bottom hollow provides a rooting medium for *Eleocharis multicaulis,* which then characteristically grows in a loose matrix of *Sphagnum cuspidatum* and *S. auriculatum.* The type is recorded from the central part of the region and is generally limited in Britain to a line north of the Great Glen.

Community 30 - *Rhynchospora alba* mud-bottom hollows

Sphagno tenelli-Rhynchosporetum albae, subass. *Sphagnum auriculatum,* var. *Rhynchospora alba;* Ml -*Sphagnum auriculatum* bog pools

Restricted to the far west, this nodum is the aquatic extension of the *Rhynchospora alba-Sphagnum* low ridge (Community 18) discussed above. It requires a firm mud-bottom to the hollow. Farther south in Britain its presence on mire expanses extends as far south as Wales, where shallow A2 hollows have extensive mats of ft *alba,* but it has not been recorded from the patterned mires of Dartmoor by the NCC's Peatland Survey (unpublished).

Community 31 -*Rhynchospora fusca* hollows

Sphagno tenelli-Rhynchosporetum albae, subass. *Sphagnum auriculatum,* fac. *Rhynchospora fusca;* Ml -*Sphagnum auriculatum* bog pools

Like *Schoenus nigricans* (see Community 20), the only location for this type in Caithness and Sutherland is in the extreme north-west near Loch Laxford. Here it forms both *R. alba-R. fusca* mixed swards and single-species stands within the mud-bottom (A2) hollows, in a manner characteristic of other British examples of this type within mire patterns (e.g. Lindsay *et al.* 1983).

Vegetation group 11 - *Sphagnum auriculatum* (A3) bog pools

These are distinguished from the next type by their tendency, during periods of extreme drought, to lose their free water and dry out. Under normal weather conditions, this community floats freely within an expanse of open water.

Community 32 -*Sphagnum auriculatum* bog pools

Eriophorum angustifolium community, subcomm. *Sphagnum auriculatum;* Ml -*Sphagnum auriculatum* bog pools

Where free water is present almost permanently and a loose matrix of aquatic *Sphagna* represents the major biomass of vegetation in the pool, *Sphagnum auriculatum* becomes a constant alongside *S. cuspidatum.* It varies from a sparse scattering of individuals within dominant *S. cuspidatum* mats in the east to pools entirely dominated by a loose matrix of *S. auriculatum* in the west. The companion species are *Menyanthes trifoliata* and *Eriophorum angustifolium,* but in the west *Utricularia vulgaris* agg. may be found in some pools. The type is found mainly within the blanket mire patterns of western Scotland; towards the drier south and east the dominant community type is the *Sphagnum cuspidatum* (Al) hollow (Vegetation type 9).

Vegetation group 12 - Deep pool (A4) vegetation

Community 33 - Deep pools

Permanently water-filled, many of these pools have no vegetation at all, apart from an algal community attached to the pool sides. The characteristic vegetation, where there is any, is *Menyanthes trifoliata,* which sometimes supports a column of *Sphagnum cuspidatum,* the whole mass floating loose in otherwise empty pools up to 4 m deep.

6 Flushes and ladder fens

Vegetation group 13 - *Molinia-Myrica* flushes and ladder fens

Ladder fens tend to occur on the margins of mire expanses (see Figure 7) and are usually dominated by what appears, at first sight, to be much the same vegetation as on many other parts of the mire margin, particularly the soakaways. The most characteristic species of the ladder fen community is therefore *Molinia caerulea.* This fact alone is not sufficient to distinguish ladder fens from other mire margin communities. It is therefore necessary to take particular note of the microtopography.

Community 34 - *Molinia-Myrica* ridges

Although at first sight this community is typical of a *Molinia*-rich bog ridge, closer inspection reveals a number of distinctive features. The *Sphagnum* cover is markedly discontinuous, forming low hummocks, and the bare peat surface between is stained a dark, ochreous colour, which also stains the individual plants of *Sphagnum* in the hummocks. *Polygala serpyllifolia* and *Pedicularis sylvatica* are often present, and occasional plants of *Carex rostrata* or even *C. lasiocarpa* can be found growing through the ridges. In Scandinavia, *Trichophorum cespitosum* and *Trientalis europaeus* would be present in such a community (Professor H Sjörs pers. comm.).

Community 35 - *Carex rostrata-C. lasiocarpa* mud-bottom hollows

The linear hollows (solid mud-bottom "flarks") are often ochre-stained and generally support scattered *Carex rostrata*. The community may also have *Carex limosa* in the poorer variants or *Carex lasiocarpa* in richer examples. In Sweden these fen hollows, or "flarks", would also contain *Carex livida, Carex chordorhiza, Scheuchzeria palustris, Utricularia intermedia* and *Juncus stygius* (Professor H Sjörs pers. comm.).

11 Distribution of notable plant species

Information on the localities of particular species was collated by using the Revelation data-base, which contained species records obtained from the various sources described in Chapter 8. Several species were not recorded comprehensively during the survey, and the data-base can give only the most general indication of their distribution. For the species discussed, however, the data are reasonably comprehensive for the peatland sites surveyed. These species are chosen for individual consideration for several reasons -

Range

- Variation across the two Districts, indicating the variability and completeness of this peatland system

- Their relationships and importance to distribution in the rest of the UK and Europe

Rarity

- Regional, national and international status

- Some of the species are under-recorded for some of the more remote parts of the region. These data show the region to be more important for some species than would have been predicted from existing published information, e.g. Perring & Walters (1976) and Perry (1975).

Indicator value

- Some species appear to be restricted by certain environmental factors, e.g. altitude and hydrology.

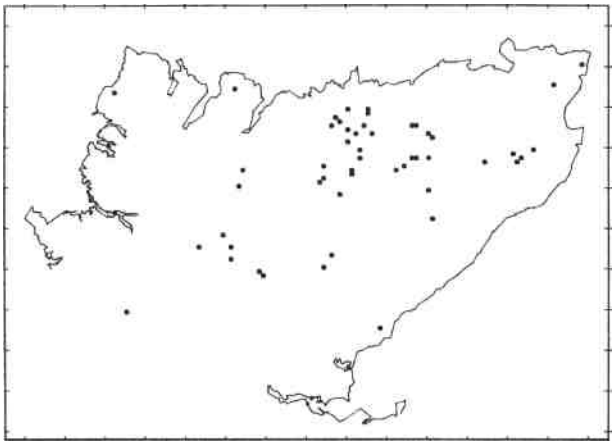
When one is considering the distribution patterns of these species, it is important to take into account the uneven distribution of survey sites and peatland systems (see Figure 28). The maps in Figures 32-49 show only whether or not a species is recorded from each 1 km square. All records are from peatland sites, but some species occur in other habitats and so have a wider overall distribution.

Comments on British distributions are based on Perring & Walters (1976) and those on northern European distributions mainly on Fitter (1978).

Arctostaphylos uva-ursi

Regional (see Figure 32)

Mainly a central and eastern species on survey sites but with a more western total distribution (Perring & Walters 1976). The more westerly records are mostly not from mire sites, but from drier morainic



D J Charman/R M O'Reilly

Figure 32 *Arctostaphylos uva-ursi*

ground, coastal and upland heaths, and other mineral soils and rocks, which are its more usual habitat in Britain. On mire sites it is almost entirely restricted to T2 high ridges and T3 hummocks.

National

Locally abundant in the Highlands, but now rare in the Southern Uplands, Cheviots, Pennines and Lake District (Perring & Walters 1976). Godwin (1975) notes that the majority of fossil records from Britain are from beyond its present southernmost limit and describes it as a species which was formerly widespread during the late Weichselian but whose range has since become restricted to northern and montane regions. Conolly & Dahl (1970) show that its present distribution in Ireland and northern Scotland corresponds to the 24°C maximum summer temperature isotherm.

Europe

Mainly in northern Europe and Iceland. Commonest on dry or very dry sites and typical of gravel ridges within pine-lichen forest.

Betula nana

Regional (see Figure 33)

Restricted to central parts of the region, with 45 records from survey sites. Found on high ridges and hummocks, often with *Arctostaphylos uva-ursi* or *Sphagnum fuscum.* The species is not common in Caithness, with only two records for the District.

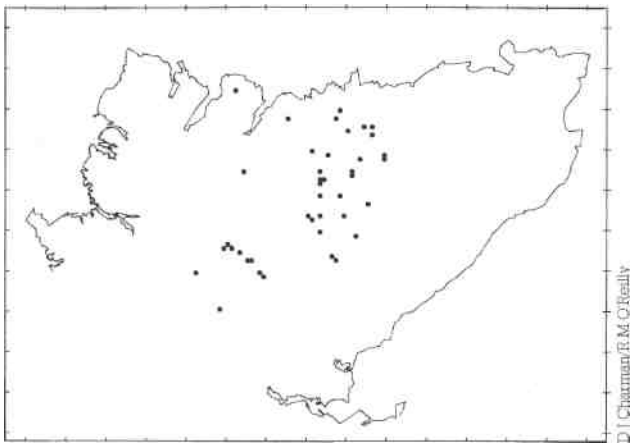


Figure 33 *Betula nana*

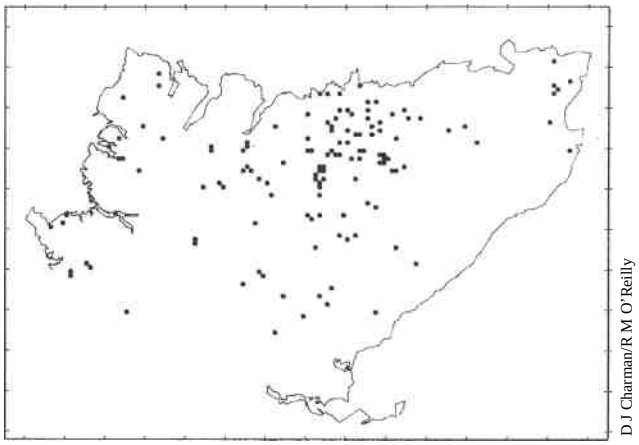


Figure 34 *Myrica gale*

National

Very local in the Highlands, with two isolated outposts in Northumberland and Durham, and recently (post-1930) only found in 46 10 km squares in Britain (Perring & Walters 1976). The survey reveals that 16 10 km squares have this species on peatland sites in the region. The survey record from A'Mhoine is the most northerly for Britain.

Europe

This is a circumpolar plant (if related taxa are included) associated with arctic-alpine mires and heaths. It extends as far north as 76° in Spitzbergen (Godwin 1975), and Conolly & Dahl (1970) suggest that its present distribution is limited by the 22°C maximum summer temperature isotherm. Drury (1956) and Cowardin *et al,* (1979) give examples of *Betula nana* bog from the Yukon delta, but it is absent from the blanket bog regions of Canada.

Myrica gale

Regional (see Figure 34)

The species has a widespread distribution on peatlands but occurs with greater constancy in central and western areas. Eastern locations tend to be on sites with some enrichment from water movement. It is one of the characteristic species of ladder fens.

National

Generally common in the north and west of Scotland, Lakeland, north-west Wales and western Ireland, but scattered and rather local through much of eastern Scotland and Ireland and the rest of England and Wales (Perring & Walters 1976). The northern extremity of its range is reached in the region, apart from two locations in Orkney.

Europe

Myrica gale has a distinctly oceanic to sub-oceanic distribution in Europe, Matthews (1937, 1955) describing it as "Oceanic Northern". Its occurrence throughout Caithness and Sutherland serves to emphasise the oceanicity of the entire region.

Vaccinium oxycoccos/Vaccinium microcarpum

These two species are difficult to distinguish in the field, so our peatland records have been amalgamated for the map.

Regional (see Figure 35)

Present only in eastern Sutherland and Caithness and with only 16 separate locations noted. *Vaccinium microcarpum* and *V. oxycoccos* are each recorded for only a single 10 km square in the region by Perring & Walters (1976). Although the nature of the sites varies somewhat, presence seems to be linked to wet, *Sphagnum-rich* margins around deep watershed pools with no lowering of the water table.

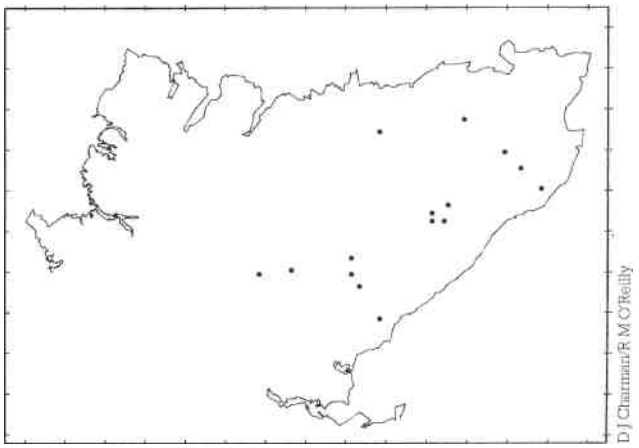


Figure 35 *Vaccinium oxycoccoslmicrocarpum*

National

Both species are here at the extreme northern limits of their distribution. *Vaccinium microcarpum* is present in only 19 10 km squares, mainly in Grampian Region. This species tends to occur further north than *V. oxycoccos* (Clapham, Tutin & Warburg 1962), which has its centre of distribution in northern England and southern Scotland.

Europe

V. oxycoccos is found in all of Fennoscandia, except the mountains, and further south and east in Europe, while *V. microcarpum* is found chiefly in central and northern Fennoscandia. Northern Scotland is an oceanic outpost of this distribution.

Drosera anglica

Regional (see Figure 36)

This is an example of a species which is ubiquitous in peatlands across the region, occurring in almost every 10 km square (Perring & Walters 1976). It occurs at or around the water table in the microtopography and also within flushes.

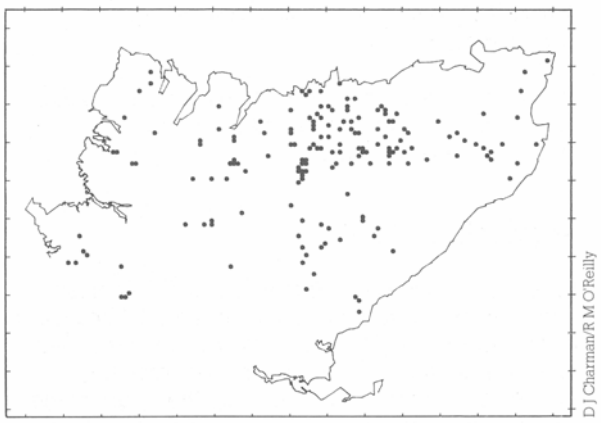


Figure 36 *Drosera anglica*

National

Widespread and common only in peatland areas of the north and west Highlands and western Ireland, and very local elsewhere. It is more continuously distributed within Caithness and Sutherland than anywhere else (Perring & Walters 1976). Its European distribution is mainly in northern and western parts.

Drosera intermedia

Regional (see Figure 37)

This is a notable component of wet, bare peat hollows in the west. It does not occur in Caithness

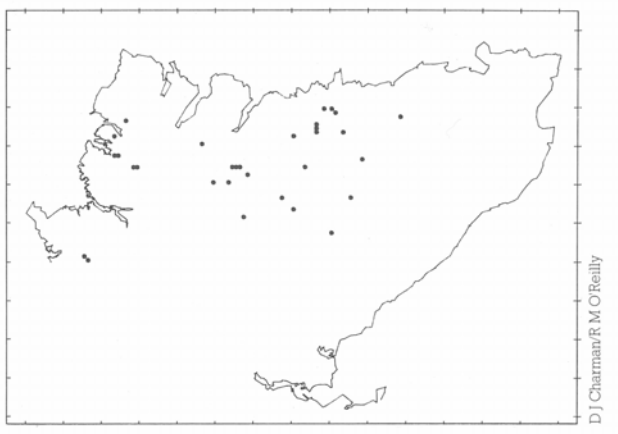


Figure 37 *Drosera intermedia*

except on the wet, bare peat of flush margins. There are a number of records for central Sutherland, but at least some of these may be in error, possibly mistaken for vegetative *Drosera anglica* or *D.* x *obovata.*

National

Generally a western but very local species, both in mainland Britain and in Ireland, but locally abundant in southern and eastern areas in its characteristic habitat, wet lowland heath (Clapham *et al.* 1962; Perring & Walters 1976). At its northerly limit in the British Isles in Sutherland.

