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European significance of British woodland types

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1. Introduction

Background

Increasingly, English Nature needs to relate the woodland conservation work that it does to a wider European framework. This is explicit with respect to Annex 1 types under the EU Habitats and Species Directive, but is implicit in the approaches taken to defining Priority Habitats under the Biodiversity Action Plan. English Nature's ability to do this is limited by lack of knowledge of the abundance and distribution of woodland types on the Continent that are comparable to those in Britain. The aim of this project is to review briefly the state of knowledge on habitat distribution and abundance for these types and to indicate where it would be useful to carry out further work to fill the gaps.

Objectives

1. To summarise the current state of knowledge on the extent and distribution on the Continent of HSD Annex 1 woodland types that occur in Britain.
2. To carry out a similar analysis for the woodland types identified as important under the BAP programme.
3. To provide names and address of people on the Continent who hold/update such information so that English Nature can approach them in future directly.

Geographical limit of the exercise

The specific focus of the study is the political limit of the European Union - at the present time Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden and the UK. However, in the report, it has often been necessary to refer to broader natural limits of the woodland types so as to give a more complete picture of their distribution and variability through Europe as a whole and to assess the ecological significance of the British examples. Figure 1a shows the Member States of the EU within the wider European context and Figure 1b the Biogeographic Zones.

Comparability of woodland types

This study identifies woodland types on the Continent that are 'comparable' to those of nature conservation significance in Britain and reviews briefly the state of knowledge on their abundance and distribution elsewhere. For the Habitats and Species Directive, it might be supposed that the representatives in the Member States of the various Annex 1 woodland types had been identified centrally as part of the process of specifying a clear agenda for nomination of Special Areas of Conservation. This could then provide a sensible starting point for assembling an overview of the extent and variability among the woodland types across the Continent.

In fact, as is clear from the Manual of Interpretation (CEC 1994), the 'sub-types, regional varieties and correspondence with other classification systems' of each of the Annex 1 habitats, have usually been identified in only a very rudimentary fashion, with information from certain countries figuring much more prominently than others. Some of this

information originates from the CORINE Habitat Classification (CEC 1991) that forms the background to identifying the Annex 1 Habitats. In other cases, Member State representatives have contributed comment as the *Interpretation Manual* was developed. The UK equivalents are often among the more clearly defined national examples, the equivalent NVC communities (Rodwell 1991 *et seq.*) to the woodland habitats being often unambiguous - if sometimes open to argument. Without making use of such definitions as might be available for other countries, it has been left to each Member State to wrestle with the precise meaning of the habitats in their own territory. It is obvious that sometimes politically expedient decisions about the identity of a woodland type, as with other habitats, have overriden strictly ecological interpretations of its meaning.

Phytosociology as a common descriptive language

The most widely accepted measure of comparability among woodland types across Europe is that represented by phytosociological definitions. Using this approach, associations have been characterised from relevés, their definitions published in the phytosociological literature with their formal author citations and date of publication and the units referred to a syntaxonomic hierarchy. Even just for woodland, this literature is extensive and widely dispersed and, within the EU, only the UK (Rodwell 1991 *et seq.*), Austria (Mucina *et al.* 1993) and the Netherlands (Schaminée *et al.* 1995 *et seq.*) have published detailed national overviews of their plant communities (Rodwell 1995).

Although this kind of information has been used in developing the Habitats Directive - through the CORINE Habitat Classification which underlies the definition of the habitats - the use was not always consistent from country to country nor always very accomplished: the information available across Europe is patchy and the phytosociological definitions often technical and sometimes contentious. The phytosociological interpretation of the Habitats Directive woodlands, like many other of the habitats, is thus sometimes unclear, incomplete, outdated and inaccurate.

To give an accurate picture of the character and extent of the Habitats, and the significance of the British examples, we have therefore had to effectively construct definitions from available information in the literature and from national experts, both phytosociologists and those involved in interpreting the Habitats Directive in the Member States. Sometimes, these groups of experts in Member States are one and the same, but a continuing problem in understanding the Habitats Directive is the institutional separation between the various kinds of experts involved in the classification of habitats and vegetation types and the differences in their scientific cultures. Getting a clear message out of all this is difficult.

We have carried out this exercise partly by correspondence, partly in discussions at the 9th European Vegetation Survey Workshop at Erice in Sicily in March 2000 and the 43rd Symposium of the International Association for Vegetation Science at Nagano in Japan in July 2000. The syntaxonomic overview that we have assembled for woodlands is summarised in Appendix 1 (using a revised version of the overview included in Rodwell *et al.* 1999 as the framework) and the list of expert contacts has been supplied to English Nature.

The significance of the British woodland component

What is the 'significance' of the British component of each of the important woodland types, conceived (as far as possible) in terms of its relative extent, the features of its composition and the way the woodland is used? Describing the character of the woodlands in floristic and ecological terms - and this aspect of the significance of our own examples - is the easiest part of this particular task, given the generally high quality of phytosociological data, the competence of the national experts contacted and the common language to which the NVC gives access. However, obtaining accurate data on their extent in the Member States is impossible at the present time because very few of them hold national data bases in which clearly identified vegetation types or habitats have been comprehensively catalogued and mapped. Among the most advanced in this respect at the moment is Spain which already has extensive CORINE habitat maps cross-referenced to phytosociological syntaxa. In most cases, therefore, we have been driven to use qualitative and comparative terms to express the extent and proportion of the woodlands in the various Member States. The same is true of the condition, use of and threats to the various woodland habitats.

