D. A Stead

NATURE CONSERVATION IMPORTANCE

OF

DUICH MOSS

SCOTLAND, UNITED KINGDOM

AND

POTENTIAL DAMAGE TO SITE AS A CONSEQUENCE

OF PROPOSED DRAINAGE AND PEAT EXTRACTION

WITH

A CONSIDERATION OF POSSIBLE ALTERNATIVE SITES

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PREFACE

1. This compilation of information was prepared by the Nature Conservancy Council (NCC) at the request of the Commission of the European Communities.

2. A number of recent publications have significantly increased the information available concerning both the nature conservation importance of peat bog systems and the impacts associated with peat bog drainage. In the following account, information arising from these new investigations, and therefore not included in the NCC's original submission to the Secretary of State for Scotland (see Part 9) is annotated in the text by an asterisk *.

PART 1: BACKGROUND

Introduction

1. Duich Moss, or Eilean na Muice Duibhe, is a peat moss on the island of Islay off the west coast of Scotland in the United Kingdom. The site has been notified by the Nature Conservancy Council (NCC) as a Site of Special Scientific Interest under British legislation (Section 28 of the Wildlife and Countryside Act 1981) and, together with other areas of Islay, has been identified as important for the conservation of species listed in Annex 1 of the European Communities' Council Directive (79/409/EEC) on the Conservation of Wild Birds. It is the UK Government's intention to notify the site as a Special Protection Area under Article 4 of this Directive. This process has already commenced with the initiation of consultations with the owners and the local planning authority.

2. The Nature Conservancy Council was established as the British Government's statutory conservation agency by the Nature Conservancy Council Act 1973. Its statutory functions include the provision of advice to Ministers on the development and implementation of policies for and affecting nature conservation in Great Britain.

Sites of Special Scientific Interest and planning law

3. The concept of Sites of Special Scientific Interest (SSSIs) has existed in British law since the coming into effect of the National Parks and Access to the Countryside Act 1949. Under the 1949 Act (still in force) the Nature Conservancy Council has a duty to notify sites that are of special interest by reason of any of their flora, fauna, or geological or physiographical features to the local planning authority who in return seek the views of NCC before determining any application for planning permission that the site's owners or occupiers may submit to them.

4. The provisions relating to SSSIs were further developed with the enactment of the Wildlife and Countryside Act 1981. Under this legislation the duties of the NCC are extended in that in addition to notifying the local planning authority of their opinion that the site is of special scientific interest, they also have to inform the owner(s) and occupier(s), as well as the relevant Secretary of State. Furthermore the actual nature of the special scientific interest must be detailed. In reflection

of the fact that many SSSIs were being damaged or destroyed as a result of activities which did not require planning permission (eg afforestation, changes in agricultural use) and hence did not require consultation with NCC; the 1981 Act requires NCC to inform the owner or occupier of those operations which could potentially damage the scientific interest of the site and in return the owner or occupier must inform NCC of his intention to carry out any of these operations. If the NCC concludes that such proposals are incompatible with the maintenance of the site's scientific interest they can offer a management agreement (with financial compensation) to maintain the status quo.

5. The additional protection afforded SSSIs under the 1981 Act are not directly relevant to the proposal to extract peat from Duich Moss. Such a proposal requires planning permission and so the procedures associated with Section 23 of the 1949 Act are applicable. Under Article 13(1) (g) of the Town and Country Planning (General Development) (Scotland) Order 1981 (following Article 11(1) (f) of the Town and Country Planning (General Development) (Scotland) Order 1975), the Local Planning Authority is required to "consult NCC before granting planning permission where development is of land in an area of special interest notified ...in accordance with Section 23 of the National Parks and Access to the Countryside Act 1949...". The Local Planning Authority is required to take into account any representations received from NCC and (under the National Planning Guidelines issued by the Scottish Development Department - 500 Circular 30/1977: Development Planning and Development Control) to notify to the Secretary of State of any intention to grant planning permission for development affecting a nationally important site against NCC advice.

6. The scientific interest of the Duich Moss site was not appreciated by the NCC until it was initially surveyed in 1980. It had not therefore been notified under the 1949 Act. The passing of the 1981 legislation required all existing sites to be re-notified in a far more detailed way. This entails detailed survey work by NCC to confirm the nature of the scientific interest of the site and those operations that may potentially damage it. In consequence re-notification of the 4,000 existing sites (apart from the notification of new ones) is a long process which still continues. The completion of the notification of Duich Moss was not a high priority until planning permission for peat extraction was applied for in February 1983, although the owner had already been told of NCC's intention to proceed. At this point the Local Planning Authority, informed that NCC considered the site of

be of SSSI standard, agreed to consider the planning application as if the site had already been notified. This remained the situation up until July 1984 when the Secretary of State announced his intention to grant planning permission, at which point NCC completed the notification of the site as a SSSI.

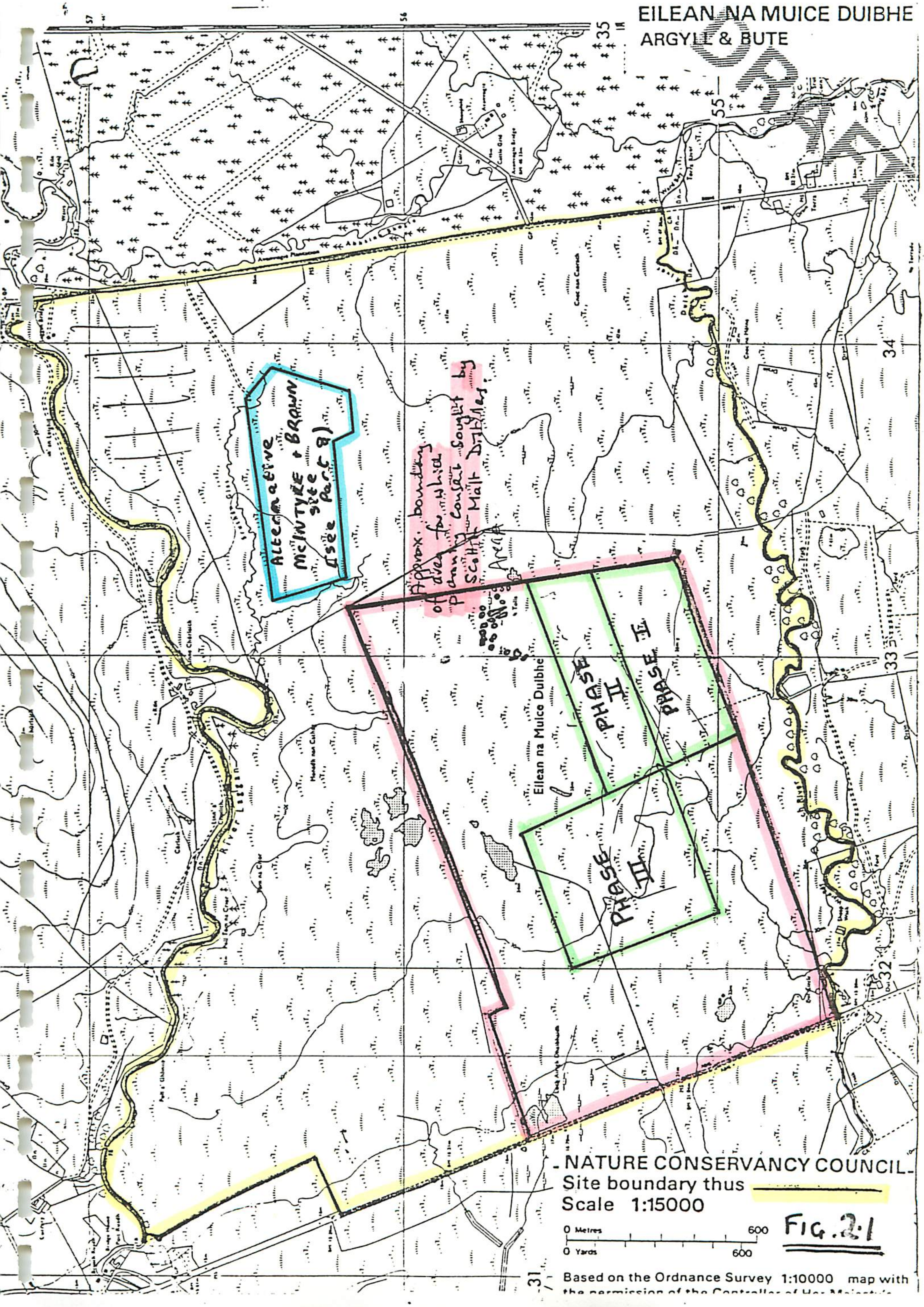
PART 2: NATURE CONSERVATION IMPORTANCE OF DUICH MOSS (EILEAN NA MUICE DUIBHE), ISLAY