Europe

In Europe it spreads no farther north than central Fennoscandia, except for two records east of the White Sea.

Rhynchospora alba

Regional (see Figure 38)

Scattered records were obtained from all but the far east of Caithness, but it occurs as a more constant component of western peatlands, generally on a low ridge with *Sphagnum papillosum* or in hollows just below the water table. It is, for example, abundant at Laxford Bridge.

National

Of similar distribution to *Drosera intermedia*, generally western in Britain and Ireland. It is frequent in some southern wet heathland locations, such as Thursley Bog on the Surrey Greensand and the New Forest valley mires. Sutherland is the northern limit of its British distribution, apart from an isolated record for Shetland.

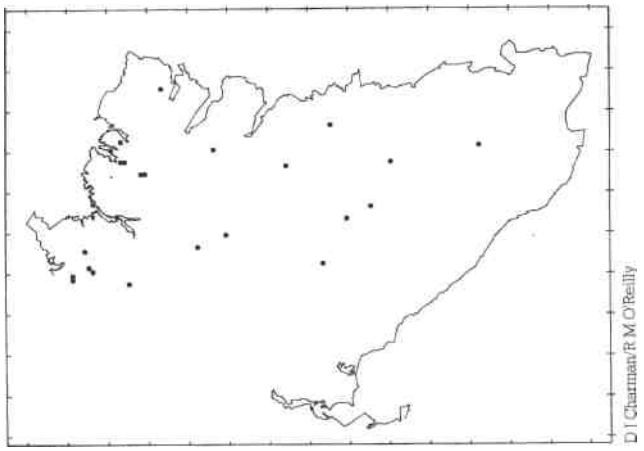


Figure 38 *Rhynchospora alba*

World

It is found in most of Europe except northern Fennoscandia, north and east Russia and most of the Mediterranean. It does not occur in the Arctic. It also grows in Japan and in both Pacific and eastern North America, with a few scattered localities elsewhere.

Rhynchospora fusca

Regional

Recorded from only two locations, both close to Laxford Bridge. It grows in the aquatic zones, generally lower than *R. alba,* at A2.

National

A rare species, having its main populations on the south coast of England in Dorset and Hampshire and in western Ireland. It occurs at one or two locations near the west coasts of Scotland and Wales, but the Laxford records are not given by Perring & Walters (1976). The record for Cors Fochno in Dyfed is a recent rediscovery (Fox 1984) after its apparent disappearance from the site during the middle of this century. Interestingly, it has been found in an area of flooded peat-cuttings which mirror the conditions of mud-bottom hollows. A similar phenomenon is found at Thursley in Surrey, where ft *fusca* occupies flooded tank tracks left by post-war military manoeuvres.

World

Dierssen (1982) records the species from Ireland and Norway. Tubridy (1984) describes its occurrence in mud-bottom hollows on Mongan Bog, in County Offaly. It grows mainly in western Europe, where its northern, eastern and southern limits extend beyond those of ft *alba.* It is present in North America, but absent from the Pacific area.

Eleocharis multicaulis

Regional (see Figure 39)

Found in hollows and pools (A1-A3), with either *Sphagnum cuspidatum* or *S. auriculatum* or alone in the deeper water, this species is scattered across the two Districts.

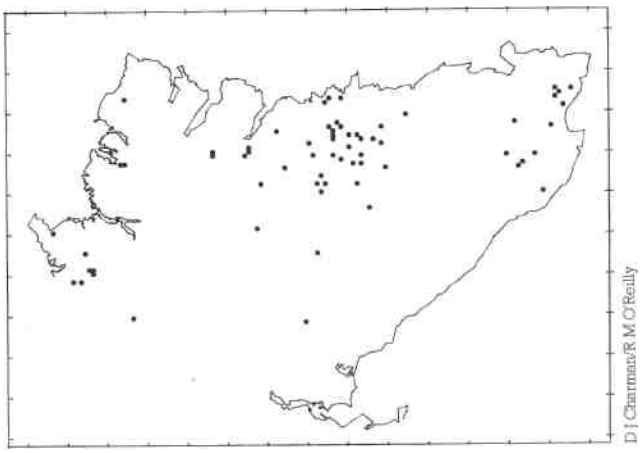


Figure 39 *Eleocharis multicaulis*

National

It is another species fairly widespread in the far west of Britain and Ireland, but very local elsewhere and mainly on lowland bogs and wet acidic heaths, which provide important outposts in the New Forest, Surrey and East Anglia. It is not rare, but its distribution across Sutherland and Caithness reflects the oceanic conditions of the whole region.

World

Godwin (1975) describes the species as European-Atlantic. It extends above 60°N only on the Faeroes and in westernmost Norway (Professor H Sjörs pers. comm).

Carex limosa

Regional (see Figure 40)

This species is present across both Districts but is more constant and abundant in the west, particularly in A2 mud-bottom hollows. In addition to such ombrotrophic conditions, it is also characteristic of flushed areas, especially sloping and ladder fens. Present in 34 10 km squares, though only 10 post-1930 records are shown by Perring & Walters (1976).

National

Mostly in northern and western Scotland and western Ireland, but scattered through northern

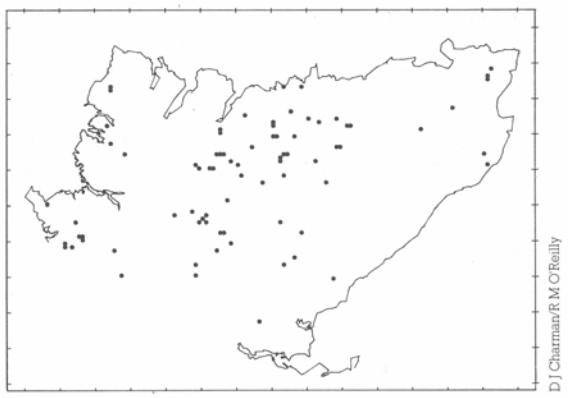


Figure 40 *Carex limosa*

England and Wales. However, the bulk of these records are for minerotrophic mires. The species does not occur in bog pools south of the Silver Flowe in Galloway and is almost completely restricted to the extreme west coast for its distribution within this microtope. Only in Caithness and Sutherland does it extend eastwards in blanket bogs.

World

Carex limosa is found in western mire systems in Ireland and in Norway (Moen 1985), but on the continent it is not at all an oceanic species, being recorded for instance in Al and A2 hollows on Estonian mires (Masing 1984). Matthews (1955) classifies it as "Continental Northern" and provides a map (p. 139) showing its southern limit in Europe. Its world distribution is widely circumboreal.

Carex pauciflora

Regional (see Figure 41)

Present throughout the region but perhaps having a centrally based distribution, *Carex pauciflora* grows on low ridges, often with abundant *Sphagna*, typically in a *Sphagnum papillosum* T1 lawn.

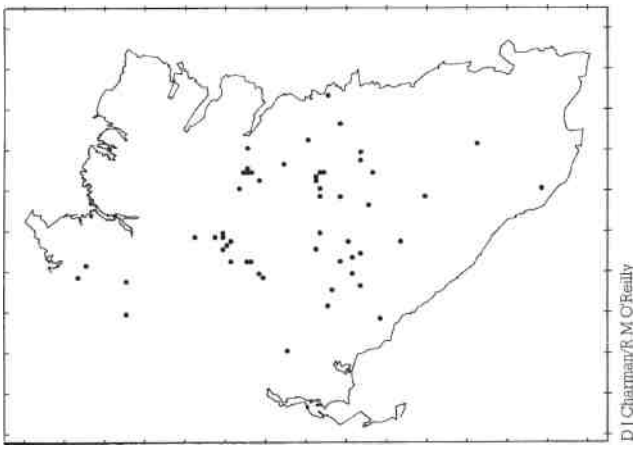


Figure 41 *Carex pauciflora*

National

Widespread and often common in ombrotrophic mires through much of the Highlands, but very local in south-west Scotland and northern England. Not recorded further north than Sutherland.

World

Sjörs (1983) describes *Carex pauciflora* as "doubtfully minerotrophic" and states that it occurs in most oligotrophic sloping and mountain mires in Sweden, whilst Botch & Masing (1983) recognise it as a species largely restricted to oligotrophic moss communities. The world distribution is similar to that of *Rhynchospora alba*, though it is probably less favoured by an oceanic climate.

Molinia caerulea

Regional (see Figure 42)

Present in almost every 10 km square in the region (Perring & Walters 1976), its occurrence on ombrotrophic peatlands is more westerly. Throughout the region, but increasingly towards the

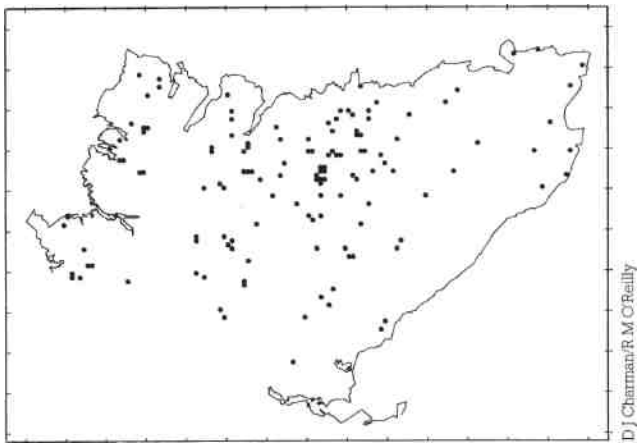


Figure 42 *Molinia caerulea*

west, this species is found most abundantly alongside burns and seepages, where it is encouraged to develop monotypic stands by the increased oxygenation of the peat (see Chapter 1). For the same reason, it is typical of the mire margin on many sites. On the mire expanse, however, it is quite markedly restricted to sites west of the Halladale, and it is not a common component of ombrotrophic expanses until west of the Naver. Its presence can be encouraged on a site by burning, and, like *Racomitrium lanuginosum*, its distribution has been artificially enhanced by man's activities in the area.

National

It is difficult to draw any useful conclusions from the map of Perring & Walters (1976), because the

species records undoubtedly come from a wide range of sites other than ombrotrophic bog, but, from evidence gathered during the course of the NCC's SSSI Guidelines field survey throughout Britain (NCC unpublished), the mass occurrence of *Molinia caerulea* on ombrotrophic mire systems is a distinctly western phenomenon. Areas characterised thus are Dartmoor, west Wales, Cumbria, Dumfries and Galloway, the Inner and Outer Hebrides, and the extreme west coast of Scotland. Much the same is true of Ireland. *Molinia* on mire expanses tends to be rather sparse in growth, and the dense, tussocky habit develops where flushing with mineral-rich water occurs, especially when loaded with sediment.

World

Molinia caerulea is almost entirely restricted to Europe, where it is a widespread species.

Sparganium angustifolium

Regional (see Figure 43)

A species of deep, open water pools (A3-A4), it is generally uncommon over much of the region, and the records from the survey are western.

National

A western plant, especially abundant in the Western Isles, but local elsewhere.

World

Again this species shows the affinities of this region with more northern regions, as its centre of distribution is in Norway and Sweden, becoming rarer to the south, though recorded as far south as Spain.

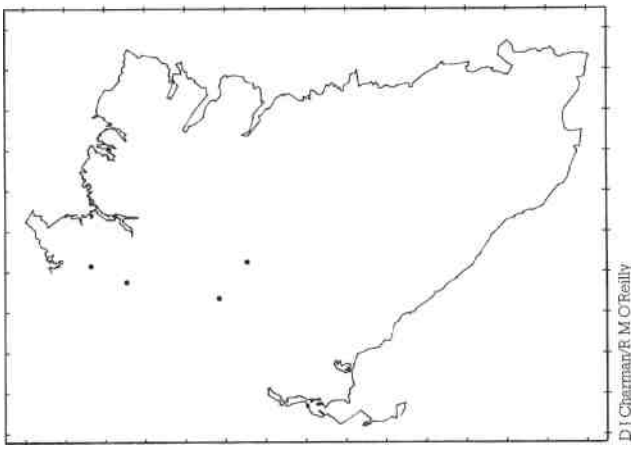


Figure 43 *Sparganium angustifolium*

Carex dioica

This sedge is common in richer minerotrophic mire and flush habitats throughout Scotland, but it has a quite distinct niche in the mires of Sutherland, Caithness and Wester Ross. Although it is not normally found on the mire expanse, it is often found on the T1/T2 ridges of base-rich ladder fens in these Districts. It is a species of Europe and western Siberia.

Carex lasiocarpa

C. lasiocarpa is typical of the mud-bottom hollows ("flarks") in slightly enriched ladder fens, though it grows through the ridges too. It is recorded from the mesotrophic fens of Caithness, where the shelly boulder clay tends to encourage rather more mineral-rich mire systems. Its occurrence within the central and western parts of the region is linked quite strongly with ladder fen systems, but it is also found in more typical seepages where there is a little base-enrichment.

Erica cinerea (see Figure 44)

Although very much a hyperoceanic species, *Erica cinerea* adopts a niche in Scotland which ensures that its roots are not subject to anaerobic waterlogging. Thus it smothers the thin peat cover of rock outcrops with vigorous growth in the far west.

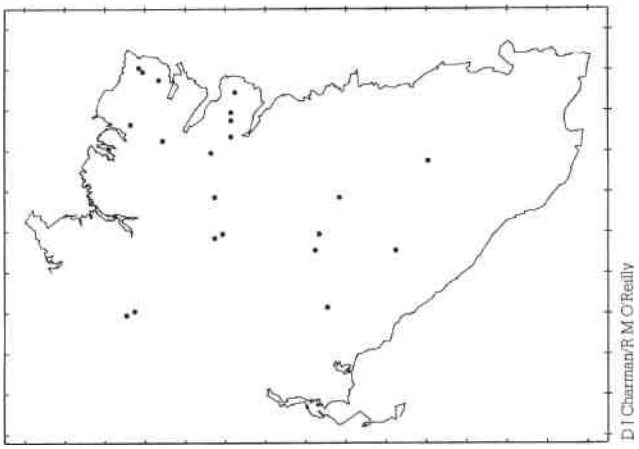


Figure 44 *Erica cinerea*

On mires, it only occurs on tall erosion hags or the cut edges of old peat banks (thus adopting the same niche as that taken by *Vaccinium myrtillus* in north-west England). Osvald (1949) shows it adopting much the same behaviour on eroding hummocks in the Lough Boleynagee area of Ireland. Although generally western, it occurs a considerable distance eastwards where the niche is available. Its European distribution is almost entirely restricted to the Atlantic seaboard, and there are records from Madeira and a single locality in north Africa. It is extinct in West Germany.

Rubus chamaemorus

This species is typical of Pennine and upland blanket bog (Eddy, Welch & Rawes 1969) and is also recorded extensively within Caithness and Sutherland by Perring & Walters (1976). Its presence on blanket bog, however, is restricted to more montane situations on the higher hills of Sutherland and the Morven range in Caithness, where it is often abundant, as well as in higher-level *Calluna* heath on shady slopes. It is sparse in *Calluna-Eriophorum vaginatum* blanket bog on the Knockfin Heights. During the survey it was recorded within the region only from the steep east-facing slopes of Ben Armine, in an association of *Sphagnum rubellum, Vaccinium myrtillus, Calluna* and *Listera cordata.*

Listera cordata

This is an often overlooked species on mires which, if the records for Caithness and Sutherland are any indication, occurs within T2/T3 *Sphagnum-rich* swards where the dwarf shrub layer is tall but open. Its occurrence on the Dubh Lochs of Shielton in Caithness is associated with this niche.

Schoenus nigricans

Sparling (1962, 1967a, 1967b, 1968) and Boatman (1960) examine the widespread occurrence of this species on western Irish blanket bog in some detail, pointing out that it can occur on ombrotrophic peats with a pH as low as 3.7. Lindsay *et al.* (1983) give a British location for *Schoenus nigricans* on blanket bog, in Islay, but further investigation of the site has revealed that there is a certain amount of flushing from nearby slopes. Sparling (1968) states that the records for Ireland are on "unflushed or slightly flushed blanket bogs". The latter accord with the conditions on Islay.