Capture in the cSACs

The Natura 2000 network aims to capture a proportion of the examples of each of the habitats in the various Member States. This end result will be a complex algorithm of the extent and significance of the habitats across Europe as a whole, in the various biogeographic zones and in the individual States themselves and of the political resolve of the EU constituents. Meanwhile, a further problem we encountered is the extraordinary difficulty of obtaining accurate information about the number, location and size of the candidate Special Areas of Conservation in order to assess whether the significance of the national capital of each of the woodland habitats is reflected in the candidate SACs. Our request for formal permission to access this information centrally through the database at the European Topic Centre on Nature Conservation in Paris was rejected by the European Commission. Fortunately, we were saved the laborious task of pursuing each Member State separately (unfeasible, in fact, within the scope of this exercise) by the generosity of WWF-UK in allowing us access to the results of a project engaged on a similar task to ours for all the Habitats Directive habitats. Details of the database we have constructed using this information is given in Appendix 2 where it will be seen that, even then, information is incomplete for particular Biogeographic Zones (like the Boreal) or for particular countries (like Germany where the Länder have not yet supplied the Federal Government with the requisite information about the cSACs). Furthermore, no geo-locations are given for the cSACs in the information supplied, so we have had to provide hand-drawn copies of cSAC maps for the various woodlands, necessarily less than accurate in their detail. Tables 1 & 2 show the numbers and areas of the cSACs in the EU Member States and their biogeographic zones (with the percentage contributions below in each figure) and Tables 3-13 in Appendix 3 give details of the names and sizes of the cSACs. These data are as complete as we could obtain by August 2000.

Two caveats need to be attached to the comparisons of numbers of cSACs proposed for each woodland type by the UK and other EU Member States. First, while this report was being compiled, there was a meeting to consider the various countries' submissions within the Atlantic Biogeographic Zone (the Kilkee Meeting). Following this, the UK country agencies proposed a further tranche of woodland cSACs to meet what were seen as shortcomings in the original list. These are currently the subject of a consultation exercise before being put forward to Brussels.

Second, at the Kilkee meeting, it was also noted that there was a difference between the way in which the UK had presented its list compared to other countries, in that the UK had listed only sites where the Annex 1 type was the prime reason for the site being put forward as a cSAC. Other countries had also listed occurrences of Annex 1 Habitats on sites where they occurred but were not the prime feature. Therefore, following the Kilkee Meeting, all occurrences on existing and new SACs were identified. Appendix 4 to this report shows the revised distributions of Annex 1 woodland cSACs in Britain post-Kilkee, including the new sites out for consultation and the additional occurrences of Annex 1 types on existing cSACs.

The perspective of the Biodiversity Action Plan

The UK Biodiversity Action Plan woodland types were in part selected because they included Habitats Directive Annex 1 types. Although the BAP types do go wider than the Annex 1 types, we have structured our report around the latter, using the BAP definition where relevant to then provide a wider perspective on the range of variation and the significance of the UK contribution to the European woodlands defined more broadly in this way. The exception is the BAP Wood Pasture category which has a more complex relationship to the Habitats Directive.

The format of the accounts

We have arranged the woodland accounts in what seems to be a sensible ecological order, rather than by their numerical Habitats Directive codes and we have structured them in a simple modular fashion giving (1) a definition of the woodland types in terms of other classifications (Hall & Kirby 1998), including the National Vegetation Classification (Rodwell 1991), the Forest Practice Guides (Forestry Commission 1994) and the forthcoming EUNIS Habitat Classification (Davies & Moss 1997), (2) a note on the coherence of the definition provided by the Interpretation Manual, (3) a summary of the character and significance of the UK examples in a European context, (5) a comment on the pattern of cSAC designation and (6) a summary of the difference which the broader BAP perspective makes to understanding the character and significance of British woodlands. Each account is accompanied by maps of the UK examples of the Habitats Directive and BAP types and of the woodland cSAC network across the EU.

Appendices and references

Appendix 1 comprises the syntaxonomic overview of European woodlands, Appendix 2 an account of the EuroSAC database with the cSAC details in Appendix 3. Appendix 4 shows the post-Kilkee cSAC maps for the woodland types.