1. Duich Moss displays a variety of hydrological and morphological features characteristic of both northern blanket peat and lowland raised bog in an unusually intact state over a relatively large area and is, in the opinion of the Nature Conservancy Council, a nationally important peatland. For this reason the Council has notified it as a Site of Special Scientific Interest under the Wildlife and Countryside Act 1981. The importance of Duich Moss to the UK SSSI system is its unusual mixture of peatland types, and the extent of its undamaged bog communities. In a British context this habitat type is almost entirely restricted to Scotland where most examples have been destroyed for forestry, agricultural conversion or peat extraction.

2. Duich Moss is a mixture of shallow blanket bog and deep raised bog falling in altitude from east to west. The peat surface is irregular, reflecting undulations in the underlying raised beach deposits and varying depth of peat developed above this. In one or two places these deposits outcrop through the peat mass and stand as definite hillocks of mineral soil or very shallow peat.

3. The vegetation of Duich Moss is very much akin to the Hebridean Blanket Bogs and as such the site forms an important habitat link in the national series of peatlands, both in a north-south and an east-west context. The intact nature of the surface is reflected in the well developed areas of actively growing Sphagnum moss as well as healthy populations of the rare mosses Sphagnum imbricatum and S. fuscum. The site has invertebrate and ornithological interest and is the single most important British site for Greenland White-fronted geese. In this connection the site is of international importance and is proposed for designation as a Special Protection Area under the EEC Directive 79/409/EEC.

4. There are major depressions and drainage seepages on the north east and south west sides of the site which have developed in response to the original drainage patterns on the raised beach gravels. Peat depth across the whole bog is very variable, ranging from less than half a metre to over 5 metres. The northern boundary of the bog is the Laggan River and the southern boundary the Duich River. The site is bounded to the east and west by roads (see Fig. 2.1 for site boundary details).



EILEAN NA MUICE DUIBHE
ARGYLL & BUTE
Alternative McINTYRE + BROWN site (see Part 8)
Approx. boundary of area for which planning consent sought by Scottish Malt Distillers.
Area
PHASE I
PHASE II
PHASE III
Eilean na Muice Duibhe
River Laggan
NATURE CONSERVANCY COUNCIL
Site boundary thus
Scale 1:15000
0 Metres 600
0 Yards 600
Based on the Ordnance Survey 1:10000 map with

FIG. 2.1

5. The centre of the bog is occupied by several systems of small lochs, pools (dubh lochans) and bog hollows. The extent of these "pool systems" is annotated on the map included as Appendix 2 of Part 9 Annex 1. There are four main systems, the largest in the north-west, the smallest, having only bog hollows, in the south-east and lying in Phase 1. In places these are separated from each other by natural seepages draining towards the Laggan River. However, across the centre of the site and between the two main pool systems are large areas of almost level bog ('flows') with a very soft surface dominated by actively growing Sphagnum mosses.

6. Blanket bogs are a scarce resource in world terms and so the surviving British examples of this habitat type are important internationally. In a European context, this kind of bog is found only in Britain, western Ireland and the west coast of Norway, where similar high rainfall/low evapotranspiration areas occur. The general significance of peatlands in Britain is explained in Part 3 of this report and the particular importance of Duich Moss is detailed in Part 4.

7. In the public debate about Duich Moss the aspect which has received most attention is the use of the site by Greenland White-fronted geese. The geese are not the major feature of interest, although they do mean that the site merits international status on the basis of its ornithological interest. This interest is detailed in Part 5.

PART 3: THE SIGNIFICANCE OF PEATLANDS IN BRITAIN

1. Peat formation and bog types

1.1 Britain and Ireland possess relatively few natural features which are remarkable on a world-wide scale. Compared with continental Europe they have a somewhat limited wild flora and fauna in numbers of species. Both countries have lost most of their natural vegetation through many centuries of human development. Perhaps their most distinctive natural feature is an oceanic climate which becomes more extreme with distance west and north.

1.2 It is this cool, windy and humid climate which, in combination with a prevalence of rugged terrain and hard, acidic rocks, places such a severe limitation on the possibilities for agriculture and even forestry in the western Highlands and Islands of Scotland. The dominant tendency is for soils to acidify and for waterlogging to cause the accumulation (instead of decomposition) of dead plant remains as peat.

1.3 The wetter the climate, the lower the temperature and the more infertile the ground, the more is the normal process of plant decomposition overridden by that of preservation. Over thousands of years the tendency has thus been for deposits of peat to build up on all but the steeper slopes. The conflicting rates of growth and decay which continue to produce the present depth of peat depend on the degree of waterlogging and speed of water movement. Accumulation of peat, encouraged by water logging and a slow rate of water seepage, is therefore greatest on flat ground and very gentle slopes.

1.4 These conditions especially favour the growth of bog mosses or Sphagnum, of which there are 30 different kinds in Britain. Bog mosses are remarkable in soaking up water like a sponge, in needing only small amounts of nutrients, and in forming a living ground cover to the bog surface, often continuously over many hectares. They help to carry up and hold the water-table through their upward growth, and gradually raise the living bog surface ever higher. Other plants such as cotton grass (Eriophorum) and deer sedge (Trichophorum cespitosum) grow rooted in the bog moss carpets and their remains also become incorporated in the peat. Above a certain depth of

peat, the bog surface becomes insulated from any lateral ground water influence, and depends for its moisture on rain or snow and for its nutrients on atmospheric fall-out. The chemical characteristics of such peat are high acidity and nutrient poverty, in complete contrast to the fen peat of lowland valley swamps formed by sedges, reed and herbaceous plants under the influence of nutrient-rich ground water.

1.5 Bog moss is, however, an extremely delicate plant, readily damaged by trampling and destroyed by fire which can creep over even a spongy bog surface during dry weather. If the bog water table is lowered by draining, bog mosses decline but other plants such as cotton grass increase, and if the surface dries out completely, dwarf shrubs such as heather (Calluna) may become dominant.

1.6 A peat deposit is seldom uniform throughout its whole depth, and an examination of different levels can show not only the detailed changes in vegetation over time, but can also allow deductions about the historical changes in conditions occurring during development of the bog. The analysis of pollen grains preserved in the peat is a more refined technique for unravelling this history of change in both vegetation and the associated environmental influences.

1.7 In the less oceanic lowlands of England and Wales, development of these deep Sphagnum bogs has been limited to certain wide flood-plains, where they appear as islands which have grown in their centres to a height up to 6 metres or more above the surrounding land. Tailing off gradually and then steeply at their edges, their appearance is slightly convex and has led to the name "raised bog".

1.8 Under the much wetter conditions of the western and northern uplands, peat of similar kind has formed much more generally over the landscape, and, though it varies in wetness and depth acording to slope, in areas of gentle topography it can cover virtually all the ground, and so has been called "blanket bog". This type is widespread through western and upland Britain, from Dartmoor northwards, but reaches its greatest development and occurs extensively down almost to sea level under the extreme oceanic conditions of western and northern Scotland (and western Ireland).