A single record for the species on ombrotrophic peats has also been found for mainland Britain, at Laxford Bridge in Sutherland. The site is a raised mire unit formed at the head of Loch Laxford, and the extensively patterned surface supports *Schoenus* tussocks at the Tl level. As on Islay, there is a suggestion of water flow through the pools in this part of the site, but the patterns are still quite typically ombrotrophic and the area concerned is clearly part of the ombrotrophic dome. *Schoenus nigricans* is a widespread species in Britain, especially in western Scotland, but most of its habitats are somewhat nutrient-rich and it is most abundant in base-rich habitats.

Pleurozia purpurea (see Figure 45)

A large number of survey sites in Caithness and Sutherland possess this species, and it appears to be almost uniformly distributed. From field observations it is perhaps more constant and more abundant in Sutherland and the west generally. It is common throughout western Scotland and western Ireland but is totally absent from England and Wales. It has a highly disjunct world distribution in cool, humid regions, being found elsewhere in Europe in Ireland, Norway and the Faeroes, and also in Alaska, Pacific British Columbia, the Himalayas and the West Indies (Ratcliffe 1969).

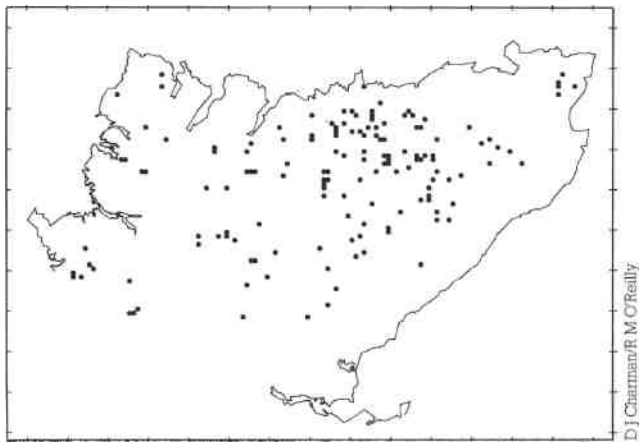


Figure 45 *Pleurozia purpurea*

Sphagna

One of the most important aspects of the peatland area is the abundance and variety of *Sphagnum* species present. Nowhere else in the British Isles is there such a large and continuous expanse of terrain dominated by this genus. Three species in particular are discussed here.

Sphagnum imbricatum and *S. fuscum*

Regional (see Figures 46 and 47) and national

Both these species are prominent hummock-formers (T3), and survey records show that they are most constant in central and eastern Sutherland and throughout Caithness, having a similar distribution.

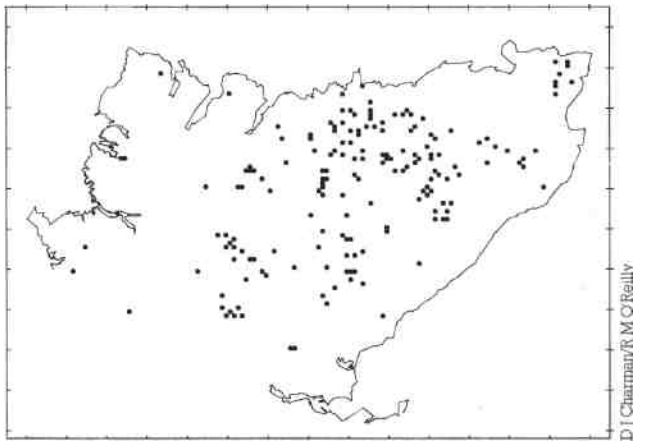


Figure 46 *Sphagnum imbricatum*

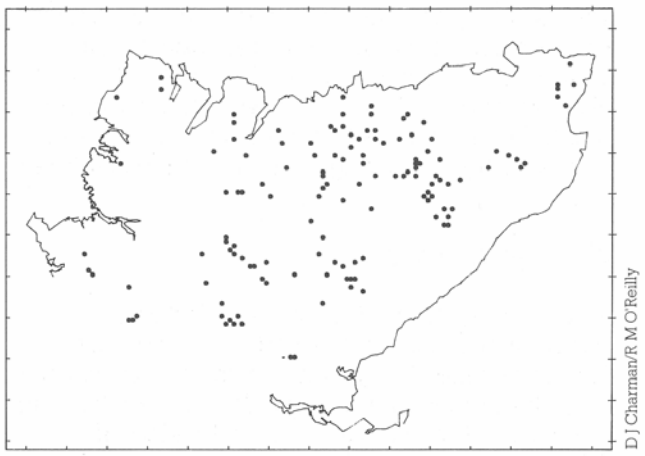


Figure 47 *Sphagnum fuscum*

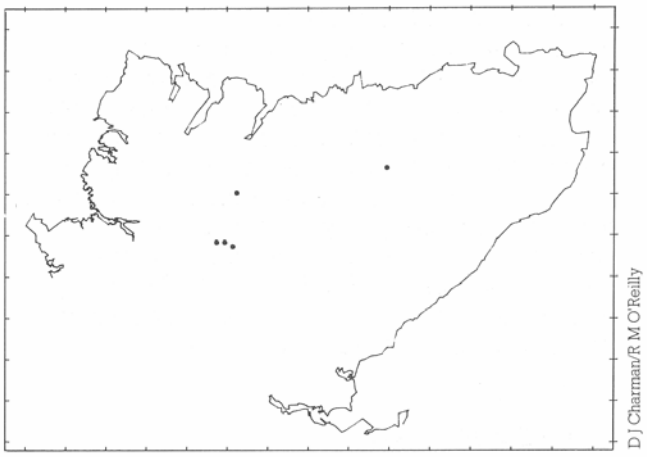


Figure 48 *Sphagnum pulchrum*

Both are noted as northern-continental species by Birks (1973) and Goode & Ratcliffe (1977). *S. fuscum* occurs at a generally higher level of hummock and over a wider range of altitude (0-1050 m) than *S. imbricatum* (mostly below 460 m). It is widespread in montane blanket bog in the Highlands. Caithness and Sutherland hold a high percentage of the British distribution of these two species. *S. imbricatum* is of particular interest, as it occurs widely and abundantly as a major component of south Pennine peat, although present-day vegetation is of a very different nature, lacking *Sphagnum* altogether (Tallis 1964c). The possible causes for this and the implications for Caithness and Sutherland are discussed in Chapter 5.

World

S. fuscum has a mainly circumpolar-boreal world distribution and is extremely frequent in Fennoscandia, whilst *S. imbricatum* is sub-oceanic and has a disjunct world distribution(Smith 1978). Flatberg (1984) has recently shown that the bog-dominant both in America and in western Europe is subsp. *austinii*. This deep brown subspecies is a hummock-former not only in Scotland but also in coastal British Columbia and adjacent Alaska.

Sphagnum pulchrum (see Figure 48)

This is a rare *Sphagnum* species, occurring only locally on the Solway mosses and in a few locations in north-western England and Wales, mostly on raised mires, and in valley mires in Dorset. Perry (1965) shows a single location further north than Wigtownshire, at Claish Moss, but our survey has discovered six locations, all in Sutherland. Most notably it is the dominant *Sphagnum* species around the low summit of Cnoc an Alaskie, where it grows in its typical position around the water table, at the Tl/Al transition. It grows in the altitude range of 120-300 m in Sutherland, mostly at the higher end of this range. This fits well with the range given by Perry (1965) of 8-300 m.

Sphagnum strictum

This most oceanic of the British *Sphagna* occurs widely in Sutherland, but mainly around the edges of the blanket bogs and on shallower peat or peaty gleys amongst steeper ground or moraines. It is typically found in wet heath communities with *Trichophorum, Molinia, Erica tetralix* and *Calluna* or in soligenous mires with *Molinia* and *Myrica.* The species is amphi-Atlantic and only slightly sub-oceanic in Europe. In Scandinavia it is probably most frequent in the uplands (approx. 200-700 m), where it is clearly minerotrophic, though mostly weakly so, and usually grows as a fringe at or slightly above the water's edge in "flarks" or pools.

Racomitrium lanuginosum (see Figure 49)

Large hummocks of this species are found throughout the mires of the two Districts, but in Caithness, except in high-level mires such as Knockfin Heights, it is generally associated with damaged, eroding sites. Towards the west it occurs more frequently on undamaged sites, even being found as part of the bryophyte layer within the Tl zone, but continuous cover on hummocks and ridges

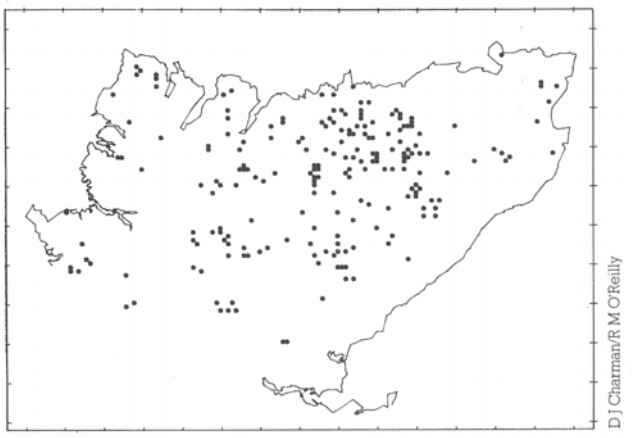


Figure 49 *Racomitrium lanuginosum*

tends to be an indicator of damage. Moore (1977) demonstrates that the large hummocks of *Racomitrium* on Claish Moss in Argyll have a very long history and are therefore likely to be entirely natural. Hummocks of *Racomitrium* are common in Ireland (Osvald 1949), but they are partly replaced on some raised mires by hummocks of *Leucobryum glaucum*, as at Mongan Bog in County Offaly (Tubridy 1984) and on blanket bogs in Connemara (Groenendael *et al.* 1975). This is an almost cosmopolitan moss, but it occurs as a community dominant mainly in highly oceanic areas.

Campylopus atrovirens

This common species of wet acidic rocks and mineral flushes in western Britain is also a widespread peatland species. It sometimes occurs on deep peat, but its more typical habitat is on disturbed, sometimes eroded, bog and on the shallower peats of wet heaths with *Trichophorum* and *Calluna.* It is an Atlantic species in Europe as a whole, though occurring as far east as the Black Sea.

Dicranum bergeri

This is a rare moss in Britain, regarded as an indicator of undamaged raised mires and a few low-level blanket bogs, where it forms conspicuous carpets or crowns low hummocks in association with *Sphagnum.* It was recorded from the Moss of Killimster, but during the present survey was found only at the Dubh Lochs of Shielton. It has a northern European distribution.

12 Analysis of site types

As a final stage in the analysis of peatland features, to provide a further basis for nature conservation evaluation, the variation between mire systems throughout the two Districts was examined on the basis of two major attributes. These were the vegetation groups derived from the earlier vegetation analysis and the information relating to microtopography obtained from survey. In the field, the surface structure is often the more striking and readily identifiable attribute because the vegetation almost invariably occurs as a complex mosaic within the structural patterns (see Chapters 1 and 2). By combining these, the overall character of the mire unit can be revealed, as illustrated by Lindsay *et al.* (1983) and Lindsay *et al.* (1985).

We assigned vegetation types derived from the floristic descriptions to individual sites. On the basis of information recorded on the original field sheet, these vegetation types were then allocated to particular zones within the microtopography. After vegetation types had been allocated to each site, the information was transferred from the Revelation data-base into TWINSPAN, where each site was treated as a single sample, with attributes of vegetation type rather than species. The resulting data matrix thus consisted of 399 such samples, each with a record of one or more vegetation types. This second-order analysis of TWINSPAN output is a technique successfully employed by Ratcliffe & Hattey (1982) in the analysis of lowland wetland communities in Wales. The approach allows the broad spectrum of vegetation to be classified from all samples irrespective of sites and then the sites from which samples were taken to be classified in turn on the basis of the combination of vegetation classes each site contains.

The TWINSPAN analysis, at the first level of division, isolated eroding mire from *Sphagnum-rich* types. The distribution of these two major types (see Figure 50) reveals both the extensive occurrence of

Figure 50 Distribution of sites (on the basis of 5 km squares) within the first major division of TWINSPAN for the analysis of site types from the NCC's Peatland Survey data. The two categories broadly represent - (a) *Sphagnum-rich* sites; (b) sites with some erosion or damage.

Comm. no.	Microtope and community type		Site type: Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10	Type 11	Type 12	Type 13	Type 14	Type 15
	Peat mounds	(T5)					I	I				I					I
	Erosion haggs	(T4)		I	I	I	II	I	I	I		II	III		V*	IV	V*
	Hummocks	(T3)	I	V	IV	V	V	V	V	V	V	V	V		V*	IV	IV*
	High ridge	(T2)	IV	V	V*	V*	V*	V*	V*	V*	IV*	V*	V*	III	V*	V*	V*
	Low ridge	(T1)	V*	V	V*	V*	V	V	V*	V*	II	V	V	V*	IV	V	IV
	Sphagnum hollow	(A1)	I	IV	V	V*	V	V	V	V	V	V	III	III	III	III	IV
	Mud-bottom hollow	(A2)	V*	V*	V	V	IV*	V	V*	V	III	IV	V*		V*	V	V*
	Erosion channel	(TA2)		II			I	I		I		II	V*		V*	IV	IV*
	Drought-sensitive pools	(A3)		III	III	III	III	IV	III	V*	V*	V*	III		III	II	II
	Permanent pools	(A4)		I	I	I	I	II		V	V*	V*	II				I
1	*Juncus squarrosus* thin peat			I		I	I	II			I		I		**II**	I	I
2	*Empetrum–Hylocomium splendens* mounds/hummocks			I		I	I	I	I	**II**	**III**	I				I	I
3	*Empetrum*–hypnoid moss slopes and hummocks		I	I	I	I	I	I	I	**II**		I	I		I	I	I
4	*Racomitrium–Cladonia* hummocks and hags			I	I	I	II	I	I	I	I	**II**		**III**	**III**	**III**	**III**
5	*Racomitrium–Molinia* hummocks and hags		I	II	II	I	I	II	**III**			I	I		I	I	II
6	*Racomitrium–Pleurozia* wet low ridge		I	**III**	**IV**	I	I	II	**III**	I	I	I	I		I	I	II
7	*Sphagnum fuscum* hummocks			II	I	II	I	II	II	**III**	**III**	I	II	I	I	II	
8	*Sphagnum imbricatum* hummocks		II	**III**	I	**IV**	**IV**	III	III	**IV**	**III**	**IV**	III	**III**	II	II	
9	*Sphagnum rubellum–Odontoschisma* dry ridges		I	I	I	II	**III**	I	I	I	I	I	I	I	I	I	
10	Mixed *Sphagna* (*S. rubellum* hummocks)		I	I	III	II	I	**III**	III	II	II	**III**	III	I	I	I	II
11	*Sphagnum papillosum–Molinia* ridge		I	II	I	I	**IV**	**III**	I	I	I	I	I	I			
12	*Sphagnum–Eriophorum vaginatum* ridge		I	II	II	I	**IV**	II	II	**III**	**III**	II	**IV**	II	II	I	
13	*Sphagnum compactum* ridge			I	II	I	I	I	II	I	I	II	**III**	II	I		
14	*Sphagnum magellanicum–S. subnitens*		**III**	I		I							I				
15	*Sphagnum magellanicum–S. rubellum* ridge		I	II	I	III	I	**III**	**IV**	III	I	**IV**	I	II	II	II	
16	*Sphagnum–Arctostaphylos–Betula nana* mire			I		**II**	I	I		**III**	II	I	**V**	I	I	I	
17	*Sphagnum papillosum–Carex pauciflora*			I	II	I	I	I	I	I		I			**II**	I	
18	*Rhynchospora alba–Sphagnum* low ridge			I	**III**	I		I	I						I		
19	*Campylopus atrovirens* low ridge			**II**	**II**	I	I	I	I	I			I		I	I	II
20	*Schoenus–Molinia* mire		I	**II**	**II**		I										
21	*Carex panicea* damaged mire			I		I	I	I	I	I		I	I		I	**III**	II
22	*Narthecium ossifragum* "runnel"		I	I		I	I	I	I			I	I			I	I
23	Microbroken mire						I	I				I		**V**	I	I	**III**
24	*Sphagnum cuspidatum–Eleocharis multicaulis*							**II**				**II**					
25	Pure *Sphagnum cuspidatum* carpets			I		II	**III**	I		I	**III**	I	I		I	I	II
26	Typical *Sphagnum cuspidatum* carpets			II	I	**IV**	**IV**	**III**	IV	IV	I	IV	II	**III**	II	II	I
27	*Sphagnum pulchrum* carpets						**I**	**I**							I		I
28	*Sphagnum cuspidatum–Carex limosa*		I	I	**IV**	I	I	I	II	I						I	
29	*Eleocharis multicaulis* mud-bottom hollows			I	**III**	I	I	I	I	I		I	I				
30	*Rhynchospora alba* mud-bottom hollows		I	I	**III**	I	I	I	II	I					I	I	
31	*Rhynchospora fusca* mud-bottom hollows									**I**							
32	*Sphagnum auriculatum* bog pools		I	II	II	II	II	IV	IV	**IV**	III	II	III		II	II	II
33	Deep pools			II		II	**III**	IV	III	**IV**	**V**	**IV**	III		III	I	II
34	*Molinia–Myrica* ridges (ladder fen)		**IV**	II	III		I										
35	*Carex rostrata–C. lasiocarpa* (ladder fen "flarks")		**V**	**III**	II		I										

Table 4

Synoptic table showing the levels of constancy with which the microforms and communities occur in the site types identified in the Caithness and Sutherland blanket bogs. The Roman numerals indicate the level of percentage constancy displayed by microforms and communities in each site type: V- 100-81%; IV- 80-61%; III - 60-41 %; II - 40-21 %; I - 20-1 %. Asterisks indicate microforms which are particularly abundant within a site type. Numerals relating to communities which characterise a site type are highlighted.

actively-growing mire over a wide area of the region and also the concentration of erosion in central and western mires, leaving the low-lying flows of Caithness relatively free from its effects.