Figure 1a EU Member States and other European countries

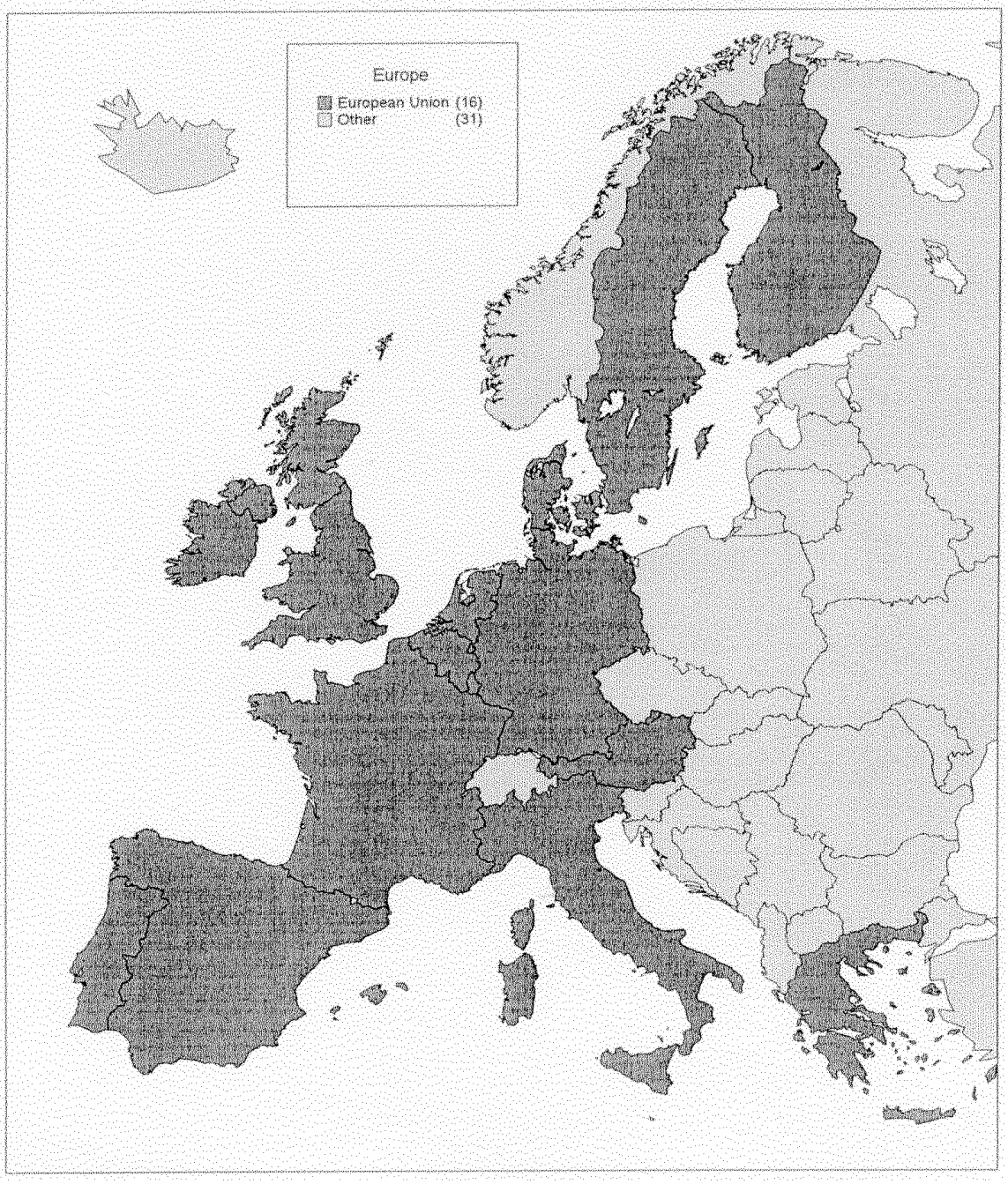

Figure 1b European Biogeographic Zones

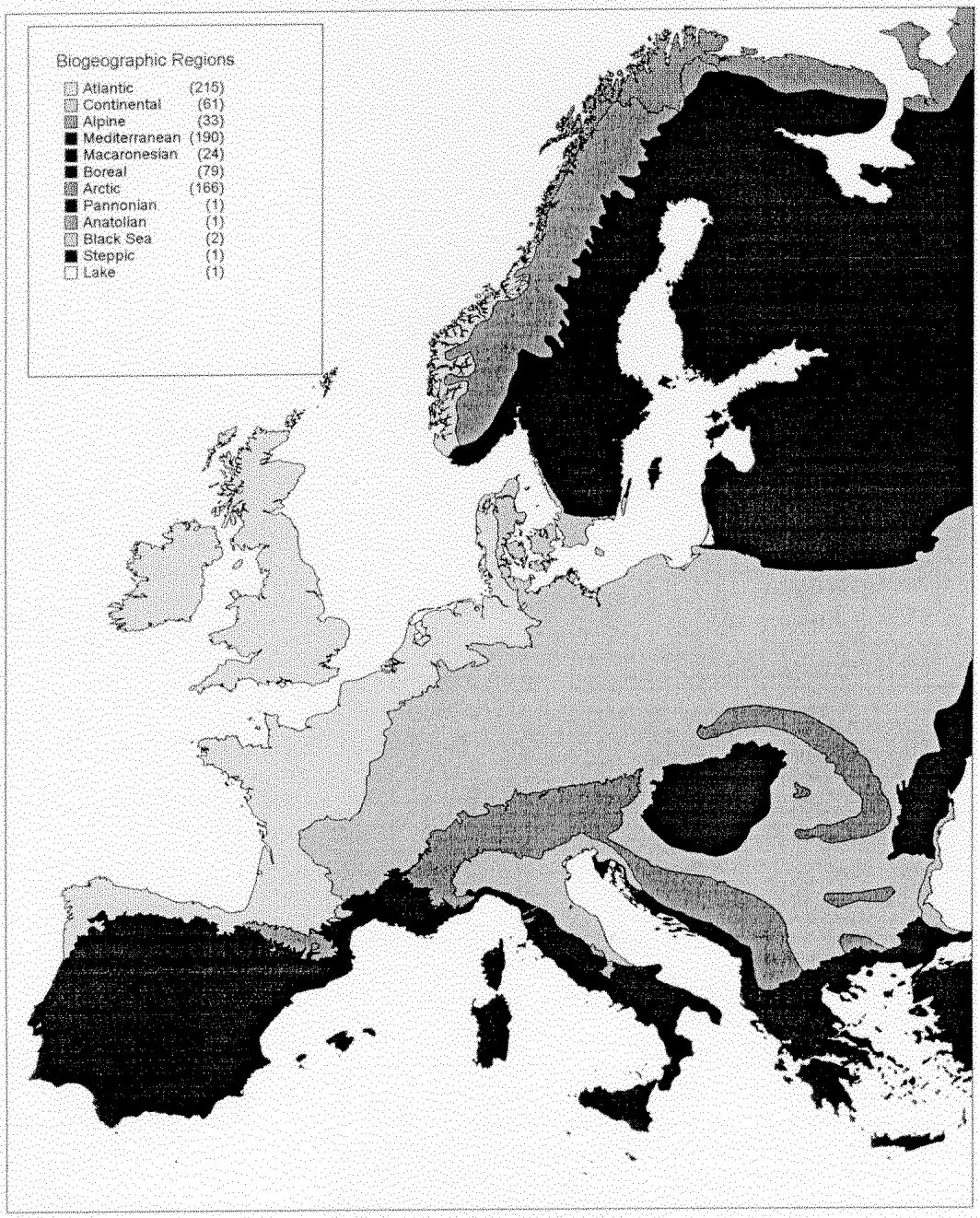

Table 1. Numbers of woodland cSACs in EU Member States as at 1 January 2000

sites	zone	5130	9120	9130	9160	9180	9190	91A0	91C0	91D0	91E0	91J0
AT	alp	3		12	1	17				9	33	
AT	con	6		10	6	18				6	33	
BE	atl	1	1	7	13		14			11	26	
BE	con	3		1	4	8	1			4	12	
DE	Alp			6		5				2	5	
DK	atl	6	1	2			8				1	
DK	con	9	5	23	3	1	5			11	11	
ES	atl		44			9					94	
ES	med	1	14			10					66	
ES	pyr					8					5	
FI	bor					6	2			659	59	
FR	alp	15	1	10		14				5	9	
FR	atl	86	46	51	22	35	30	2		23	142	
FR	con	50	41	85	42	90	14			58	154	
FR	med	16	6	2		12					18	
FR	pyr	1		1		1				1		
GR	med	9	7	23		2					20	
IE	atl	5						3		4	3	
IT	alp	4		56	8	59				24	49	
IT	con	90		10	30	15	4				129	
IT	med	68	3	9	1	42	6				54	
LU	con		1	26	17	16				5	22	
NL	atl	5		2	4	2	4			12	14	
PT	atl										3	
PT	med										9	
SE	bor	27		19	49	42	18			266	100	
SE	con	50		36	43	22	36			28	45	
UK	atl	8	5	4	2	10	4	10	10	4	6	7
Total		463	175	395	245	444	146	15	10	1132	1122	7

Key to Sites:
AT - Austria, BE - Belgium, DE – Germany, DK – Denmark, ES – Spain, FI – Finland, FR – France, GR – Greece, IE – Ireland, IT – Italy, LU – Luxemburg, NL – Netherlands, PT – Portugal, SE – Sweden, UK – United Kingdom.

%	zone	5130	9120	9130	9160	9180	9190	91A0	91C0	91D0	91E0	91J0
AT	alp	0.6		3.0	0.4	3.8				0.8	2.9	
AT	con	1.3		2.5	2.4	4.1				0.5	2.9	
BE	atl	0.2	0.6	1.8	5.3		9.6			1.0	2.3	
BE	con	0.6		0.3	1.6	1.8	0.7			0.4	1.1	
DE	alp			1.5		1.1				0.2	0.4	
DK	atl	1.3	0.6	0.5			5.5				0.1	
DK	con	1.9	2.9	5.8	1.2	0.2	3.4			1.0	1.0	
ES	atl		25.1			2.0					8.4	
ES	med	0.2	8.0			2.3					5.9	
ES	pyr					1.8					0.4	
FI	bor					1.4	1.4			58.2	5.3	
FR	alp	3.2	0.6	2.5		3.2				0.4	0.8	
FR	atl	18.6	26.3	12.9	9.0	7.9	20.5	13.3		2.0	12.7	
FR	con	10.8	23.4	21.5	17.1	20.3	9.6			5.1	13.7	
FR	med	3.5	3.4	0.5		2.7					1.6	