2. Distribution of peat types

2.1 Globally, blanket bog is a rare type of habitat, restricted to the few areas where cool oceanic conditions prevail. It is recorded in Europe for western Norway, the Pyrenees, Britain, western Ireland and Iceland, though in this last country the volcanic soil produces a rich, fen-like vegetation (Goodwillie, 1980). Elsewhere (see Fig. 3.1), it is recorded only from British Columbia, Alaska, Kamchatka, the Falkland Islands and Tierra del Fuego, together with small pockets in New Zealand and the Ruwenzori Mountains, in Central Africa (Gore, 1983).

2.2 The total global resource of blanket bog is estimated to be little more than 10,000,000 ha, of which Britain has between 1/7 to 1/10 (see Fig. 3.1). Ireland has only 771,784 ha of blanket bog compared to Britain's 1,000,000 ha. Norway, although appearing to have an extensive area of blanket bog, in fact supports only limited example of the habitat. It is similar to the north west coast of Scotland in being so rugged and steep that examples tend to be thinly scattered through the landscape, rather than forming the dominant landform.

2.3 Consequently Britain has a greater proportion of the resource than any other country in Europe.

2.4 Raised bogs are more widely distributed, occurring in most north European countries (Goodwillie, 1980). To the south, the bogs are flat, with little clear gradient over the greater proportion of the dome. Further north and west the raised nature becomes more pronounced, resulting in 'concentric' or 'eccentric' raised bogs.

2.5 The most oceanic types of raised bog, however, differ from the more continental types in lacking any form of tree cover. Continental raised bogs have a natural tree cover of pine or spruce, as well as supporting a rich variety of dwarf trees and shrubs. Oceanic raised bogs, which are characteristic of Britain and Ireland, possess only a dwarf shrub layer. Such bogs are therefore quite distinct in appearance and species composition, and are restricted to the western extremeties of Europe (see Fig. 3.2).