In all, 15 site types were identified. These can be seen in Table 4, where the results are expressed in synoptic form because of size constraints, but the raw data are readily available on request. The majority of site records in the Revelation data-base were then assigned one of these site type codes, the exceptions being the true fen sites (as discussed previously: see Chapter 10), which are mainly found within the region of shelly boulder clay in the agricultural lowlands of Caithness.

Site types of Caithness and Sutherland

There follows an account of each site type.

Site type 1: Ladder fens (see Figure 51)

General appearance

These sites always lie on gently-sloping ground and are often characterised at the upslope limit of the site by a marked zone of upwelling or constricted flushing. The expanse of ladder fen forms a smooth floor to what is usually a gently-sloping and wide zone of water collection and seepage, but, unlike the more normal valley mire, is quite distinct in having no central watercourse. Instead the pools of open water lie at right angles to the direction of seepage. The site type is often best distinguished from a distance by the relative prevalence of taller species such as *Molinia caerulea, Carex lasiocarpa* or *Carex rostrata*.

Surface microtopes

The pattern is distinctly low-relief, with few T3 hummocks. The bulk of the ridges are a mixture of high and low ridge (T2/T1), but the nature of the surface is much more humified and solid than typical T1 ridge. Al hollows are generally completely absent, and the aquatic phase is dominated by A2 mud-bottom hollows or "Harks". The ridges and flarks between them form narrow sinuous lines across the direction of seepage, but their overall trend is straight, rather than the typically arcuate pattern found on ombrotrophic surfaces.

Vegetation

The great majority of examples encountered can be classed under a limited range of vegetation types which are characterised by the abundance of *Molinia* and of the presence of *Carex lasiocarpa* or *Carex rostrata* within a background mosaic of

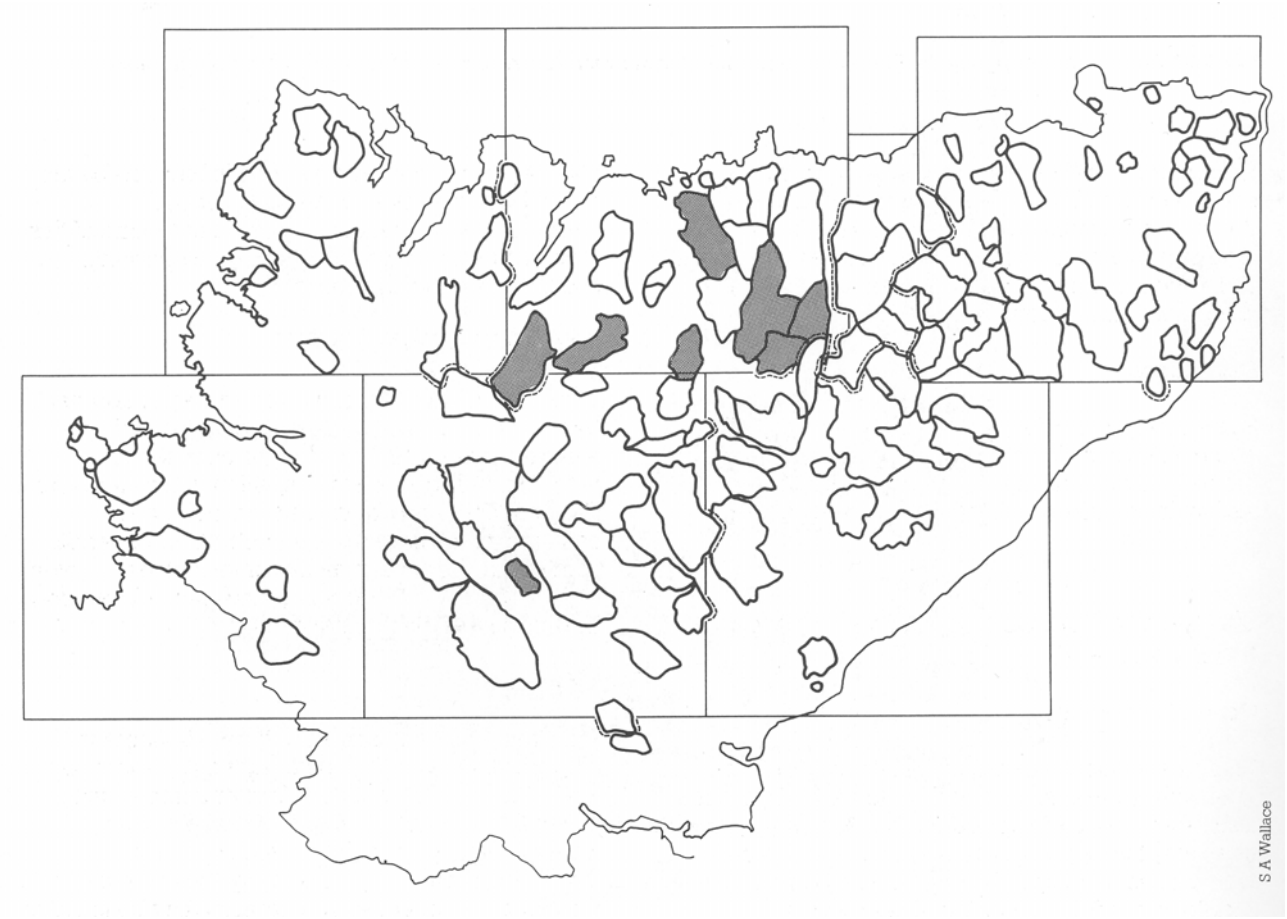


Figure 51 Distribution of Site type 1 - Ladder fens. All macrotopes with a record for the type are tinted.

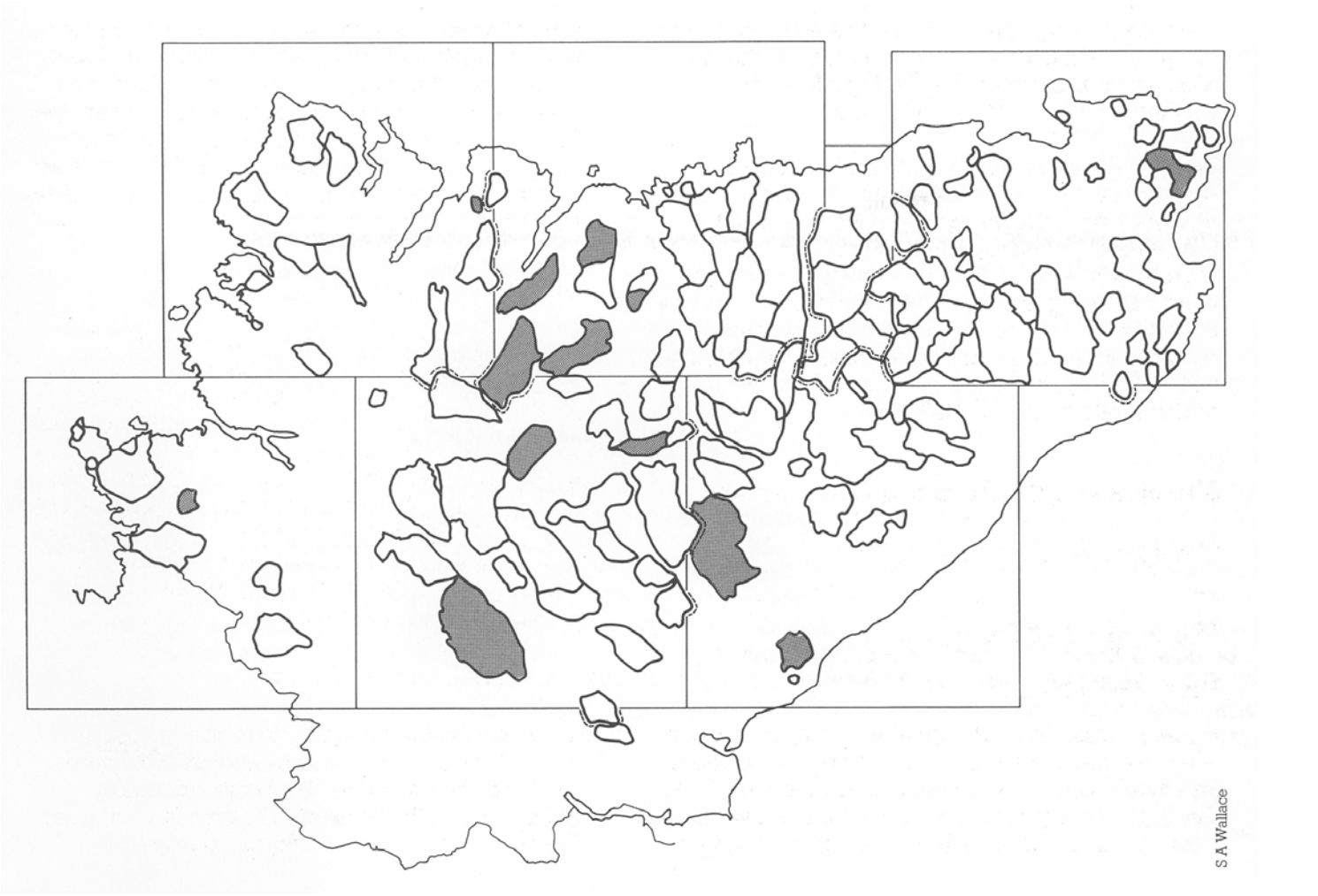


Figure 52 Distribution of Site type 2 - Flushed bog and valley mire transition. All macrotopes with a record for the type are tinted.

Sphagnum papillosum, Erica tetralix, Potentilla erecta and *Narthecium ossifragum. Calluna*-dominated *S. imbricatum* hummocks (rather than the *S. fuscum* typical of such places elsewhere round the globe) occur as isolated mounds, as do occasional *S. rubellum* and *Racomitrium* hummocks.

Distribution

So far restricted to the bioclimatic zones 02.H1/B2 and H2/B2, records for this type indicate a distinctly central distribution, the centre of this distribution also falling within one of the most active areas of afforestation.

Site type 2: Flushed bog and valley mire transition (see Figure 52)

General appearance

This type spans the transition between ombrotrophic mire, valley mire and true ladder fen and as such has a somewhat variable appearance. It is mostly found as an anastomosing pattern of ridges and channels within a basin topography (which may lie on a saddle or spur), but it can, particularly when occupying a saddle, possess deep A3/A4 pools. Within a valley mire, on the other hand, it is recognised by the mosaic of hummocks and channels lying between the zone influenced by the central water-track and the outer zone of ombrotrophic vegetation. A particular feature of this type in ombrotrophic conditions is the common occurrence of quaking mire.

Surface microtopes

These depend on the particular character adopted by the type, but within valley mires the major features consist of T2 mounds (as opposed to hummocks) and A2 channels, within which individual T3 hummocks and areas of Tl low ridge are common. In the case of more ombrotrophic saddle/ spur mires, the relief may be somewhat less uneven, with wide areas of T2 ridge giving way to Tl around the margins of deep A3/A4 pools.

Vegetation

The characteristic vegetation type is *Sphagnum magellanicum* with *S. subnitens*, the latter forming T2/T3 hummocks, whilst the former dominates the lower T1 zone. Ombrotrophic examples of this mixture, usually more dominated by *S. magellanicum*, represent one of the few types where *Vaccinium oxycoccoslmicrocarpum* may be found in the two Districts. *S. imbricatum and Racomitrium* communities, particularly associated with *Molinia*, are common on ombrotrophic examples, but less so

in valley mire conditions (though possible occurrence of the so-called "lax" *S. imbricatum* var. *affine*, often mistaken for *S. papillosum*, might repay-further investigation). In valley mires the frequent presence of *Carex limosa* and *C. lasiocarpa* communities within the *Sphagnum-dominated* mounds, which are often predominantly of *S. subnitens* in such cases, provides a link with ladder fen communities. However, the arrangement of surface patterns differs fundamentally between the two types. In addition, the A2 channels are typically richer in species than in ladder fens, with occasional records of *Utricularia vulgaris, Eleocharis multicaulis* or *Rhynchospora alba* communities.

Distribution

The general trend is somewhat more western than for true ladder fens, though a record from the hills outside Brora indicates that this is not exclusively so. A single record from north-eastern Caithness represents the mixed valley mire complex of the Lochs of Auchengill, which shows a transition to ombrotrophic mire outwards from the central water-track.

Site type 3: Low-relief 'western' blanket bog

(see Figure 53)

General appearance

Of the two types characteristic of quaking mire, this is the commoner type. It is dominated by the middle range of microtopography, though occasional large *Sphagnum* or *Racomitrium* hummocks dot the mire expanse. Free water is generally limited to mud-bottom hollows, but deeper pools are often found where the gradient is gentlest. The ground is marked by a general feeling of softness, and *Sphagnum*, rather than free water, dominates the surface, though bare peat is also a common component at the Tl/Al transition.

Surface microtopes

Over the majority of the surface, Tl low ridge and richly-vegetated A1/A2 hollows form an intimate mosaic. Only where the gradient is gentlest and A3 pools form is there any clear orientation to the pattern. Areas of T2 ridge are abundant, but are unusually soft. T3 hummocks are the only feature to break an otherwise smooth appearance.