FR	pyr	0.2		0.3		0.2				0.1		
GR	med	1.9	4.0	5.8		0.5					1.8	
IE	atl	1.1						20.0		0.4	0.3	
IT	alp	0.9		14.2	3.3	13.3				2.1	4.4	
IT	con	19.4		2.5	12.2	3.4	2.7				11.5	
IT	med	14.7	1.7	2.3	0.4	9.5	4.1				4.8	
LU	con		0.6	6.6	6.9	3.6				0.4	2.0	
NL	atl	1.1		0.5	1.6	0.5	2.7			1.1	1.2	
PT	atl										0.3	
PT	med										0.8	
SE	bor	5.8		4.8	20.0	9.5	12.3			23.5	8.9	
SE	con	10.8		9.1	17.6	5.0	24.7			2.5	4.0	
UK	atl	1.7	2.9	1.0	0.8	2.3	2.7	66.7	100.0	0.4	0.5	100.0

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Table 2. Areas of woodland cSACs in EU Member States as at 1 January 2000

KM²	zone	5130	9120	9130	9160	9180	9190	91A0	91C0	91D0	91E0	91J0
AT	alp	7.30		311.68		136.92				0.36	50.43	
AT	con	0.12		89.63	33.46	95.76				32.79	168.70	
BE	atl	0.00	0.91	4.78	18.40		19.33			2.63	23.79	
BE	con	1.33		0.29	1.65	2.14	0.01			0.48	0.93	
DE	alp			0.00		2.08				0.00	0.00	
DK	atl	6.92	0.03	2.24			5.58				0.15	
DK	con	8.99	1.36	32.03	3.84	0.09	10.27			15.06	3.03	
ES	atl		898.83			6.77					96.96	
ES	med	0.00	292.94			14.41					157.84	
ES	pyr					5.87					0.04	
FI	bor					0.13	0.05			1476.72	179.97	
FR	alp	27.22	1.32	34.56		34.13				1.54	6.63	
FR	atl	75.78	68.32	99.43	33.44	18.41	63.39	1.26		9.86	231.55	
FR	con	34.69	51.15	148.60	198.58	68.20	16.74			19.18	169.43	
FR	med	41.21	16.03	4.75		7.77					27.36	
FR	pyr	0.71		3.95		0.30				1.06		
GR	med	49.94	24.00	235.28		3.53					49.66	
IE	atl	8.22						4.49		0.69	1.06	
IT	alp	3.72		306.01	8.84	112.43				11.66	59.67	
IT	con	89.28		59.58	31.52	18.76	5.39				61.58	
IT	med	66.35	17.99	31.60	1.48	41.33	23.00				34.57	
LU	con			68.43	4.36	2.35					1.52	
NL	atl	9.90		0.87	4.20	0.65	44.55			76.91	21.53	
PT	atl										31.03	
PT	med										83.91	
SE	bor	8.56		1.09	12.14	8.80	2.80			98.01	18.91	
SE	con	14.13		6.98	10.78	1.08	6.31			6.76	4.35	
UK	atl	23.96	38.56	14.17	3.73	20.41	33.94	49.54	154.87	32.31	10.50	5.56
Total		478.33	1411.44	1455.98	366.41	602.32	232.25	55.29	154.87	1786.02	1495.11	5.56