World Distribution of Blanket Mire

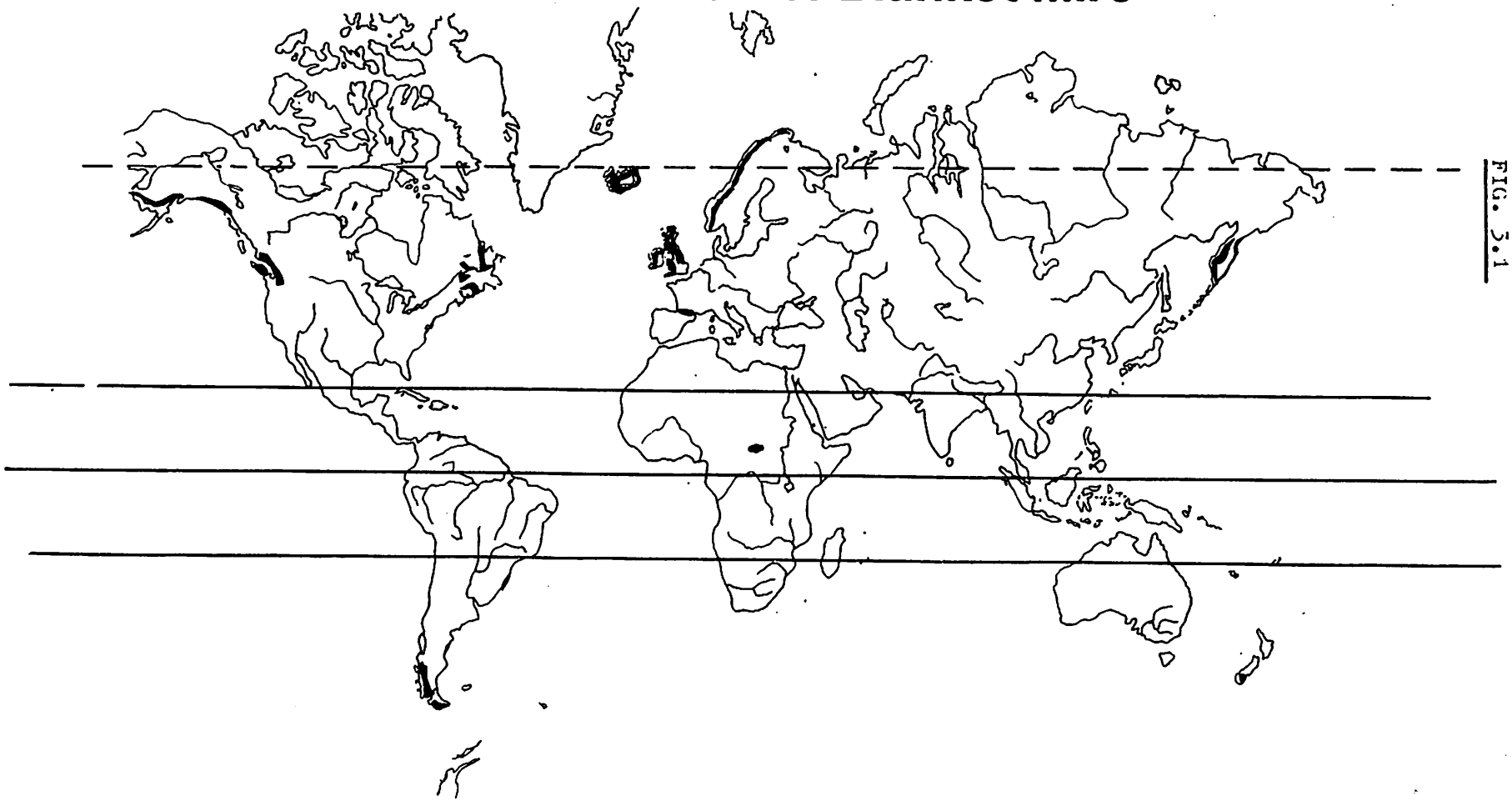


FIG. 5.1

FIG 3.2

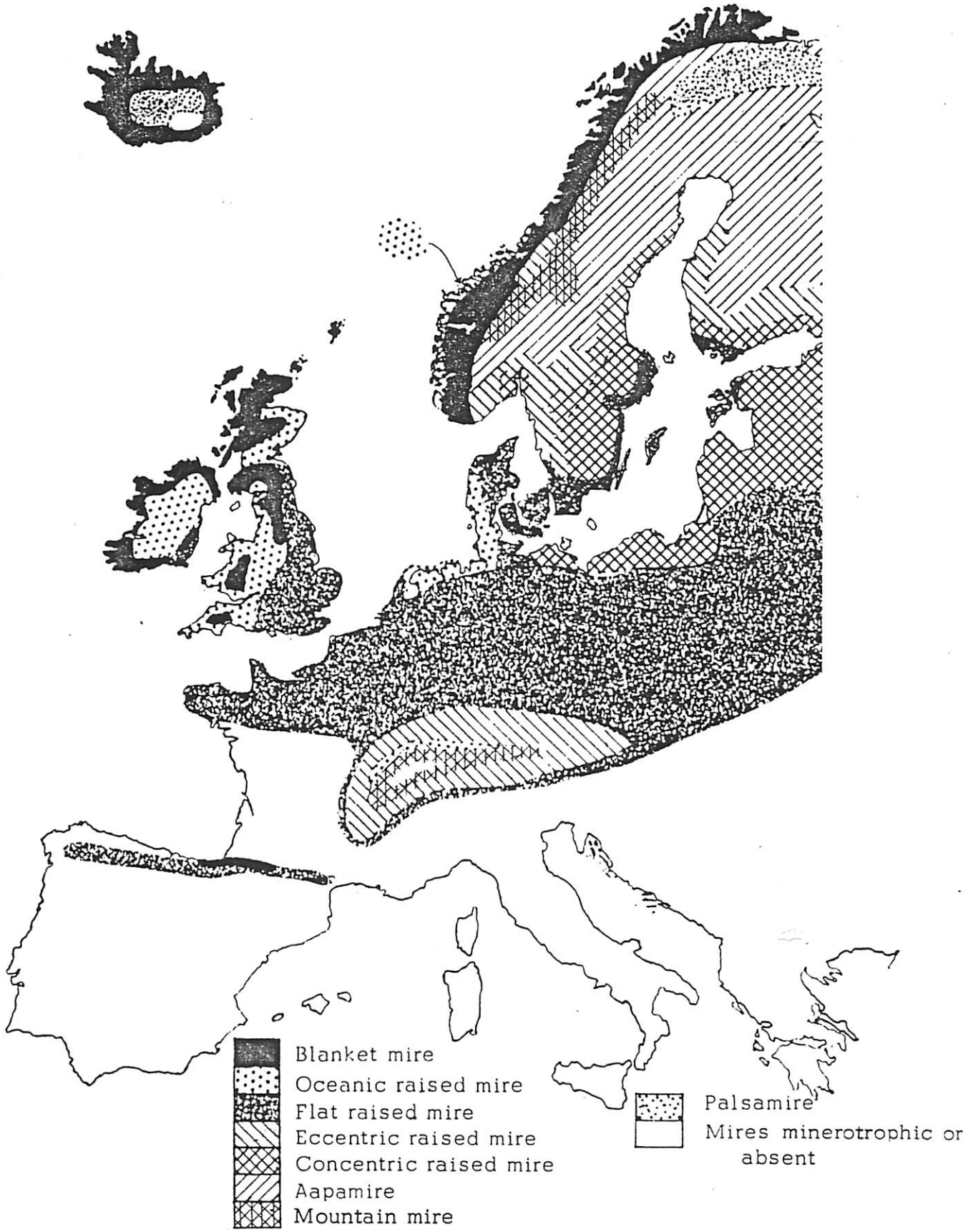


Figure Predominant mire types in Western Europe excluding minerotrophic mires.

N.B. The presence of mires falls off markedly to the south and there are far fewer of them in France and Germany than is suggested by this map.

2.6 Although in many areas raised bogs and blanket bogs are clearly separated types, there are parts of Britain where they grade imperceptibly from one into the other. There is a band running across northern England and SW Scotland in which the distinction between raised and blanket bog becomes particularly vague. This includes sites in NE Cumbria, the north Pennines, southern and central Strathclyde, Wigtownshire and Islay (see Fig. 3.3).

2.7 Such sites are characterised by relatively deep peat deposits (greater than 4m) typical of raised bogs, but which also contain significant areas of shallow peat overlying mineral ground intrusions in a pattern characteristic of blanket bog. They are referred to as "intermediate" mires in "A Nature Conservation Review" (Ratcliffe, 1977), but have also been called 'ridge-raised mires' (Moore and Bellamy, 1974) and 'semi-confined mires' (Hulme, 1980).

3. Significance of surface patterning

3.1 Most bog surfaces are irregular, with a tendency to hummock and hollow development as a result of non-uniform upward growth. Hollows sometimes hold open water and appear as pools, while the ground between may develop markedly domed and drier hummocks. Different kinds of bog moss favour these different conditions of wetness and so help to maintain this variable pattern of relief. The pools themselves are of all shapes, sizes and depths and on many northern bogs show a fascinating yet varying pattern of arrangement.

*3.2 The arrangement of these surface features, and the distribution of the various elements (such as hummock, ridge, hollow), which combine to create such patterns have been studied in some detail by Lindsay, Riggall and Burd (1985).

*3.3 This work has shown that the nature of the surface pattern is determined partly by slope and partly by climate. Climate is the over-riding factor; the wetter the climate, the more varied the surface features although the final arrangement is determined by the gradient of the bog surface (Goode, 1973).

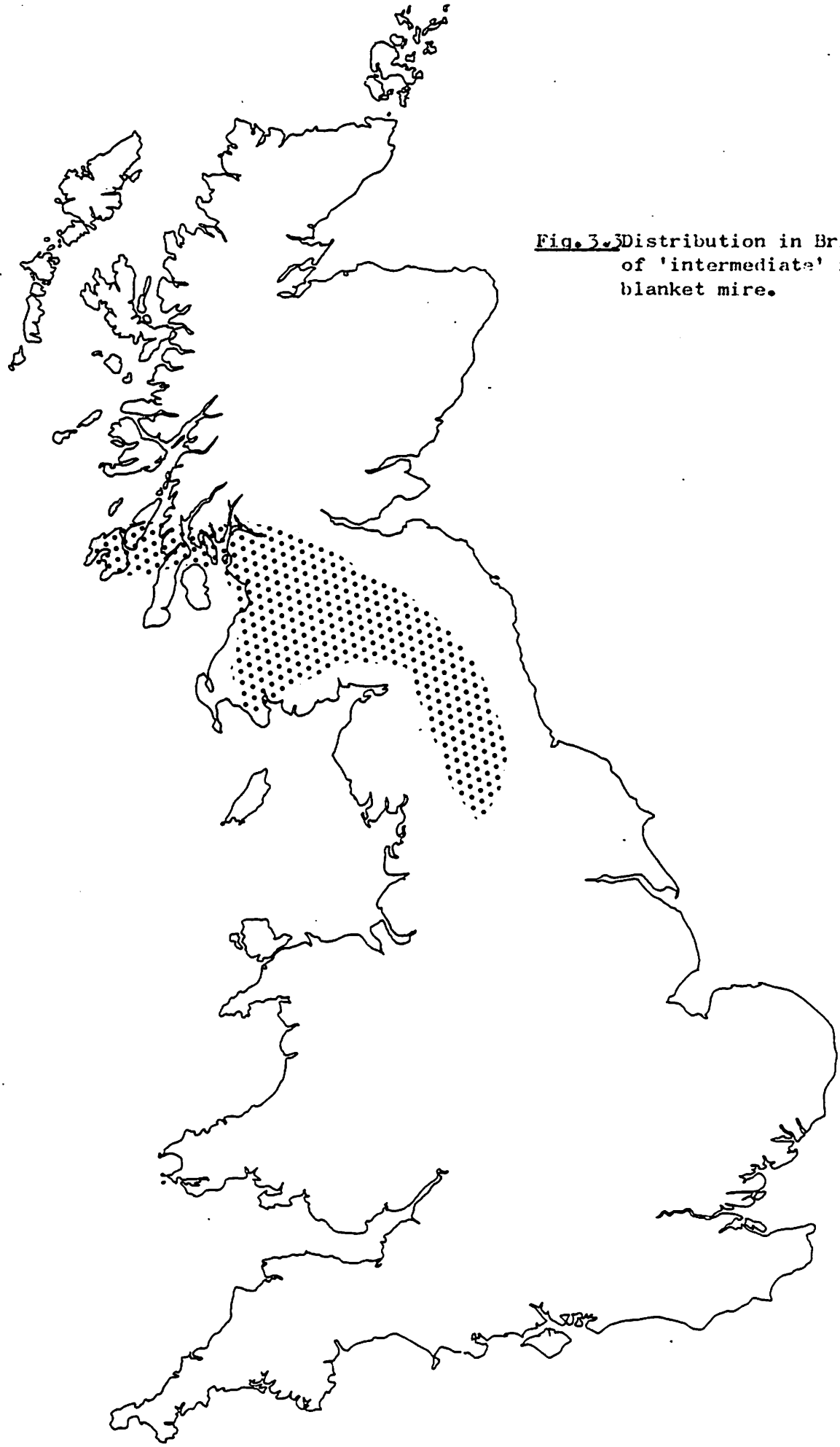


Fig. 3.3 Distribution in Britain of 'intermediate' raised/blanket mire.