Vegetation

Dominated by a *Racomitrium-Molinia-Pleurozia purpurea* community, the ridges are markedly 'western' in their vegetation. The typical

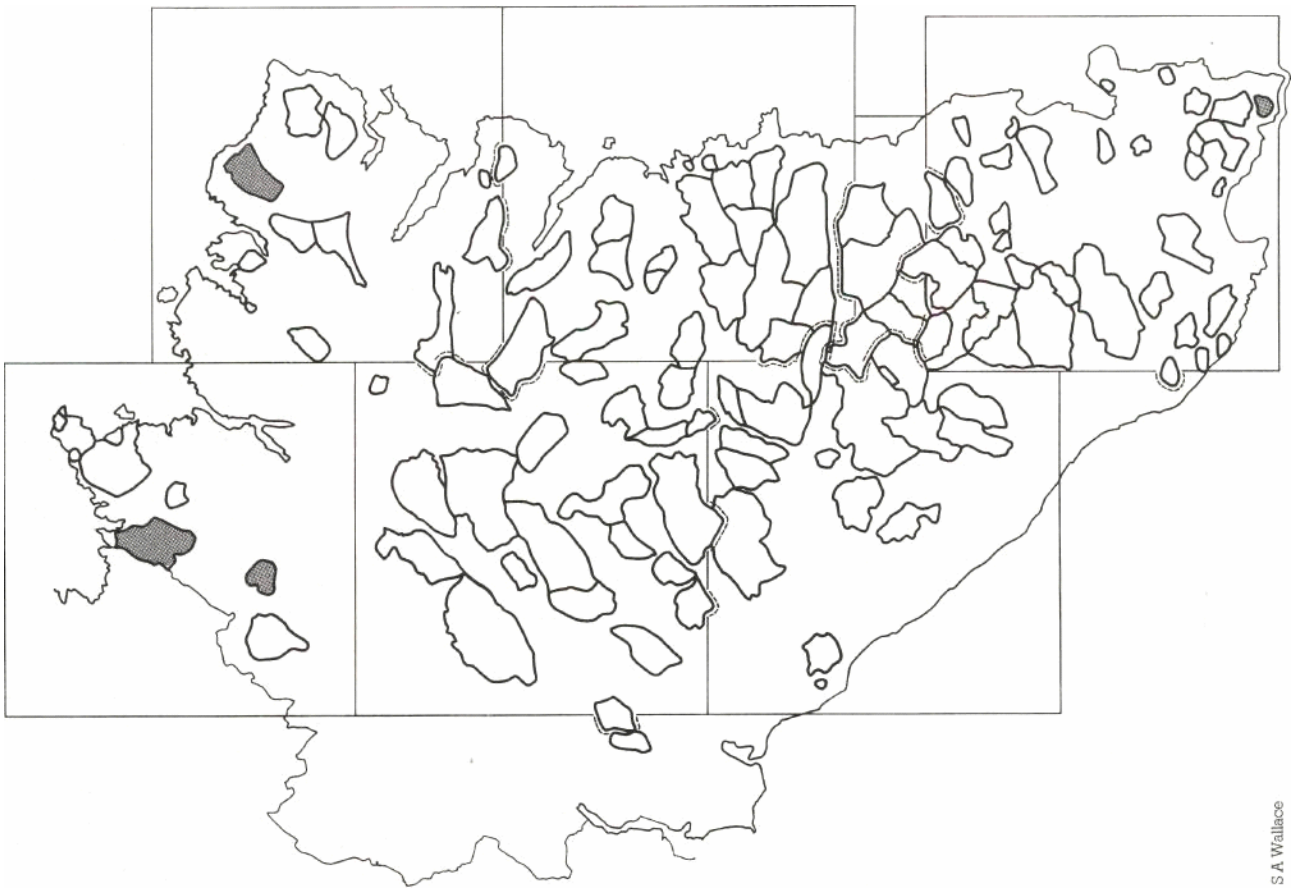


Figure 53 Distribution of Site type 3 - Low-relief Western' blanket bog. All macrotopes with a record for the type are tinted.

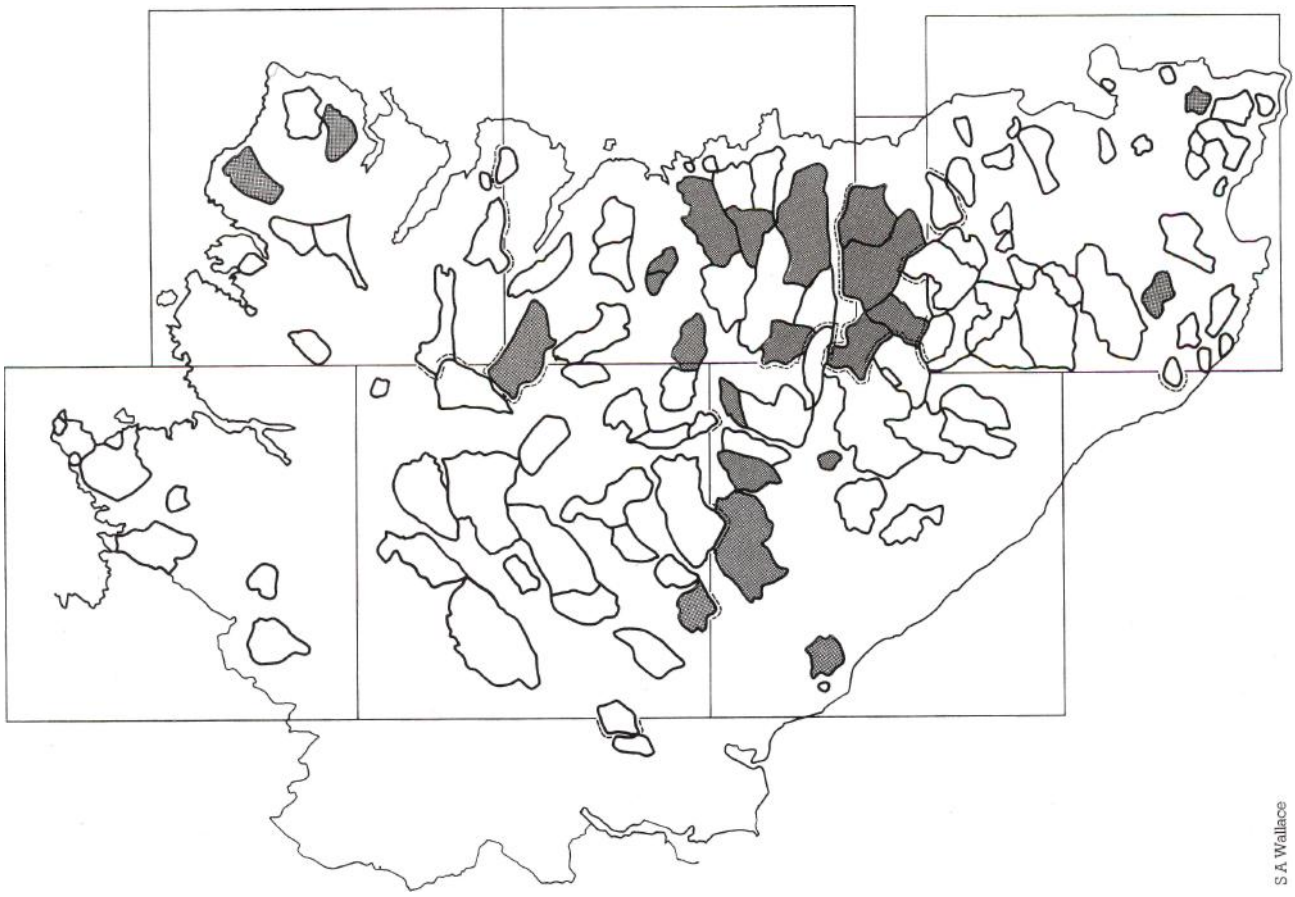


Figure 54 Distribution of Site type 4 - Low-relief northern boreal blanket bog. All macrotopes with a record for the type are tinted.

Rhynchospora alba-Drosera intermedia mud-bottom hollows of western areas are also restricted to this type, and *Campylopus atrovirens* carpets, often associated with a mixed *Sphagnum* sward which includes *S. tenellum*, are characteristic. This is a type very similar to that described for parts of Coladoir Bog on Mull (Lindsay *et al.* 1983) and in mires on the Outer Hebrides (Goode & Lindsay 1979; Hulme 1985).

Distribution

Entirely restricted to the west coast, this type characterises the Sutherland peatlands west of the Moine Thrust. It is a type which could have been expected much more widely through central Sutherland if that geological boundary were not there.

Site type 4: Low-relief northern boreal **blanket bog** (see Figure 54)

General appearance

Found typically on spurs or saddles, this type appears initially similar to low-relief 'western' bog, but on closer inspection it is generally found to have a more 'corrugated' appearance than the western type. This appearance is derived from the more clearly defined orientation of the surface microtopography. It also has more obvious *Sphagnum* and dwarf shrub layers than the western type. It frequently contains extremely soft quaking mire.

Surface microtopes

The dominant elements are T2 and Tl ridge, with Al hollows. These combine to form a surface topography which is not as smooth as the more western type, being distinctly raised into a series of corrugations which generally reach T2 level. Higher T3 hummocks are scattered through this, and in places the corrugations give way to pools of A2 or A3 free water.

Vegetation

Far more strikingly dominated by *Sphagnum* than the western type, the general communities comprise various dwarf shrub *Sphagnum* communities, including frequent *S. imbricatum* types. The characteristic vegetation, however, is *Sphagnum-Betula nana-Arctostaphylos uva-ursi*, which is common on both T1 and T2 ridges growing through the soft *Sphagnum* sward. This and the abundance of *S. papillosum* make it unique to Caithness and Sutherland as a blanket bog community. Also within the vegetation mosaic is the typical *S. cuspidatum*

hollow community, with *Drosera anglica, Eriophorum angustifolium* and *Menyanthes trifoliata*.

Distribution

Largely shared out between the H2/B2 of both hyperoceanic and euoceanic zones, with an extensive area also within zone 02.H1/B2, this type is predominantly central, though with both western and eastern outliers.

Site type 5: *Eriophorum vaginatum* 'eastern' blanket bog (see Figure 55)

General appearance

One of the most characteristic site types of the two Districts, this is commonly found on watersheds and valleyside flows where the ground is dominated by high ridges and mud-bottom hollows or deeper pools. The usual surface is more firm than that described for the previous two types, being more akin to the solid ridges of a ladder fen. The extent of free water is an obvious feature, usually forming linear rather than rounded pools. The vegetation has a somewhat irregular appearance, owing to the presence of *Eriophorum vaginatum* tussocks mixed with dwarf shrubs at the higher levels of the microtopography.

Surface microtopes

Forming wide bands between A2/A3 pools, the typical surface is dominated by T2 high ridge. T3 hummocks are common as isolated features, and very occasional areas of erosion hags can be found, usually towards the margin of sites (e.g. Pearsall 1956). Although the majority of free water is in shallow A2/A3 hollows, more typical A3 pools are also found where the gradient is gentlest.

Vegetation

The most significant community recorded for this site type is the *Sphagnum pulchrum* complex, which mainly occurs towards the south-western limit of this site type. In more ordinary conditions the type is characterised by a *Sphagnum* mosaic within which *Eriophorum vaginatum* and *Odontoschisma sphagni* are common components together with frequent *S. imbricatum* and *S. rubellum* T3 hummocks. Aquatic phases are normally dominated by typical *Sphagnum* hollows, 'pure' Al *Sphagnum cuspidatum* hollows or *S. auriculatum-S. cuspidatum-Menyanthes* pools.

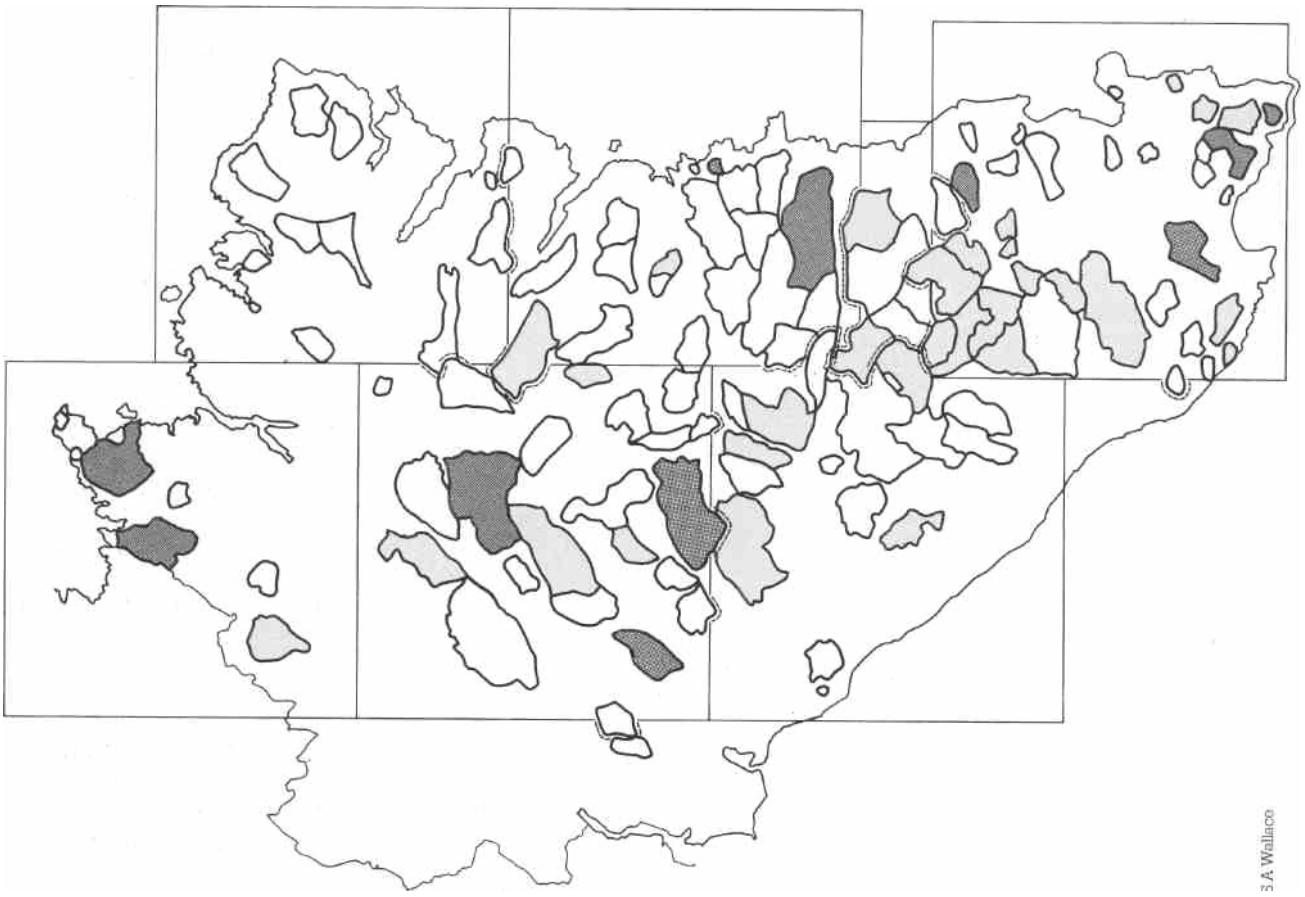


Figure 55 Distribution of Site type 5 -*Eriophorum vaginatum* 'eastern' blanket bog. The dark tint represents the macrotope which contains the largest example of the type within each bioclimatic zone. The light tint represents other macrotopes with records for the type.

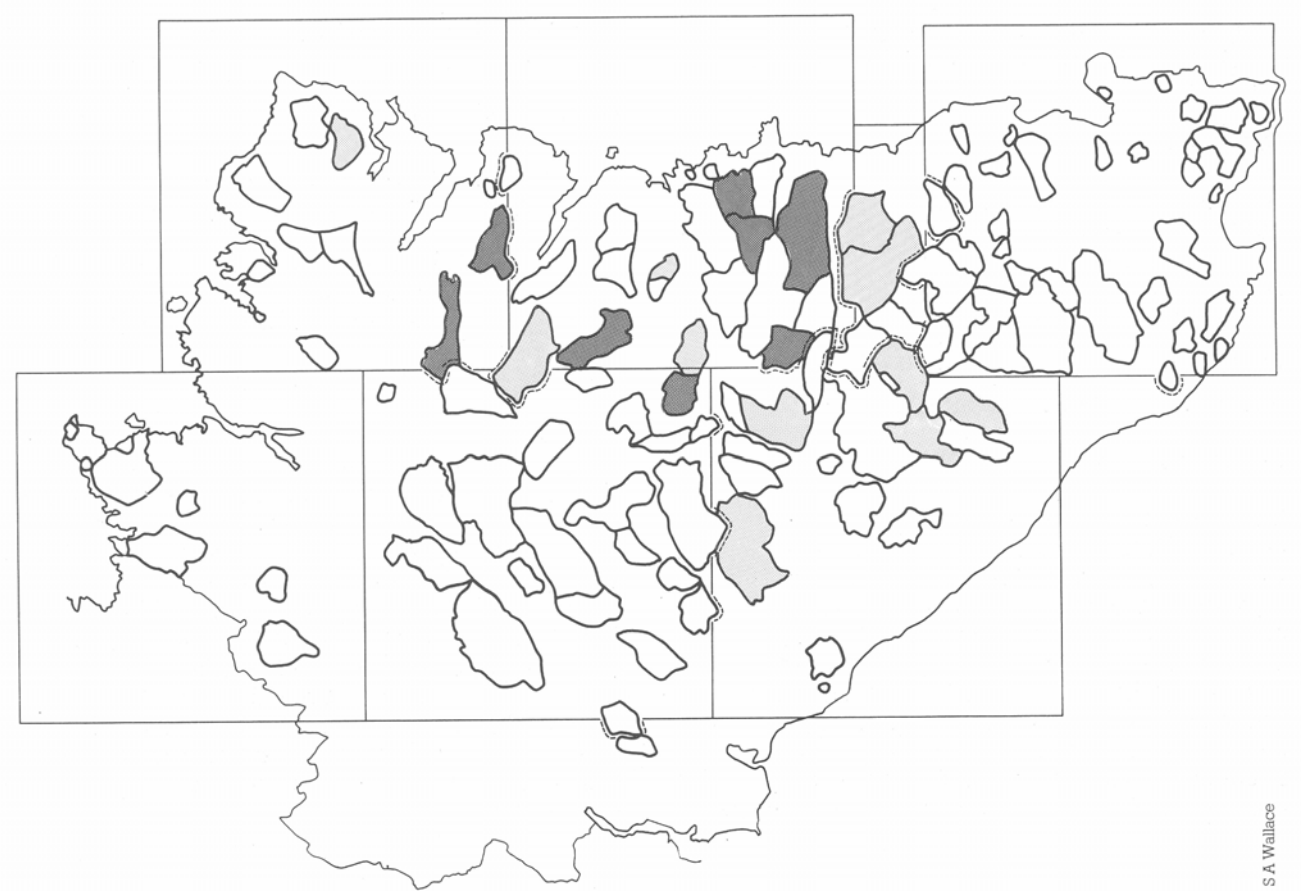


Figure 56 Distribution of Site type 6 - *Molinia-Sphagnum-Menyanthes* blanket bog. The dark tint represents the macrotope which contains the largest example of the type within each bioclimatic zone. The light tint represents other macrotopes with records for the type.