Key to Sites:
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%	zone	5130	9120	9130	9160	9180	9190	91A0	91C0	91D0	91E0	91J0
AT	alp	1.53		21.41		22.73				0.02	3.37	
AT	con	0.03		6.16	9.13	15.90				1.84	11.28	
BE	atl	0.00	0.06	0.33	5.02		8.32			0.15	1.59	
BE	con	0.28		0.02	0.45	0.36	0.00			0.03	0.06	
DE	alp			0.00		0.34				0.00	0.00	
DK	atl	1.45	0.00	0.15			2.40				0.01	
DK	con	1.88	0.10	2.20	1.05	0.02	4.42			0.84	0.20	
ES	atl		63.68			1.12					6.49	
ES	med	0.00	20.75			2.39					10.56	
ES	pyr					0.97					0.00	
FI	bor					0.02	0.02			82.68	12.04	
FR	alp	5.69	0.09	2.37		5.67				0.09	0.44	
FR	atl	15.84	4.84	6.83	9.13	3.06	27.29	2.28		0.55	15.49	
FR	con	7.25	3.62	10.21	54.19	11.32	7.21			1.07	11.33	
FR	med	8.62	1.14	0.33		1.29					1.83	
FR	pyr	0.15		0.27		0.05				0.06		
GR	med	10.44	1.70	16.16		0.59					3.32	
IE	atl	1.72						8.12		0.04	0.07	
IT	alp	0.78		21.02	2.41	18.67				0.65	3.99	
IT	con	18.66		4.09	8.60	3.12	2.32				4.12	
IT	med	13.87	1.27	2.17	0.40	6.86	10.29				2.31	
LU	con			4.70	1.19	0.39					0.10	
NL	atl	2.07		0.06	1.15	0.11	19.18			4.31	1.44	
PT	atl										2.08	
PT	med										5.61	
SE	bor	1.79		0.07	3.31	1.46	1.20			5.49	1.27	
SE	con	2.95		0.48	2.94	0.18	2.72			0.38	0.29	
UK	atl	5.01	2.73	0.97	1.02	3.39	14.62	89.61	100.00	1.81	0.70	100.00

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2. Woodland accounts

2.1 Asperulo-Fagetum beech forests

Natura 2000 code 9130
Habitats Directive code 41.13
BAP Priority Habitat Lowland Beech & Yew Woodland
NVC Community W12 *Fagus-Mercurialis* woodland & W14 *Fagus-Rubus* woodland *p.p.*
Forestry Commission Guide Type 2. Lowland beech-ash woods
Peterken Stand Type 8C Calcareous pedunculate oak-ash-beech woods
Vegetation Map of Europe 5.2.1-3 Eutrophic and eu-mesotrophic beech & mixed beech forests
EUNIS Habitat G1.6 Beech woodland & G1.C Mixed deciduous and coniferous woodland

Summary

Even conceding a broader British range for this woodland type in planted and self-sown stands of beech beyond its generally accepted natural north-western European limit at the Chilterns, the UK examples of the Asperulo-Fagetum comprise but a small proportion of the vast and complex range of mesic beech and mixed-beech forests that extends right across the north-west European lowlands into the mountains of the centre and south. Also, compared with many other parts of Europe, our stands are small and scattered - partly because of the limited occurrence in the UK of more calcareous rocks and superficials and partly because of the general primacy of ash and oak in Carpinion communities through much of the wooded British lowlands. Beech arrived late here but we have also long had a silvicultural preference for oak, in contrast to much of central Europe, where beech is the more highly regarded timber tree. Despite these features, British stands, along with those in north-east France, have a distinctive Atlantic feel to their floristics, even if this is expressed partly through the absence of Continental plants and somewhat muted with the often deep shade cast by beech. Compared with northern France, the proportion of known UK sites designated as cSACs as at 1 January 2000 appeared low and additional sites were proposed following the Kilkee Meeting.

Coherence of interpretation of HD habitat

The explicit name of the habitat is a misleadingly narrow phytosociological term for the range of woodlands that are included in the Definition. These correspond partly with a broad understanding of the alliance Asperulo-Fagion (now Galio odorati-Fagion) R.Tx 1955, though there is insufficient indication in the Definition and Geographical Distribution that the type also extends into the mountainous regions of the Mediterranean and Alpine biogeographic zones. The Interpretation Manual correctly includes both W12 *Fagus-Mercurialis* and W14 *Fagus-Rubus* woodlands as falling within this type though only a minority of more basiphilous stands in the latter ought to be included and, in our view, the W12b *Sanicula* sub-community approaches the HD 9150 Cephalanthero-Fagion in its

composition, habitat and ecological dynamic. The CORINE units included in the Habitat Types section do not cover the full range of Asperulo-Fagetum woodlands.