*3.4 Thus bog surfaces in the south and east of Britain are very simple, with only hummocks, ridges and shallow hollows. Further north and west the patterns become increasingly complex, until in the Outer Hebrides deep pools become the dominant feature, forming what Ivanov (1981) calls 'bog-lake complexes' (see Fig. 3.4).

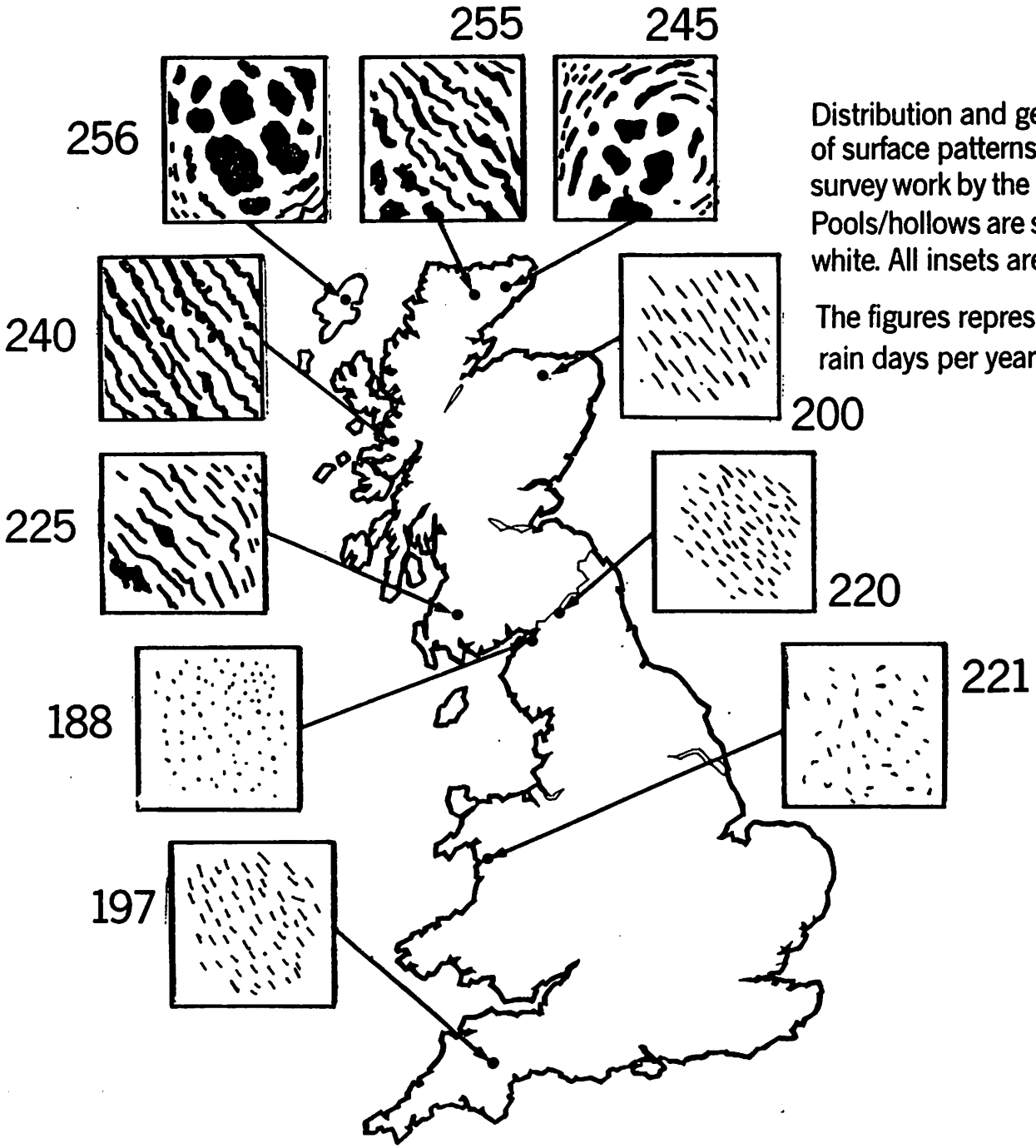
*3.5 Such patterns play a fundamental role in determining the distribution of plants and animals on a site. Lindsay, Riggall and Bignal (1983) and Lindsay, Riggall and Burd (1985) have demonstrated the close relationship which exists between species groups and the physical patterns.

*3.6 The physical nature of the surface undulations is so small (from high hummock zone to pool zone is generally no more than 1m) and the water table is such a stable phenomenon that the conditions produce fierce competition between plant species for living-space.

*3.7 This competition results in the formation of several sharply-defined and extremely narrow 'zones' (no more than 10cm in height) which lie above or below the water table. Each zone has its own characteristic range of vegetation associations which rely on the stability of the system for their continued survival (see Fig. 3.5).

*3.8 Under natural conditions the water table remains within 3–4cm of the bog surface for 90% of the time (Ingram 1983), providing the vegetation zones with a stable environment. If the average water table were to fall by just 5cm, the impact on these zones would be profound (Ivanov, 1981 page 199), with the loss of some zones and the rise to dominance of others.

*3.9 The range of physical patterns, and associated vegetation zones, provides a significant source of variation between bog systems throughout Britain. Sites which have largely similar species lists can still display many differences in the arrangement of their patterns and vegetation zones. This variation is of fundamental importance in the process of site selection within NCC's peatland protection programme (Lindsay, Riggall and Burd, 1985).



Distribution and general structure (seen from above) of surface patterns in Britain, taken from ongoing survey work by the Nature Conservancy Council. Pools/hollows are shaded black, ridges and hummocks white. All insets are drawn at a scale of 1:1,000.

The figures represent the average number of rain days per year for each site.