Distribution

The most widely distributed of the site types, it nevertheless shows a distinct trend towards the eastern and southern part of the two districts. Its prevalence in Caithness perhaps underlines the somewhat drier nature of the climate and links the type with the *Eriophorum vaginatum* mires of more southern blanket mires.

Site type 6: *Molinia-Sphagnum-Menyanthes* blanket bog (see Figure 56)

General appearance

Typically occurring as gentle valleyside flows or saddles, the dominance of *Molinia* in the vegetation of this type indicates a certain amount of surface seepage, either from upslope parts of the mire or even perhaps from mineral ground. The large proportion of the surface taken up by free water is perhaps the most striking feature when one walks through the site, with ridges only barely prevailing over open water as the major phase. Both pools and ridges tend to be linear, though the most level ground is dominated by deep, rounded pools. Although quaking ground is not strictly a common feature of this type, the narrow ridges between pools can be distinctly unstable, giving the appearance of quaking mire.

Surface microtopes

The dominant microforms are T2 high ridge and A2 hollows, though these latter give way dramatically to large A3/A4 pools where the ground is almost level. The A2 hollows are linear and abundant in much the same fashion as those found on the hyperoceanic Claish and Kentra Mosses on the Ardnamurchan Peninsula, which also have the same eccentrically sloping morphology. T1 low ridge is abundant, but not dominant, forming a fringe to most areas of transition between ridge and hollow. Hummocks are also common.

Vegetation

Most of the ridge communities are characterised by *Sphagnum-dwarf* shrub types, particularly with *S. rubellum* and *S. papillosum.* However, *S. imbricatum* T3 hummocks are common, and higher hummocks are dominated by the eastern community of hypnoid *mosses-Empetrum.* The abundance of *Molinia-Sphagnum* and *Racomitrium-Molinia-Pleurozia purpurea* distinguishes the type. The large extent of aquatic communities is another characteristic of this type, however, with A1 hollows of 'typical'

S. cuspidatum, S. cuspidatum-Eleocharis multicaulis and the transition *S. cuspidatum-S. papillosum.* In the A2 hollows and A3/A4 pools, *S. auriculatum-S. cuspidatum* is the dominant in shallower areas, whilst typical deep pools have *Menyanthes* or are devoid of vegetation.

Distribution

The type is largely central in distribution, with a distinct western 'tail'. It is concentrated in 02.H2/B2, but is also spread between the hyperoceanic and euoceanic parts of H1/B1.

Site type 7: Hyperoceanic patterned blanket **bog** (see Figure 57)

General appearance

This is perhaps the closest that any of the Caithness and Sutherland mires come to the extreme patterning of Claish and Kentra Mosses on the Ardnamurchan Peninsula. Patterning is linear, with a marked corrugation of the surface, but much of the ground is extremely soft and quaking (unlike that of the Ardnamurchan mires). With *Molinia* as one of the community dominants, the vegetation has a greener appearance than many of the mires further east. The type supports a nationally rare mire community in the form of *Rhynchospora fusca* A2 hollows, on the extreme west coast.

Surface microtopes

Predominantly T2 and T1 ridges forming narrow ribbons between equally narrow A2 mud-bottom hollows, the type also possesses A3 pools in places. T3 hummocks are abundant but not dominant.

Vegetation

The overall character is one of *Molinia*-dominance and of western communities such as *Carex limosa-S. cuspidatum* Al hollows, *Rhynchospora alba* in both ridges and hollows, and Myrica-hypnoid mosses on drier ridges. *Sphagnum imbricatum* hummocks are abundant, as is mixed *Sphagnum* with dwarf shrubs. *Racomitrium* occurs both as hummocks with *Molinia* and within the ridge level as a mat with *Pleurozia purpurea.* As mentioned above, the most significant single community recorded within this type is the A2 *Rhynchospora fusca* mud-bottom hollow, which is recorded from five other ombrotrophic mire sites in Britain, two of those being Claish and Kentra Mosses.

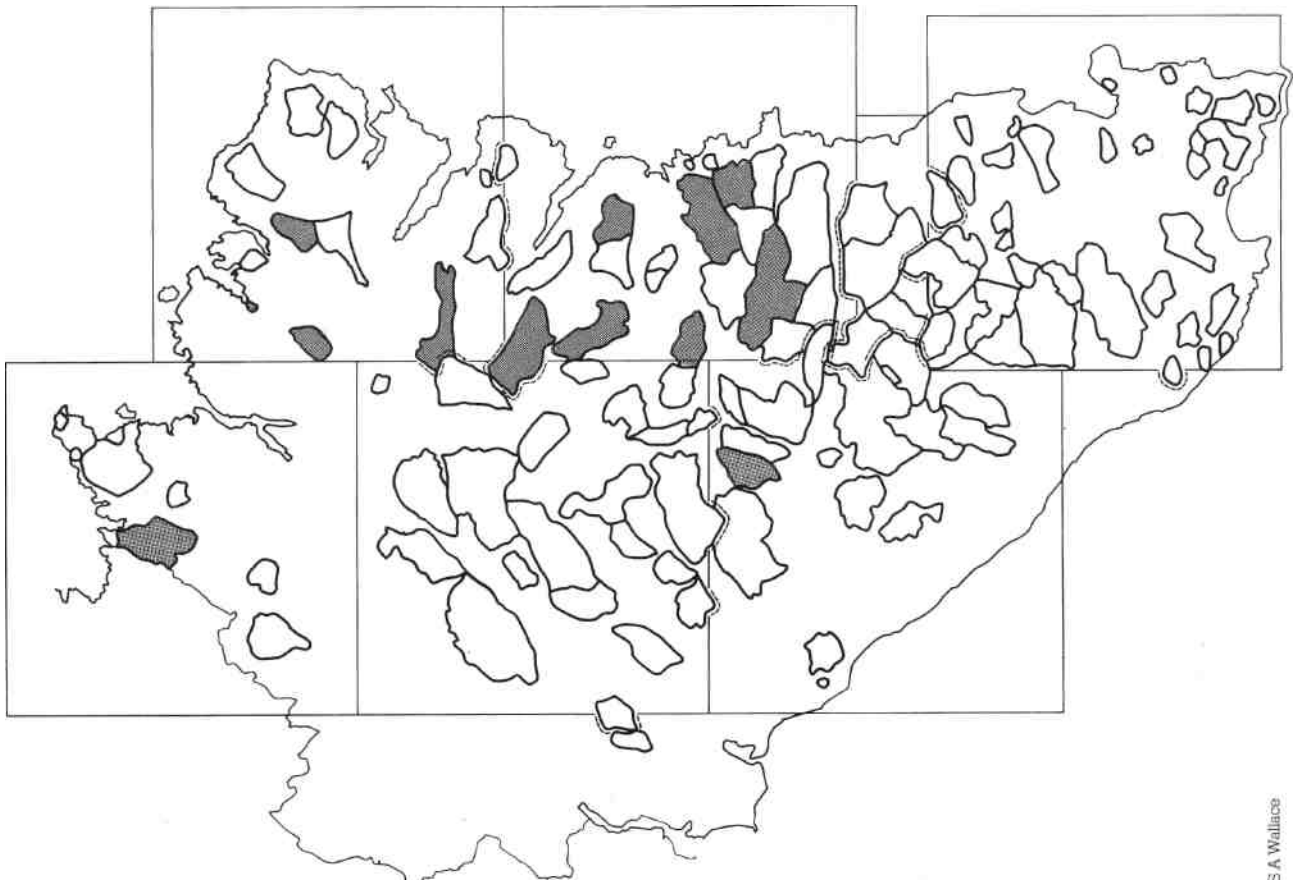


Figure 57 Distribution of Site type 7 - Hyperoceanic patterned blanket bog. All macrotopes with a record for the type are tinted.

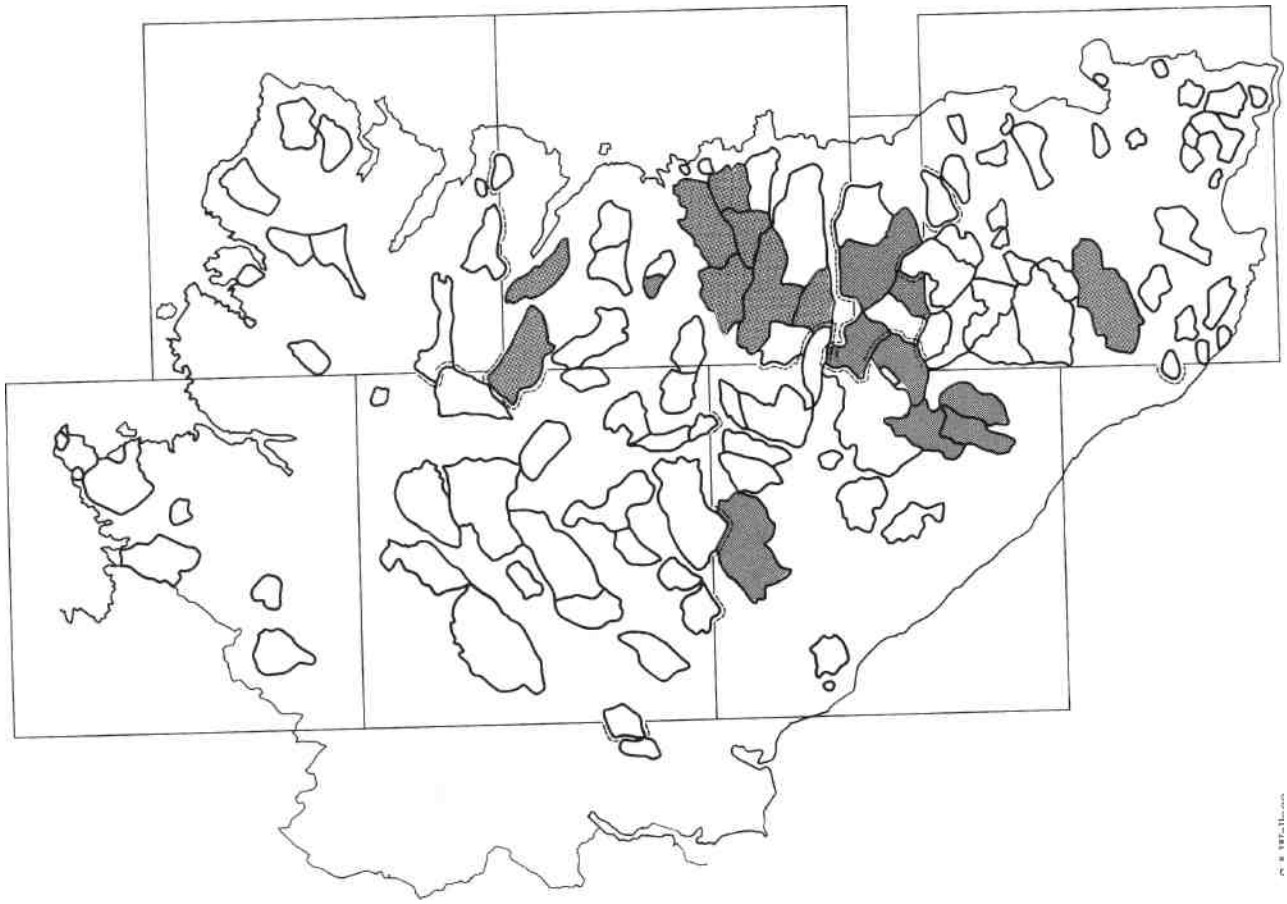


Figure 58 Distribution of Site type 8 - Central watershed blanket bog. All macrotopes with a record for the type are tinted.

Distribution

Markedly north-western, the type is perhaps best expressed west of the Moine Thrust, but it extends as far east as Strathy.

Site type 8: Central watershed blanket bog

(see Figure 58)

General appearance

This type is one of the western variations on the type which dominates the watersheds in central Caithness. Like the Caithness type, it is characterised by a relative abundance of northern boreal dwarf shrubs and is marked by the complete lack of any more typical western indicators such as *Molinia* or *Potentilla erecta,* but it also has more abundant soft low ridge than typical Caithness watersheds. Although the surface pattern of large, deep pools reveals a close link with eastern watersheds, the soft *Sphagnum* carpets and abundance of *Betula nana* and *Arctostaphylos uva-ursi* also reveal a close affinity to Site type 4: low-relief northern boreal blanket bog.

Surface microtopes

From the air, the pools can be seen to be widely spaced and oval, rather than truly rounded. The dark coloration of the water indicates that they are deep, typically A4. The wide ridges between them have only limited Al hollows, the majority of these being restricted to the outer edge of the patterning. Tl and T2 ridges predominate, with T3 hummocks dotted regularly across these.

Vegetation

Sphagnum communities dominate the vegetation of this type with *S. magellanicum* in particular recorded from the T1 level. *S. fuscum* occurs more abundantly in this type than any other, as regular T3 hummocks, and the majority of other *Sphagnum* communities identified in the region are extensively recorded. Particularly significant, however, is the abundance of the *Sphagnum-Betula nana-Arctostaphylos* community. It occurs with T2 high ridges of *Sphagnum papillosum* or *S. fuscum,* but also within T3 hummocks of *Hylocomium splendens* and *Empetrum nigrum.* The A3 and A4 pools tend to have extremely limited vegetation cover. Only the true A2 hollows have extensive *S. auriculatum-S cuspidatum* communities. The remainder of the water bodies have only *Menyanthes* or are devoid of vegetation.

Distribution

The type is centred on mires within the Halladale and Strathy catchments, but there is something of an

eastern trend, with a number of records from the Dubh Lochs of Shielton complex.

Site type 9: 'Eastern' watershed blanket bog

(see Figure 59)

General appearance

This is the great "bog-lake complex" type (see Chapter 1), which is similar in appearance to some tundra systems but which has a much greater depth of peat than is possible under permafrost conditions. The widely spaced *dubh lochain* are often more than 2 m deep, perhaps the deepest encountered being to the south of the main Dubh Lochs of Shielton complex, where the unconsolidated bottom was measured as approximately 3.5 m beneath the water surface. Unfortunately this particular area is now isolated, surrounded by forest ploughing.

Surface microtopes

Obvious features are the A3/A4 pools, the absence of T1 low ridge and the wide, dry expanses of T2 communities which predominate between the large open water bodies. Al hollows are common around the margins of the pool complexes, but they are not so generally common throughout the mire unit as to be regarded as dominant.

Vegetation

The extent of dry T2 ridge is emphasised by the abundance of the *Empetrum-Aulacomnium palustre-Hylocomium splendens* community, recorded more abundantly from this type than from any other. Within this T2 expanse, the *Sphagnum-Betula nana-Arctostaphylos uva-ursi* community is common, but not as frequent as in the previous type. The presence of extensive Al *Sphagnum* hollows round the margins of the mire macrotope is indicated by the abundance of 'pure' *S. cuspidatum* carpets, this pure variety being particularly characteristic of Caithness watershed mires. The *S. imbricatum*-dwarf shrub and *S. fuscum*-<dwarf shrub communities are also common.