Character and significance of the UK examples in a European context

Woodlands dominated by beech, alone or with other trees, comprise the major forest types across much of central Europe. They are particularly important in the lowland and colline landscapes to the north of the Atlantic and Continental biogeographic zones but continue to make a prominent contribution at higher altitudes in the warmer south, where cooler temperatures in the mountains of the Alpine and Mediterranean zones sustain a zone with beech above other deciduous or evergreen broadleaf forest.

British examples of the Asperulo-Fagetum woodland type (Figure 2) share many general floristic features with the mesophilous beech forests that occur on drought free, mesotrophic, brown calcareous mull soils all across Europe: eastwards through Belgium and Germany into Poland, Austria and Czechia, south-west through France into the Pyrenees, and south-east through Switzerland into the mountains of Italy, Illyria and the northern Balkans. Beech is the major tree in these woodlands throughout this range with, in the field layer, *Galium odoratum, Viola reichenbachiana, Dryopteris filix-mas*, *Oxalis acetosella, Anemone nemorosa, Geranium robertianum, Mycelis muralis, Sanicula europaea, Milium effusum, Brachypodium sylvaticum, Epilobium montanum, Hedera helix and Veronica chamaedrys*. A conservative syntaxonomical view has placed all these woodland types within the alliance Asperulo-Fagion Tüxen 1955, (now known as the Galio odorati-Fagion) of which the Asperulo-Fagetum Rübel 1930 (now better defined as the Galio odorati-Fagetum Sougnez & Thill 1959 *emend* Dierschke 1989) can be seen as a type association - though it has itself been described from relatively few locations. A recent review by Dierschke (1997) has helpfully distinguished a number of geographical groupings within this complex series of woodland types and these are shown diagrammatically in Figure 3. This source also gives details of the numerous Galio odorati-Fagion associations characterised through the range which, for simplicity, we have not described here, except for the Atlantic zone.

In this series of beech woodlands, the British stands belong among the central and north European associations that are additionally characterised by the presence in the canopy (typically at low cover) of *Quercus robur, Q. petraea, Carpinus betulus, Fraxinus excelsior* and *Acer pseudoplatanus* with, in the field layer, *Mercurialis perennis, Circaea lutetiana, Lamiastrum galeobdolon, Euphorbia amygdaloides, Moehringia trinervia, Carex sylvatica, Dryopteris dilatata* and *Rubus fruticosus* agg. These woodlands extend through France and Belgium into Denmark, south-west Norway, Germany, Poland and Czechia and their overall potential range is shown in Figure 4.

Most similar of all to the UK W12 *Fagus-Mercurialis* woodlands are those beech forests of north-west France where *Ilex aquifolium* becomes a frequent subordinate canopy element, *Tamus communis* an occasional liane, *Daphne laureola* and *Ruscus aculeatus* distinctive small bushes and, where shade is not too dense, *Hyacinthoides non-scripta* a striking vernal herb. This is seen in associations like the Endymio-Fagetum (Noirfalise & Sougnez 1963, Durin *et al.* 1967, Klötzli 1970, Bardat & Frileux 1981, Zanella 1991) and the Rusco-Fagetum (Durin *et al.* 1967) included in the Northern Atlantic zone of Dierschke (1997). The occurrence of *Ilex* and the presence in many French stands of *Holcus mollis, Stellaria holostea* and *Luzula pilosa* mean that, as with British examples of this woodland type, there is a floristic trend

towards the 9120 Beech forests with *Ilex* and *Taxus*. In the NVC, such transitional stands were included in W14 *Fagus-Rubus* woodland, where *Galium odoratum* can also occur on more base-rich soils with some other characteristic Asperulo-Fagetum species.

With the move into the Continental zone of Europe beyond Belgium and Luxembourg, *Picea abies* becomes prominent as a canopy companion to beech in the central European Asperulo-Fagetum woodland type (Dierschke's zone 3). The Atlantic element in the flora fades and a new contingent of herbs appears, notably *Hepatica nobilis, Festuca altissima, Hieracium sylvaticum, Pulmonaria officinalis, Neottia nidus-avis, Daphne mezereum, Actaea spicata, Dentaria bulbifera, Asarum europaeum, Carex digitata, Maianthemum bifolium* and *Senecio fuchsii*. These woodlands can be seen as the core of this habitat type.

Further south and east in Europe, additional and more substantial floristic contrasts can be seen with the shift to higher altitudes in warmer latitudes. Here, mesic beech forests retain broad similarities to those in the UK but Carpinion trees fade in importance while *Abies alba* becomes a frequent canopy companion in a series of montane beech-spruce-fir forests. In the mountains of the Pyrenees and northern Spain (Dierschke's zone 2), there is a persistent Atlantic element with *Ilex aquifolium* and *Blechnum spicant* still common, though other herbs such as *Scilla lilio-hyacinthus, Helleborus viridis* and *Scrophularia alpestris* give a distinctive Iberian feel. Further east, in the Cevennes, Jura and Vosges, this Atlantic element is lost.