FIG 3.14

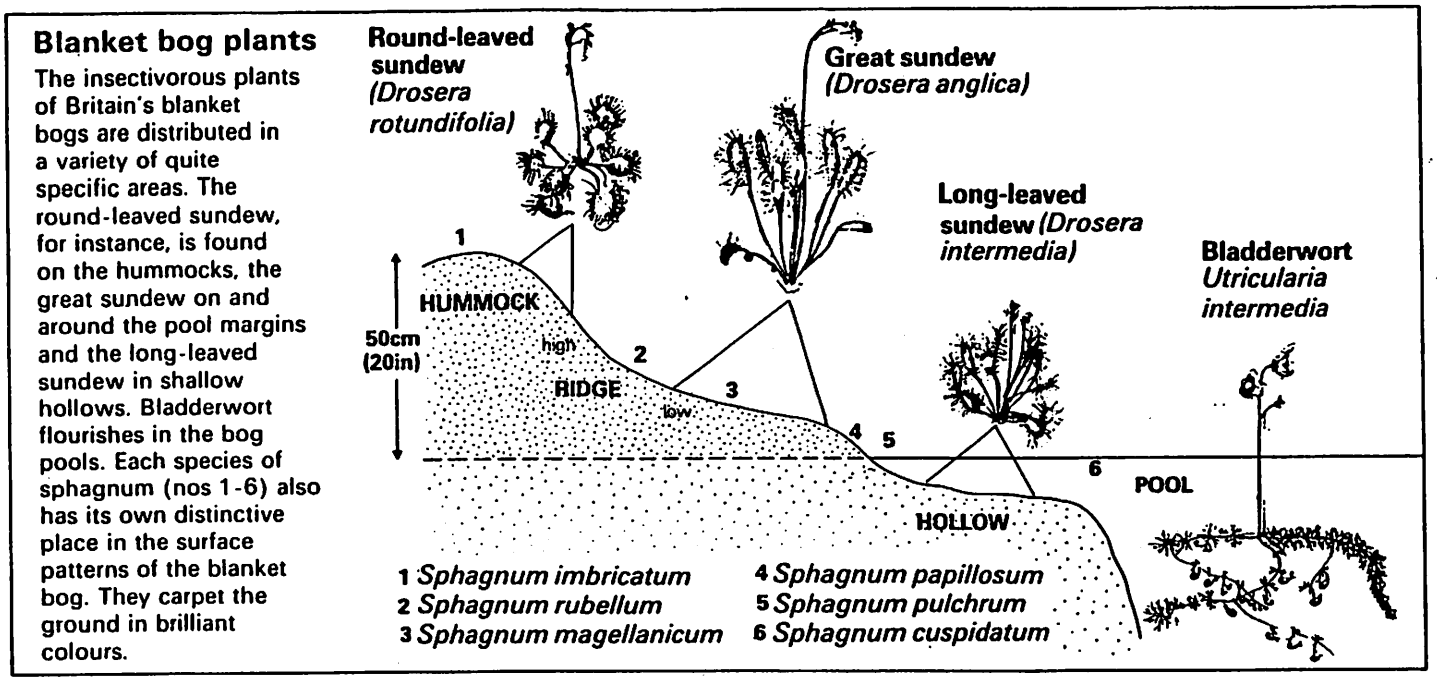


Fig. 3.5 Distribution of vegetation types in bog surface pattern

*3.10 The variety shown by these patterns is of interest not just to plant and animal ecology, peat science and hydrology, but is part of the appeal to the field naturalist for both its species variety and visual attraction. The boglands are not only the habitat of a distinctive flora, with many local or rare plants, but are also the haunt of a variety of birds and insects. In Scotland, especially, they are the breeding place of a distinctive group of birds whose main home is on the tundras of northern Eurasia.

4. Threats and losses

*4.1 Peatlands clearly assignable to raised bogs have always been localised in Britain. However, in a study shortly to be published by NCC (Bragg et. al. in prep.), the major original concentrations of lowland raised bog in Britain were examined for changes in land-use since the middle of the last century. Between that time and 1978, 84% of this habitat was found to have vanished to forestry, agriculture and commerical peat cutting (see Fig. 3.6).

*4.2 Much of the remainder had been severely damaged by burning and drainage, leaving only 6% of the original 13,000ha still vigorously-growing Sphagnum-dominated bog. In total, therefore, 94% of the resource has been lost, more than half of this since the last war. If that rate of attrition had been allowed to continue, the remainder would have been lost in 30 years.

4.3 Blanket bog remains an extensive type, though much has been lost or degraded by the same processes, and higher level bogs are especially prone to damage by erosion of the peat, beginning with gullying and ending in sheet denudation. Fire and grazing have been so widespread and long continued that the proportion of the total large area of blanket bog remaining quite natural and undamaged is now quite small, and nearly all of it is in Scotland.

4.4 A further problem is that whereas deep blanket bog peat was once regarded as unsuitable for growing trees, modern techniques have changed this view and afforestation is spreading rapidly over the area which has remained Europe's largest remaining peatland, the 'flow' country of Sutherland and Caithness.

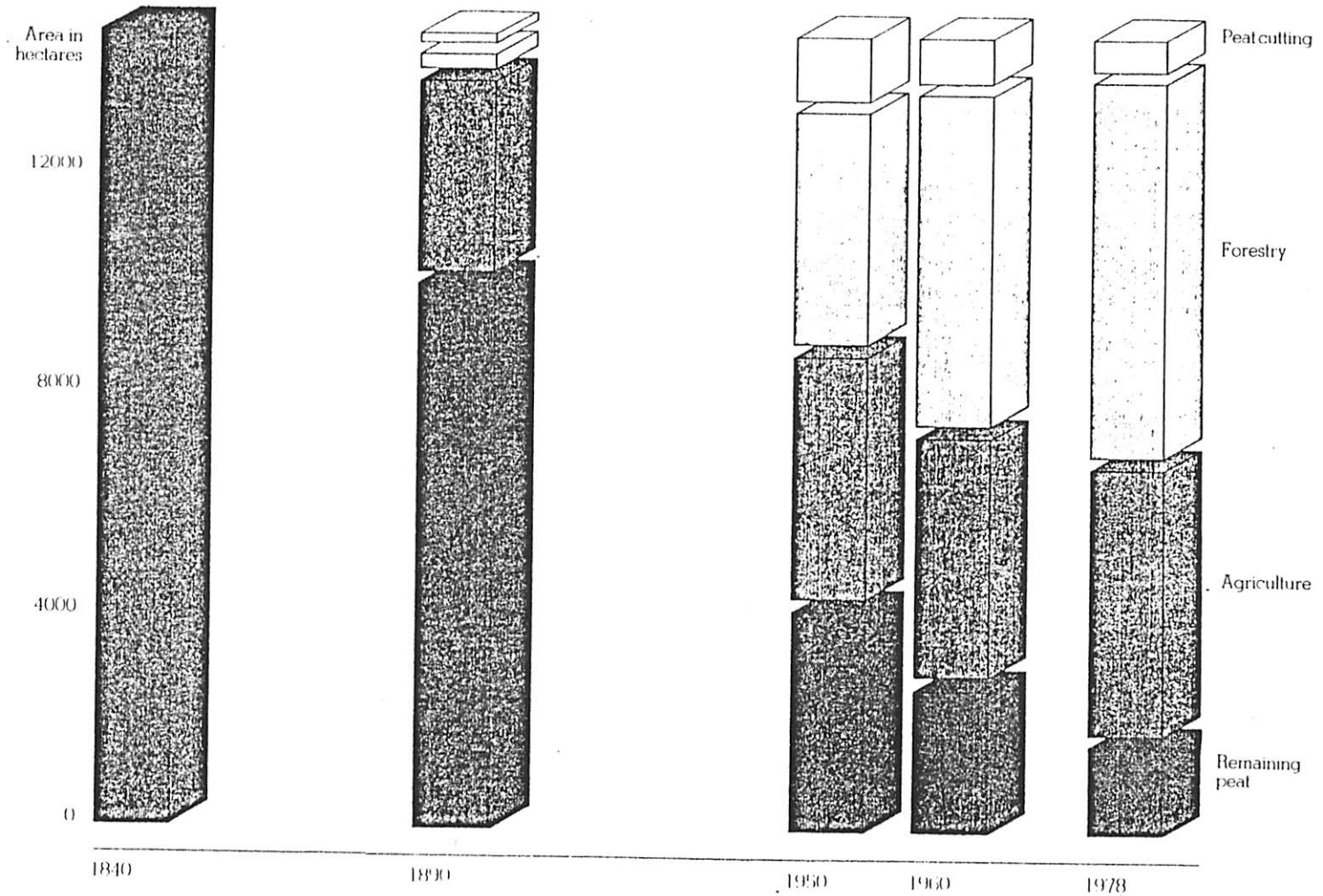


FIG 5.6

Losses due to peat cutting, forestry and agriculture since 1840

*4.5 As a result, blanket bog is now under intense threat, mainly from afforestation. 30% of the blanket peat on the Kintyre Peninsula has been lost to forestry since the war, while in the 'flow' country of Caithness and Sutherland (which supports the largest single block of blanket bog in Britain and Ireland) 33% of this has been lost to forestry interests in the last 5 years (Nature Conservancy Council, 1985; Royal Society for the Protection of Birds, 1985). Annex 1 to this Part is is an extract from the 5 February 1985 issue of Hansard, in which the Scottish Office listed the areas of ground in Caithness and Sutherland which had been approved for planting during the previous 3½ years.)

*4.6 Ireland, another major stronghold of European blanket bog, is also seeing a marked decline in this resource. Indeed, bog systems generally are under great threat in Ireland. Ryan and Cross (1984) quantify the rates of exploitation for all Irish peatland types. Their figures demonstrate (Table 3.1) that over ¼ of even the relatively unexploited blanket bogs have been modified, while overall nearly 50% of Irish peatlands have been lost as natural ecosystems.