Distribution

Entirely restricted to Caithness, the type is characteristic of the remaining large peat expanses. The type is not found elsewhere in Britain.

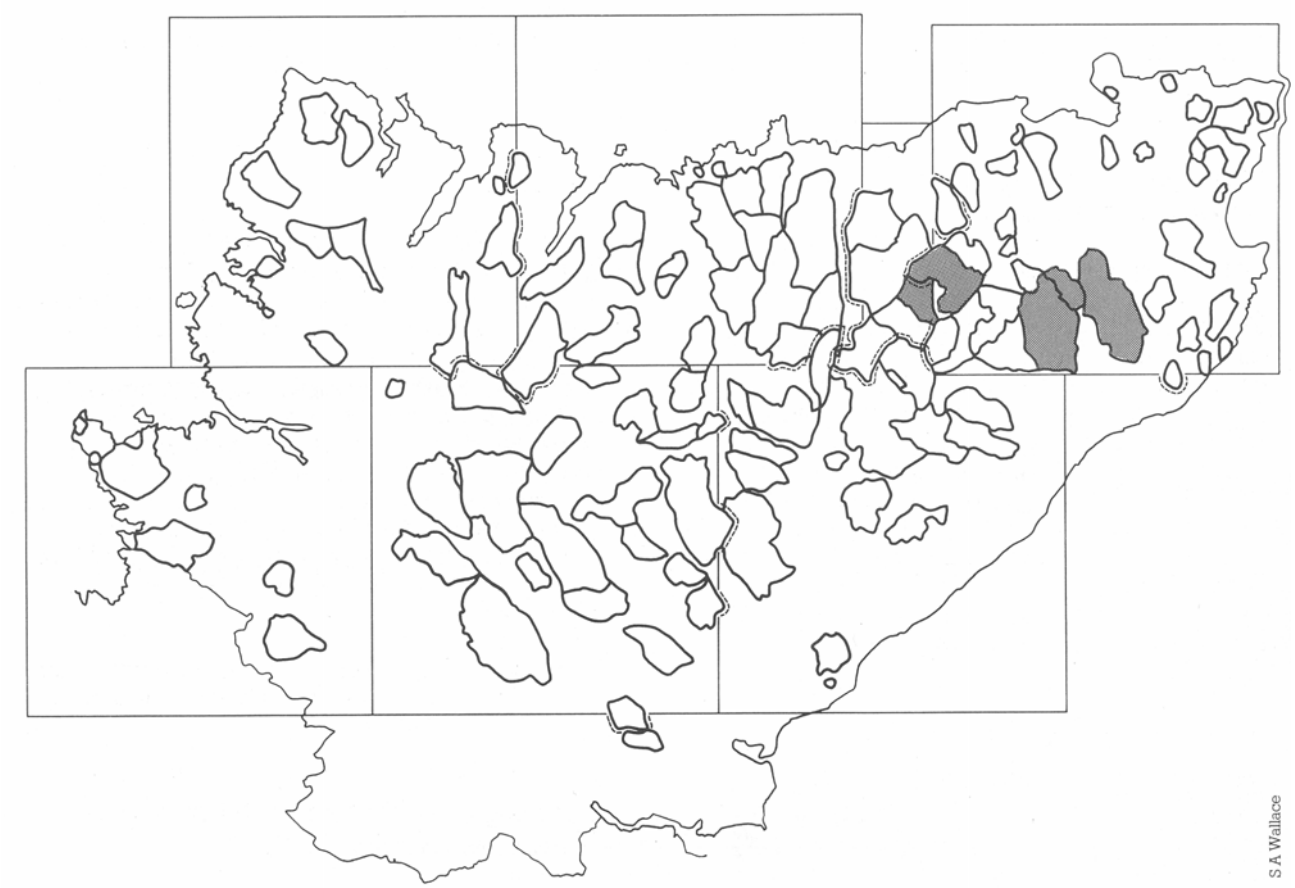


Figure 59 Distribution of Site type 9 - 'Eastern' watershed blanket bog. All macrotopes with a record for the type are tinted.

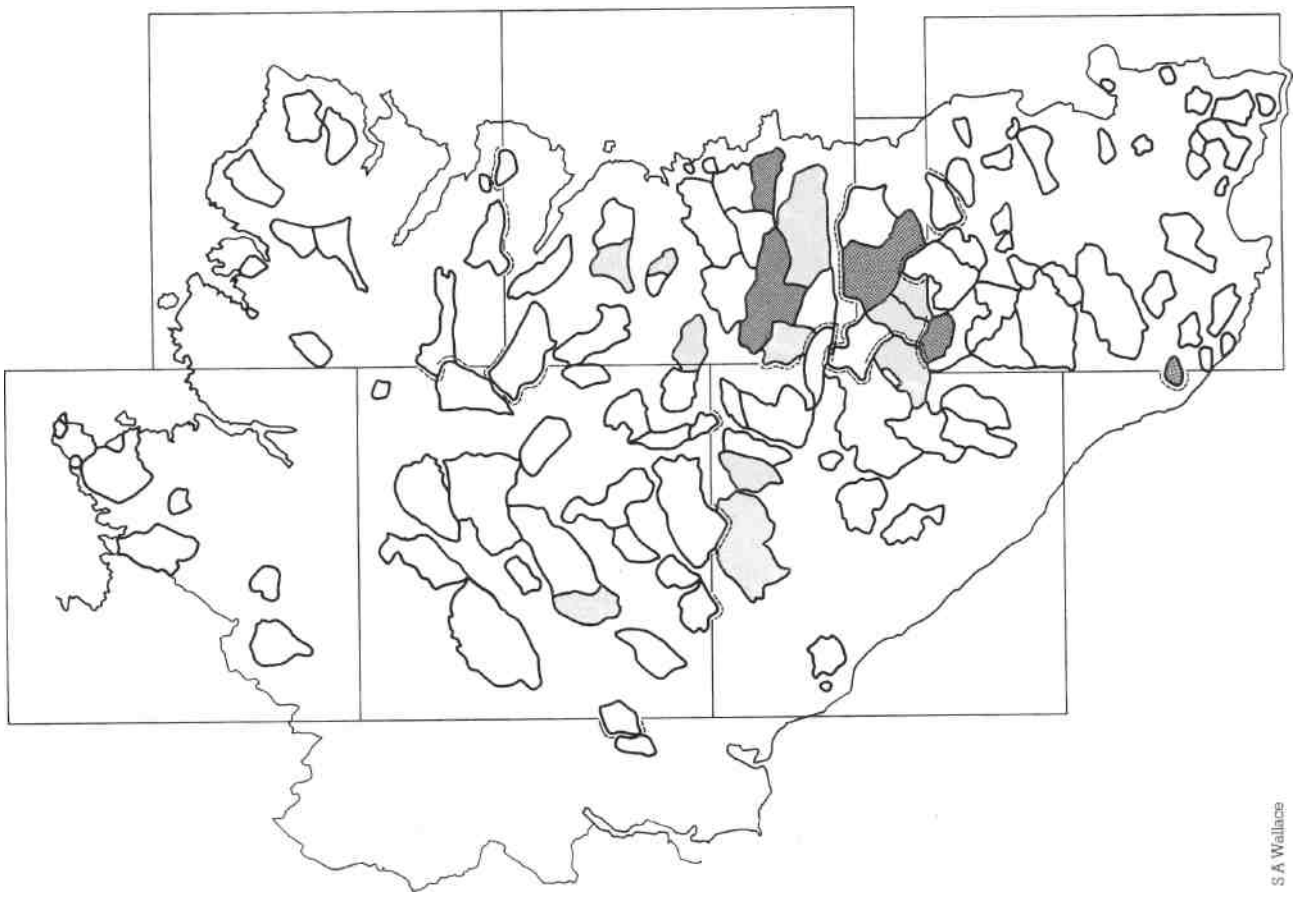


Figure 60 Distribution of Site type 10 - *Racomitrium* watershed blanket bog. The dark tint represents the macrotope which contains the largest example of the type within each bioclimatic zone. The light tint represents other macrotopes with records for the type.

Site type 10: *Racomitrium* watershed blanket bog (see Figure 60)

General appearance

This type crosses the boundary between undamaged and disturbed sites. Where the bog surface on a watershed is drier than that described for Site type 8, the lower levels of the pattern become dominated by a *Sphagnum-Cladonia* mosaic and the higher levels have increasing amounts of *Racomitrium,* now in a hummock form rather than as a low-lying mat. The impression is of a more irregular surface and all ridge areas are firm, but nowhere is there extensive bare peat. Water is extensive, as oval pools, but the pool edges are sharply defined, often with varying heights of 'peat-cliff.

Surface microtopes

A3/A4 pools are the dominant feature, with many areas having such closely-spaced oval pools that the solid ridges between can seem quite precarious. The presence of both erosion hags and gullies is generally restricted to the margins of sites, whereas the main expanse of T2 ridge is accompanied by large T3 hummocks, with areas of T1 low ridge and A1/A2 hollows around the fringes of larger pools.

Vegetation

The bulk of the ridge vegetation falls into the *Sphagnum*-dwarf shrub community, but also common are *Sphagnum-Cladina-Pleurozia purpurea* and-S. *rubellum-S. tenellum-Cladina.* The type is marked by its much higher frequency of *Trichophorum*-bare peat than in previous types, as well as, of course, the *Racomitrium-Empetrum* and *Racomitrium-Cladina* communities. Hollows and pools have a limited vegetation cover of *S. auriculatum-S. cuspidatum,* with many pools having no vegetation. *S. papillosum-S. cuspidatum* is common as a fringe around otherwise empty pools.

Distribution

The vast majority of this type is restricted to the zone 02. H1/B2, perhaps reflecting a somewhat central and upland tendency.

Site type 11: Damaged northern boreal blanket bog (see Figure 61)

General appearance

This is a type which is characteristic of a small part of Sutherland, being widespread within that restricted

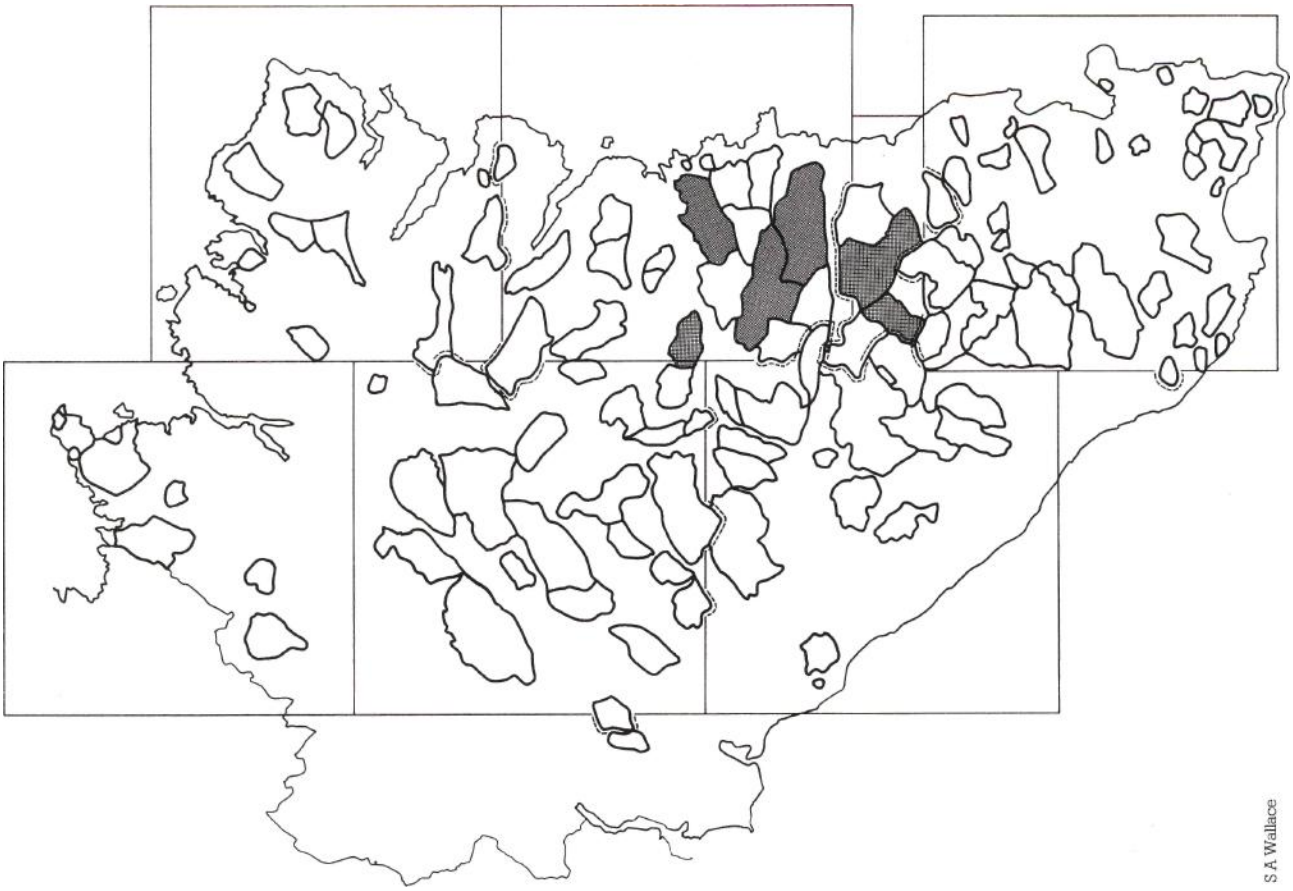


Figure 61 Distribution of Site type 11 - Damaged northern boreal blanket bog. All macrotopes with a record for the type are tinted.

area. It is almost certainly derived from more *Sphagnum-rich* types by a process of regular burning and trampling and is recognised by the great extent of bare peat at the T1/T2 level. The vegetation, which is most luxuriant on the high T2 ridges and areas of T3 hummocks, consists largely of dwarf shrubs, of which *Betula nana* is a common dominant. Extensive patterning is present, but frequently the pools are half-empty and 'peat-cliffs' are a common feature of pool edges.

Surface microtopes

The most striking difference between the surface topography of this type and of previous types is the wide extent of the erosion gully network through the site. A3 pools are frequent, but many are reduced to expanses of bare peat, and the ridge structures are almost entirely T2 or T3. Tl and Al are found only as narrow fringes to otherwise dry structures.

Vegetation

The distinctive characteristic of this type is the dominance of *Betula nana* on the T2 ridges, especially over a peat surface possessing only a patchy *Sphagnum* cover. Also typical is the presence of *Calluna, Erica tetralix* and *Myrica gale. Racomitrium* communities are generally T3 hummock *Racomitrium-Cladina,* though *Racomitrium*-bare peat is also common. *S. fuscum* and *S, imbricatum* hummocks are frequent, though scattered, whilst the commonest *Sphagnum* community is *S. rubellum-S. papillosum*-dwarf shrubs.

Distribution

As with the softer, undamaged examples of *Betula nana* mire, this is restricted to the Halladale and Strathy catchments and almost entirely to 02.H2/B2.

Site type 12: Microbroken blanket bog

(A distribution map is not included.)

General appearance

The type is recognised by its relatively smooth appearance from a distance, but on closer examination this is shown to resemble a dissected plateau in miniature, with all the raised microbroken hummocks lying no more than 20-30 cm above the bottom of the erosion channel network. Typically, bare peat predominates on the erosion mounds, but the cover of vegetation seems largely to relate to the extent of recent burning.

Surface microtopes

There are only two - the network of shallow erosion channels and the raised, isolated microbroken hags.

Vegetation

This varies with the extent of burning, but the characteristic community is the *S. cuspidatum-S. tenellum* mixture which is almost invariably found as the dominant along the bottom of the erosion network. *Trichophorum-S. compactum* may form localised communities.

Distribution

The type is widespread because it covers a large proportion of ground including both entire mire units and much of the intervening thinner peat between major systems. However, because such intervening ground was not usually classed as a mire unit, the locations obtained from the analysis of mire units and quadrats give only a very limited idea of its distribution. A map of its recorded distribution would therefore be highly misleading, indicating only those cases where a recognisable mire unit was recorded as microbroken. It is fair to say that this is one of the most extensive peatland types in the region (and, indeed, elsewhere in Scotland), often covering much of the ground which provides hydrological connections between individual mire units, together forming a mire complex or macrotope.