More widely, towards the southern part of central Europe, mesic beech-spruce-fir forests of the Asperulo-Fagetum type are widely distributed through the pre-Alps of southern Germany, Switzerland, Bohemia and northern Italy (Dierschke's zone 5) where *Lonicera alpigena, L. nigra, Salvia glutinosa, Dentaria emeaphyllos* and *Veronica urticifolia* become characteristic. Essentially similar forests extend eastwards into the Carparthians of southern Poland and Slovakia. From here, south-eastwards through the Illyrian mountains of north-east Italy, Slovenia, Croatia, Hungary and the northern Balkans, additional species such as *Cyclamenus purpurascens, Anemonia agrimonioides, Rubus hirtus, Polystichum lobatum, Vicia orobioides, Galanthus nivalis, Lamium orvula, Ruscus hypoglossum* and *Helleborus niger* increase in frequency. Finally, in the southern Balkans and Sicily, the floristic integrity of the Asperulo-Fagetum woodland type is lost with the reduction in the representation of many of the central European plants and the appearance of a more striking Mediterranean element.

cSAC designation pattern

The numbers of designated UK cSACs as at 1 January 2000 looked small in comparison with north-east France (Figure 5), if we are to ensure adequate representation of the British share of the distinctive Atlantic form of this forest type. Elsewhere, especially in east-central France, where the type is widespread, large numbers of sites have been designated, ensuring reasonable coverage of the full range of geographical types except in northern Spain. There, no Asperulo-Fagetum cSACs have been put forward, perhaps because all Atlantic beech woodlands in that region have been included in the Ilici-Fagion - a mistake if important sources like Rivas-Martinez *et al.* (1991) are to be believed. Following the Kilkee meeting, additional sites have been proposed in south Wales and on the North and South Downs, the Chilterns site has been extended and the type has been registered as occurring in other existing cSACs such as the New Forest complex (Appendix 4).

The BAP perspective

Within the Biodiversity Action Plan, the Asperulo-Fagetum is brought together with the Beech forest with *Ilex* and *Taxus* and *Taxus baccata* woodlands into an all-encompassing Lowland Beech & Yew Woodland. The NVC equivalents of this broad group are the W12 *Fagus-Mercurialis*, W14 *Fagus-Rubus* and W15 *Fagus-Deschampsia* woodlands, representing beech dominance on a wide range of soils, plus the W13 *Taxus* woodland where yew becomes pre-eminent in locally calcareous conditions.

Strictly speaking, the BAP category is a south-eastern woodland type which has been interpreted as coinciding more or less with the supposed natural limit of beech (Hall & Kirby 1998, Figure 6) but including a few outliers beyond (Rackham 1997). Beech would probably have spread beyond this line had not mixed broadleaf woodland already held sway when it crossed the land bridge to the Continent (the tree moves slowly into existing woodland and benefits from sporadic clearance into which it can invade) and had not later fragmentation of the forest cover then isolated its established populations. As it is, beech thrives in planted or secondary woodlands of the W12, W14 and W15 types beyond this limit, so it can be difficult to draw a hard and fast rule about the inclusion of particular stands. Hall & Kirby (1998), like Rodwell & Patterson (1994), favour focusing restoration and expansion within the natural limit. They also exclude more northerly W13 *Taxus* woodlands from this BAP category and place them in the Upland Mixed Ashwood.

The particular benefit for conservation in using the BAP category is that it includes in W12b the British equivalents of the Cephalanthero-Fagion, the alliance of European calcicolous beech forests on limestones, whose significance has not been recognised within the framework of the Habitats Directive. This broader BAP unit is thus the British counterpart of the full range of calcicolous, mesophilous and acidophilous beech forests that have a very wide geographical spread across the lowlands and colline regions of Europe and remain regionally of great extent.