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TABLE 3.1

AREA (HA) OF PEATLAND TYPES IN THE REPUBLIC IRELAND IN 1974

Type	Sub-Type	Area (ha) and % of type	Area (ha) and % of total
Fen	Man modified	92,508 (100%)	92,508 (8%)
Midland Raised Bog	Non-modified	67,516 (34%)	199,516 (16%)
	Man-modified	132,000 (66%)	
Western Raised Bog	Non-modified	26,665 (24%)	111,771 (9%)
	Man-modified	85,106 (76%)	
Lowland Blanket Bog (includes Intermediate type)	Non-modified	243,600 (72%)	336,831 (29%)
	Man modified	93,231 (28%)	
Mountain Blanket Bog (includes Highland type)	Non modified	320,319 (74%)	434,953 (37%)
	Man modified	114,634 (26%)	
	Grand Total		1,175,579
	Total unmodified peatland		658,100 (56%)
	Total modified peatland		517,479 (44%)

individual quotas. Producers who have direct sales quotas are liable to levy on an individual basis should they exceed their quotas.

The present Community legislation ties quota firmly to the land. A quota may not therefore be sold but may only be used by whoever occupies the land to which it is attached. The Government recognise the problems which the present arrangements may cause and have initiated consultations with interested parties to ascertain whether, and if so what, changes to Community rules need be sought.

Mr. Michael Forsyth asked the Secretary of State for Scotland how many claims for secondary quotas have been submitted to tribunals; and how many have been reduced on the grounds that the present sales are unattainable because there is no evidence from historic yields to suggest that the present yield can be achieved.

Mr. John MacKay: The tribunal considered 1,394 claims for additional quota on grounds of investments made to increase milk production in the quota year 1984-85. After assessing all the information relating to historic performance, the tribunal judged that in 291 of these cases the claimed yield was unattainable.

Forestry (Grants)

Mr. Maclennan asked the Secretary of State for Scotland if he will list in the *Official Report* the names and locations of areas of land of 10 hectares or more in Caithness and Sutherland which have received approval for planting grants under the forestry grants scheme since that scheme began, giving the acreage in each case.

Mr. John MacKay: The information covering the period from 1 October 1981 to February 1985 is as follows:

Name of Estate	*Location*	*Area approved for planting (hectares)*
Borrobol	Borrobol Forest	15
Coille a Druim	Overscaig	65
Coille Chaol	Overscaig	87
Coille Clais Charnach	Overscaig	408
Coille Linne	Overscaig	74
Coille Oisinn	Overscaig	57
Coille Righ	Overscaig	212
Grants Wood	Overscaig	53
Fiag A Tuath	Overscaig	54
Strath Duchally	Overscaig	116
Meall Odhar	Overscaig	46
Griamha	Overscaig	46
Tothel Gill	North of Keiss	163
Mireland	West of Keiss	164
Glebeland at Farr	East of Bettyhill	58
Coille am Bodach	Strathy Forest	453
Coille a Chailleach	Strathy Forest	220
Coille A Fhithich	Strathy Forest	189
Dubh Chlais	Strathy Forest	91
Phillips Mains	Near Mey	72
The Brig	Forsinard	230
Cross Lochs	Forsinard	427
The Dale	Forsinard	312
The Dyke	orsinard	448
The Hope	orsinard	1,107
Stroupster East	North west of Keiss	199
Stroupster West	North west of Keiss	198
Altnabreac	Near Altnabreac station	1,543
Jubilee Wood	North east of Loch Shin	50
Gordonbush	Strath Brora	14
Blindburn	West of Keiss	99
Bhrochain	West of Invercassley	140
Brae	West of Invercassley	148
Buillsgean	West of Invercassley	42
Carn Bheag	West of Invercassley	42
Carn Mor	West of Invercassley	255
Dhonnadh	West of Invercassley	154
Innis Beithe	West of Invercassley	102
Oisean	West of Invercassley	49
Rosail	West of Invercassley	148
Thurnaig	West of Invercassley	40
Tutim	West of Invercassley	130
Bhaird	Forsinard	97
Crubag	Forsinard	78
Fasach	Forsinard	146
Fideag	Forsinard	52
Leir	Forsinard	80
Talaheel	Forsinard	373
Casan	Forsinard	74
Imriche	Forsinard	156
Baronaheigh	Near Shebster	16
Rosehall Hill	West of Lairg	665
Merkland	North east of Loch Skin	59
Coille Nam Breac	Forsinard	53
Cutting	Forsinard	176
Loch Dubh	Forsinard	39
Thearg	Forsinard	50
Abhainn Bheag	Forsinard	55
Gleann Nam Beist	Forsinard	58
The Gunn	Forsinard	225
Mackay A' Tuath	Forsinard	110
Bad Coille	Strathy Forest	179
Coille Buidhe	Strathy Forest	298
Coille Nan Clach	Strathy Forest	161
Coille Fada	Strathy Forest	166
Coille Meadhonach	trathy Forest	99
Coille An Reidhe	Strathy Forest	226
Coille Am Sealbach	Strathy Forest	264
Coille A Saobhaidhe	Strathy Forest	309
Lochdhu	Near Altnabreac station	989
TOTAL AREA APPROVED FOR PLANTING		13,773

To date, grants have been paid in respect of a total of 4,136 hectares of planting on these properties.

Islands Councils (Inquiry)

Mr. Wallace asked the Secretary of State for Scotland how many representations he has received on the report of the Committee of Inquiry into the functions and powers of the islands councils of Scotland; and if he will make a statement.

Mr. Ancram: My right hon. Friend has received representations from a total of 43 organisations and individuals in response to his invitation to submit views on the report of the Committee of Inquiry. The committee's recommendations have also generated other correspondence since its publication.

The recommendations, and the views received on them, are being considered, and we shall announce our conclusions as soon as possible.

Draft Deer (Firearms etc.) (Scotland) Order 1984

Mr. Kennedy asked the Secretary of State for Scotland if he will make a statement on the progress of the Draft Deer (Firearms etc.) (Scotland) Order 1984.

Mr. John Mackay: My right hon. Friend expects to lay a draft Order before Parliament shortly.

PART 4: THE SCIENTIFIC IMPORTANCE OF DUICH MOSS

1. NCC's aim is to identify and then safeguard a series of peatland areas which represent the range of variation in this habitat across the country. In particular it wishes to protect the best remaining examples of the various distinctive patterned pool and hummock surfaces. The southernmost example of the oceanic 'bog-lake' patterning is the Silver Flowe National Nature Reserve in Galloway. The remaining examples are all in the Highlands and Islands. Duich Moss is an important example which only recently came to the notice of conservationists in 1980. It was not therefore mentioned in "A Nature Conservation Review", published in 1977, which listed the most valuable areas then known in Britain for their biological features.

2. The special interest of Duich Moss is that:

2.1 The areas of deep peat (i.e. the body of the bog) are undamaged and in a virtually natural state. This is shown by the continuous bog moss carpet, high water table and absence of obvious signs of past interference. (Drainage has occurred on the site, but this is largely on areas of thinner peat associated with mineral soil outcrops).

2.2 It has an unusual and perhaps unique combination of features characterising both raised and blanket bog, and a patterned surface which is the best example of the type found south of the Highlands.

2.3 It is the most important single winter roosting and feeding site in Britain for the Greenland race of the White-fronted Goose, one of the rarest races (world population c.18,000 birds) of this internationally valued species (Owen, 1979).

3. Bog type and surface patterns

3.1 The site is unusual in being a hybrid of bog types which are normally quite distinct in their distribution:

- lowland raised bog lacking bog pools;
- lowland blanket bog rich in watershed bog pools.