Site type 13: Regenerating erosion complex

(see Figure 62)

General appearance

Although described as a regenerating system, much of the ground gives the appearance of quite severe erosion, with extensive bare peat, *Racomitrium* and empty pools. However, the characteristic feature of this type is the presence of vigorous mats of *Sphagnum*, generally *S. papillosum* mixed with *S. tenellum* or *S. cuspidatum*, growing out over the bare peat expanses of empty pools and hollows. A most distinctive character is the presence of *Carex pauciflora* within these *Sphagnum* mats.

Surface microtopes

The surface is often extremely uneven, with many hollows and pools completely empty. Ridge communities are thus particularly dry, occurring on the equivalent of T2/T3 levels. T4 erosion hags are also frequent, as are erosion gullies. However, the healthy *Sphagnum* mats are equivalent to a regenerating T1 low ridge.

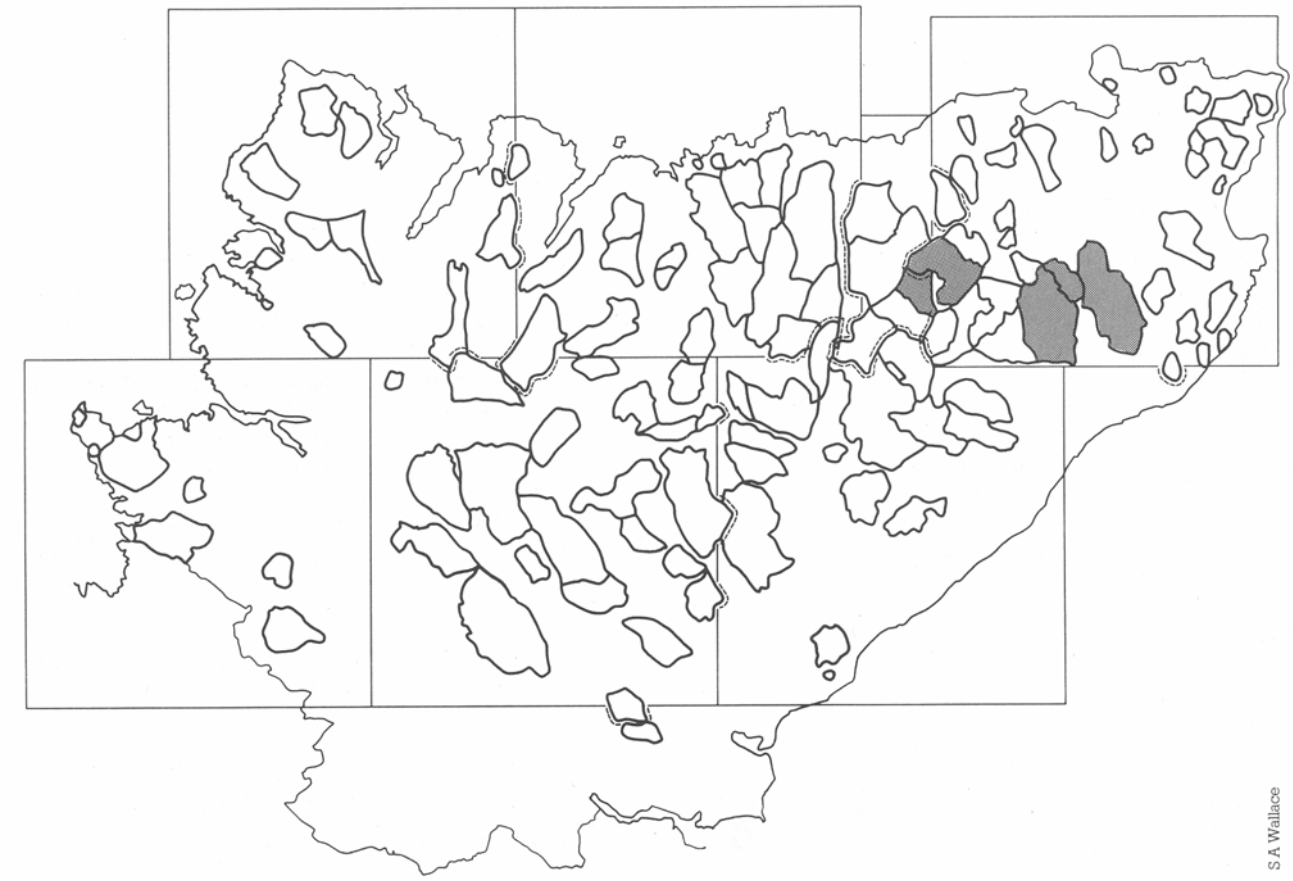


Figure 62 Distribution of Site type 13 - Regenerating erosion complex. The dark tint represents the macrotope which contains the largest example of the type within each bioclimatic zone. The light tint represents other macrotopes with records for the type.

Vegetation

Racomitrium-Cladina-bare peat is one of the most common communities within this type, together with *Trichophorum-Cladina.* Around the margins of empty pools the *Sphagnum*-dwarf shrub communities are extremely patchy, but the most vigorous is the *S. papillosum-Molinia-Carex pauciflora* community.

Distribution

The type is largely restricted to higher altitudes, being shared between 02.H1/B2, Hl/B1 and H1/A3. It is found, for example, on Knockfin Heights, the Overscaig ridge and the high-level mires around Ben Armine.

Site type 14: Severely damaged *Trichophorum* blanket bog (see Figure 63)

General appearance

This is the final stage before erosion begins either to create deep gully complexes or to expose the mineral substrate beneath the eroding peat. The surface is typically fairly smooth, all evidence of surface patterning having been destroyed by repeated burning, and the vegetation is best described as sparse. Occasional hummocks break the monotony, and frequently erosion gullies dominate the margins of such sites.

Surface microtopes

Effectively, the ground is a wide expanse of T2 high ridge, with scattered T3 hummocks and occasional depressions which can be variously classed as *Sphagnum* hollows, mud-bottom hollows or pools, depending on the state of vegetation surviving within.

Vegetation

The predominant type is *Trichophorum*-bare peat, with *Trichophorum-Carex panicea* in the wetter parts. Occasional areas of *Sphagnum*-dwarf shrub are usually dominated by *S. tenellum* or *S. rubellum*, whilst T3 hummocks may support *S. imbricatum* or even *S. fuscum. Racomitrium*-bare peat is a frequent hummock- and mat-forming type. *Molinia-Pleurozia purpurea* can be found in occasional wet depressions.

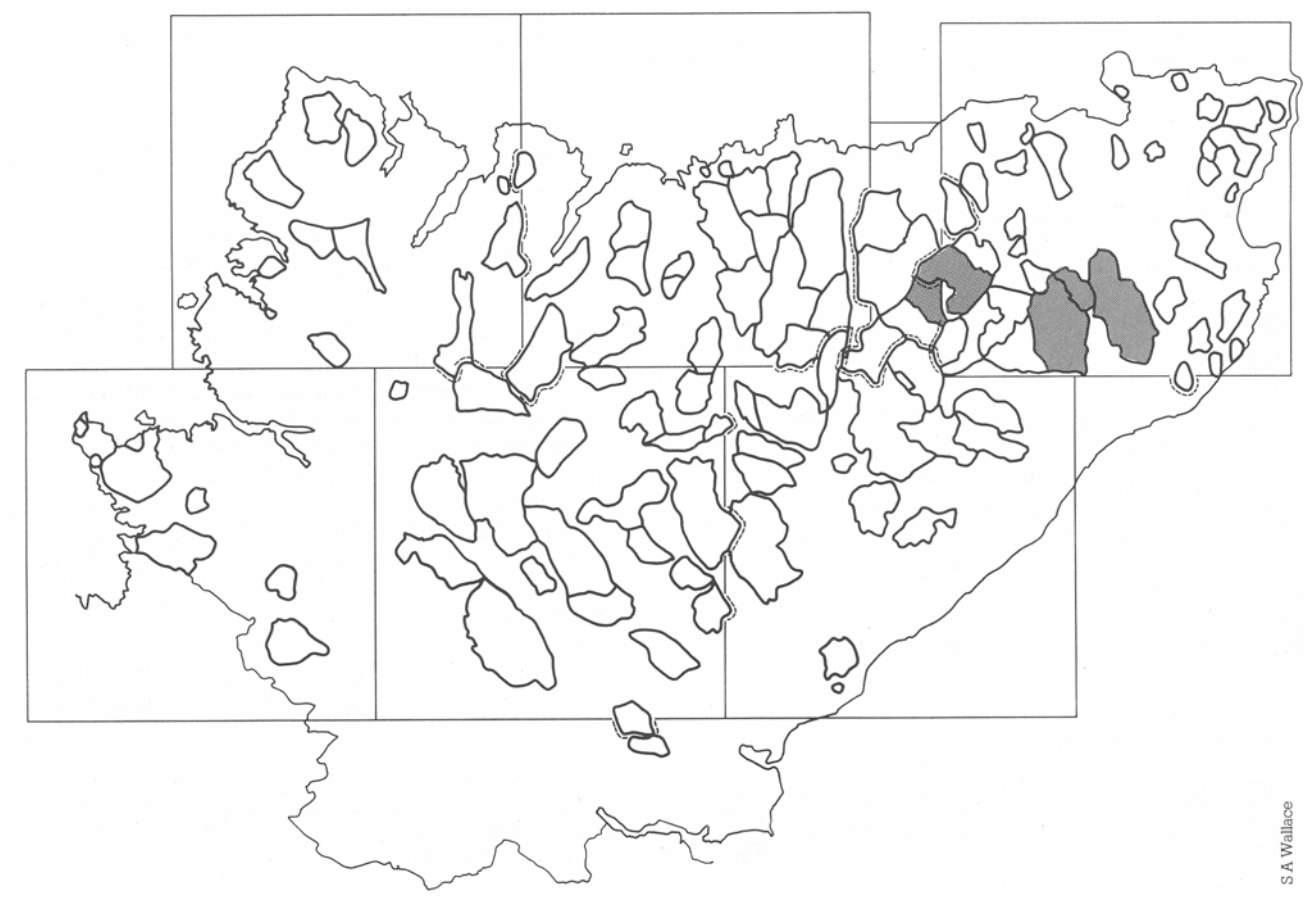


Figure 63 Distribution of Site type 14 - Severely damaged *Trichophorum* blanket bog. The dark tint represents the macrotope which contains the largest example of the type within each bioclimatic zone. The light tint represents other macrotopes with records for the type.

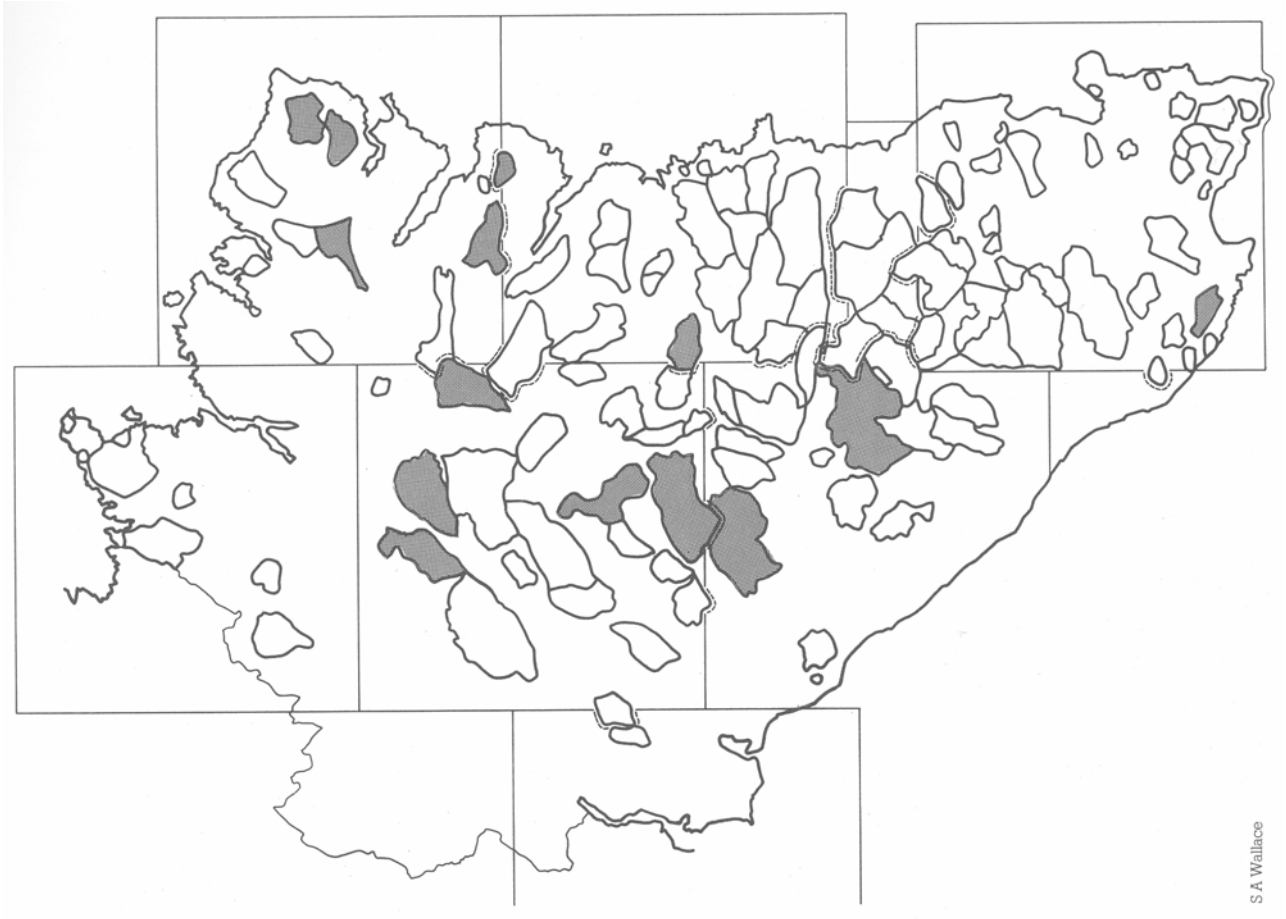


Figure 64 Distribution of Site type 15 - Plateau erosion, with *Erica cinerea.* All macrotopes with a record for the type are tinted.

Distribution

The type is largely central and western, but it is also recorded from damaged coastal mires in Caithness, particularly in the peatlands around Duncansby Head, where salt spray appears to affect the vegetation types in any case. Like microbroken blanket bog, this is a type which often dominates mire margins and thinner peat. It is therefore relatively widespread, but, because many damaged sites were not surveyed in detail, the mapped extent of the type derived from the analysis is misleading.

Site type 15: Plateau erosion, with *Erica cinerea* (see Figure 64)

General appearance

Knockfin Heights has more than once been described, from the air, as a "moonscape". The large watershed pools which dominate all the high-level plateaux of Caithness and Sutherland are in various stages of erosional decay and, possibly, regeneration. Many areas have deep erosion gullies, as described by Osvald (1949), Goode & Lindsay (1979) and Hulme (1985) for the Outer Hebrides. Other areas have extensive areas of empty watershed pools but few deep erosion gullies. It seems likely that the severity of much of this erosion is a product of burning, because charcoal remains are never hard to find. However, the extent to which the entire phenomenon is natural or unnatural is discussed in Chapter 5.

Surface microtopes

These are almost entirely erosion features, although within such large areas as Knockfin Heights it is possible to find extensive examples of relatively soft T1/T2 ridge and A2/A3 pools showing little evidence of damage.

Vegetation

The characteristic community is *Racomitrium-Erica cinerea,* which caps many of the higher erosion hags. However, *Campylopus atrovirens*-bare peat, *Molinia-Narthecium-Potentilla erecta* and *Trichophorum*-bare peat are all common components of the vegetation mosaic. In more eastern parts, *Sphagnum-Eriophorum vaginatum-Kurzia pauciflora* is an occasional type. On less damaged areas, *S. imbricatum* and *S. fuscum* hummocks are still found, but the former much less frequently than in most other site types.

Distribution

Markedly western and upland, the type is largely shared between 02.H1/A3 and O1.H1/Bl, both climatic zones characteristic of high-level plateaux.