*3.2 Sphagnum-rich lowland raised bog, without bog pools, is characteristic of southern Britain, although in the north east, examples can be found as far north as Perth. It is now known (Lindsay, Riggall & Burd 1985) that Duich Moss is the most northerly example of this type on the west coast, and is particularly important in possessing an almost continuous carpet of living Sphagnum moss, indicating that the bog is still healthy and growing.

*3.3 Watershed blanket bog is a northern and western bog type, characteristic of the Sutherland Flows, and the Outer Isles. It dominates flat-lying watershed plateaux and is always rich in large, rounded bog pools or "dubh lochans". Apart from the Silver Flowe NNR in Galloway, which has an altitude of 300m and lies in an intense rain pocket, Duich Moss is the most southerly example of this type in Britain (Lindsay, Riggall & Burd 1985).

*3.4 To find such geographically distinct bog types on one site is particularly unusual. The site is allied to the 'transition' raised blanket bogs of the Irthinghead Mire complex in Cumbria and Northumberland, or the once-extensive Wigtownshire 'flows'. However, none of these support the truly northern patterns which are so characteristic of Duich.

*3.5 Apart from two Sphagnum species, S.imbricatum and S.fuscum, the vegetation of Duich Moss contains few species which are nationally rare. What makes the site so special is the survival of an increasingly rare example of "typical" bog vegetation communities, in which more widespread bog species combine to create vigorously-growing surface patterns - hummocks, ridges, lawns and pools. Not only are such "typical" bog surfaces now so rare that extensive examples are nationally significant, but the particular combination of features displayed at Duich Moss is, with the loss of other sites, now virtually unique.

3.6 The site has suffered from extensive domestic cutting for fuel on its western side. However, a mineral ridge divides the area of thinner peat covering this western portion from the deep peat which makes up the greater proportion of the site.

3.7 Considerable past drainage activity can be seen on the site, but the vast majority of this is retricted to the thinner peat which covers the many

mineral outcrops bordering the main bog surface. Few drains have been regularly cleaned out, and their effectiveness has therefore slowly dwindled.

3.8 The area of Duich Moss which has been cut for peat commercially since 1978 lies within a separate hydrological unit from the main body of the bog. While the workings destroyed much good bog vegetation, their effects will not be felt on the main bog because they are separated from the rest of the site by a fen stream and a mineral ridge.

4. Vegetation

The vegetation of the bog varies considerably over the site and this variation can be related to:

i. Local conditions of peat depth, surface gradient and proximity to standing water, pools, pool overflow channels, main seepages and drainage basins.

ii. The detailed microtopography of the peat and Sphagnum surfaces.

iii. Local nutrient enrichment of the bog surface by geese and gulls.

iv. Localised effects of hand cutting of peat for domestic purposes and (more recently) a major area of machine cut peat extraction.

4.1 Vegetation features of the raised bog component

4.1.1 Vegetation on the bog surface varies from parts which are very wet (permanent inundation), and where a continuous Sphagnum moss cover occurs, to others much drier and dominated by Empetrum nigrum and lichens. The latter type tends to occur on the shallow peats or where mineral ground outcrops.

4.1.2 In the main seepages Molinia caerulea is dominant and a classic blanket bog-poor fen plant community has developed, marking the natural transition from purely ombrotrophic into soligenour conditions.

4.1.3 The main peatland plateau is dominated by vegetation in which Eriophorum angustifolium, Calluna vulgaris, Erica tetralix, Molinia caerulea, Eriophorum vaginatum, Myrica gale and Trichophorum cespitosum dominate together with Sphagnum capilifolium and occasional hummocks of the moss Rhacomitrium lanuginosum and the lichen Cladonia impexa. This vegetation corresponds broadly to the Trichophorum-Eriophorum bog of Ratcliffe (1964) and the Erico-Sphagnetum magelanici of Birse and Robertson (1976). This Trichophorum-Eriophorum bog is extensive and the hummocks of Racomitrium lanuginosum equivalent to the subsassociation with Cladonia uncialis) are replaced in the wettest, most actively growing areas by prominent hummocks of the rare mosses Sphagnum imbricatum and S. fuscum.

4.1.4 Myrica gale is a frequent component of the vegetation and becomes locally dominant in places despite its dwarfed habit. Throughout the main flow areas there is an active Sphagnum surface beneath the vascular plant sward with S. capilifolium, S. magellanicum, S. papillosum, S. tenellum and, in wettest conditions S. cuspidatum.

4.1.5 Calluna is generally present throughout but rarely dominates, indeed a feature of the vegetation is its remarkable shortness. This is presumed to be resultant on the very wet, severely exposed conditions.

4.1.6 Where Sphagnum cover is highest, the dominant vascular plants are Erica tetralix, Eriophorum angustifolium, Rhynchospora alba and Myrica gale. This is the commonest plant association fringing the many pools and lochans.

4.1.7 Drier areas of bog surfaces are dominated by Empetrum nigrum with Cladonia impexa, Pleurozium schreberi, Eriophorum vaginatum and Myrica gale. Molinia caerulea is occasionally dominant in these drier areas, perhaps making a fire induced vegetation community.

4.2 Poolside and fringing vegetation of the patterned blanket bog

4.2.1 Surface patterns on the bog vary from very large dubh lochans 200m long with a fringe of Menyanthes trifoliata and Juncus effusus to small

bog pools or Sphagnum covered bog hollows. Some of these hollows are dominated by Carex limosa with Sphagnum cuspidatum and Eleocharis multicaulis. Early stages of enrichment result in hollows being colonized by Juncus kochii and in some cases J. effusus. Because of the cyclic nature of goose usage (D Stroud pers comm), this response in the vegetation may be a temporary feature. The effects of gulls and/or geese are also responsible for the small hummocks of Molinia caerulea colonising the floating Carex limosa-Juncus bulbosus lawns in bog hollows. Margins of hollows and pools are dominanted by Sphagnum species, especially S. magellanicum and S. papillosum. In these conditions the sundews, Drosera rotundifolia, D. intermedia and D. anglica occur. Drainage seepages, overflow channels and rills in the vicinity of pools have Sphagnum recurvum, S. cuspidatum, Juncus bulbosus and D. rotundifolia. Narthecium ossifragum is common in these conditions.

4.2.2 The mosaic of pools is set amongst a wide expanse of relatively level Sphagnum-Eriophorum vegetation (the flows) which in places is quaking and through which small overflow channels run from pool to pool in times of flood. On the peripheries of these flat plateau there are occasional deep swallow holes ('sink holes') through which water disappears to flow along late glacial channels beneath the peat mass.

4.3 Seepages and Flushes

On the northern side of the site and in the south western corner there are small topogenous flushes in which there are tall tussocks of Molinia caerulea and Schoenus nigricans in amongst bare peat or a mixed vegetation composed of Juncus bulbosus, Carex panicea, Menyanthes trifoliata, Carex limosa as well as indicators of more basic conditions such as Breutelia chrysochoma. There is a notable lack of Sphagnum, although S. papillosum, S. capilifolium and S. plumulosum do occur. Other plants occurring in this edge community are Succisa pratense, Narthecium ossifragum, Myrica gale, Calluna vulgaris and Drosera rotundifolia.

4.4 Other species

4.4.1 The flows and bog pools are breeding areas for dunlin and curlew, while the larger lochs have breeding Red-throated Divers. Other breeding birds include Tufted Duck, Common Scoter, Redshank, Sedge Warbler and Reed Bunting. Wintering birds in addition to White-fronted geese include Hen Harrier and Short-eared Owl. (See Part 5).

4.4.2 The bog pools and hollows provide ideal conditions for dragonflies, and the variety of micro-habitats associated with the pools, flows and seepages provide conditions known to be favourable to a wide variety of specialised invertebrate communities.

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