Figure 2 **Distribution of known British stands of 9130 Asperulo-Fagetum**

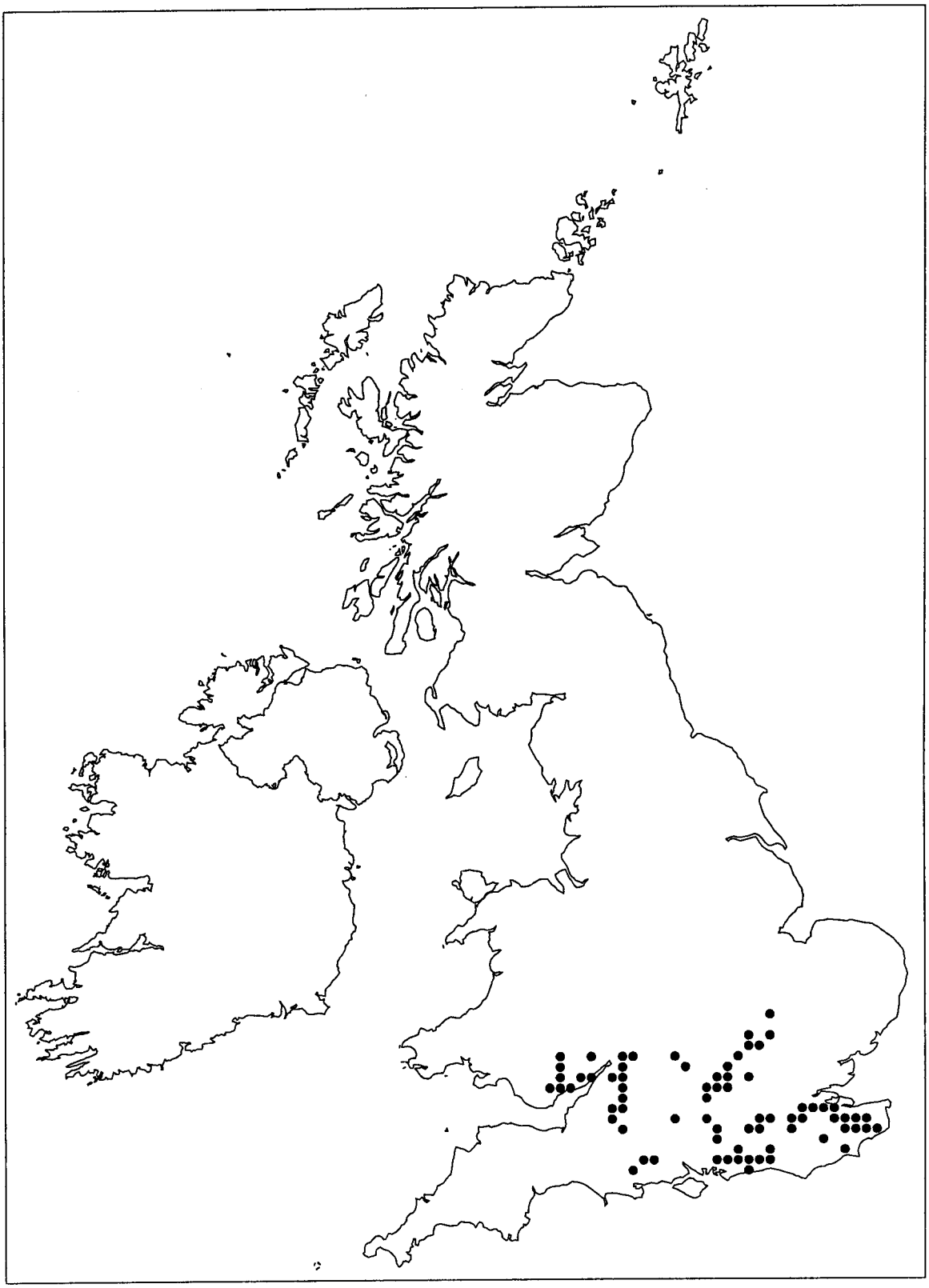


Figure 3 Major geographical types of mesic European beech forest
1 Northern Atlantic type, 2 Spanish/Pyrenean type, 3 Central European type 4 Continental French type, 5 Alpine Sub-Montane type, 6 Carpathian type, 7 SE European type, 8 Italo-Balkan type (after Dierschke 1997)

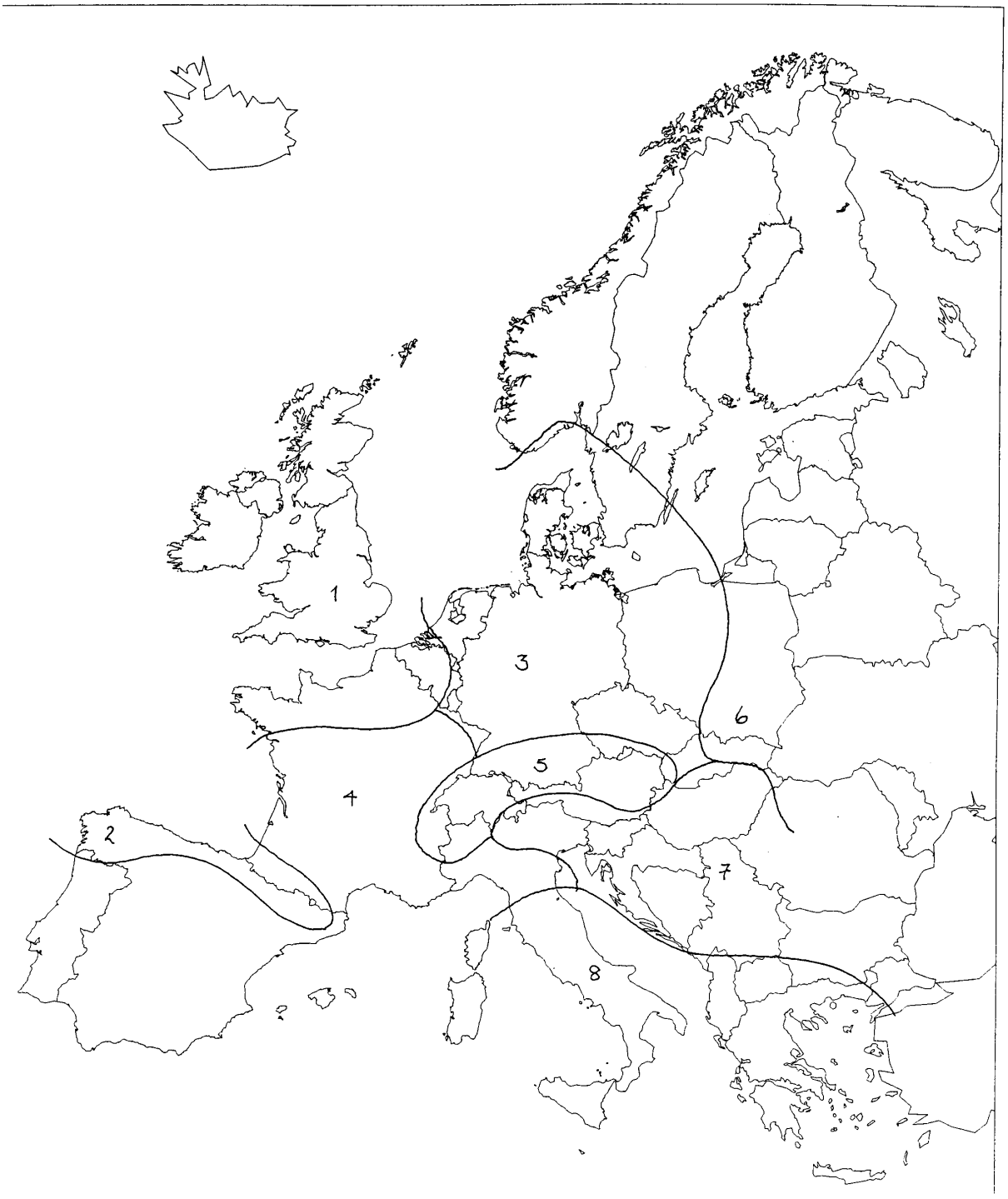
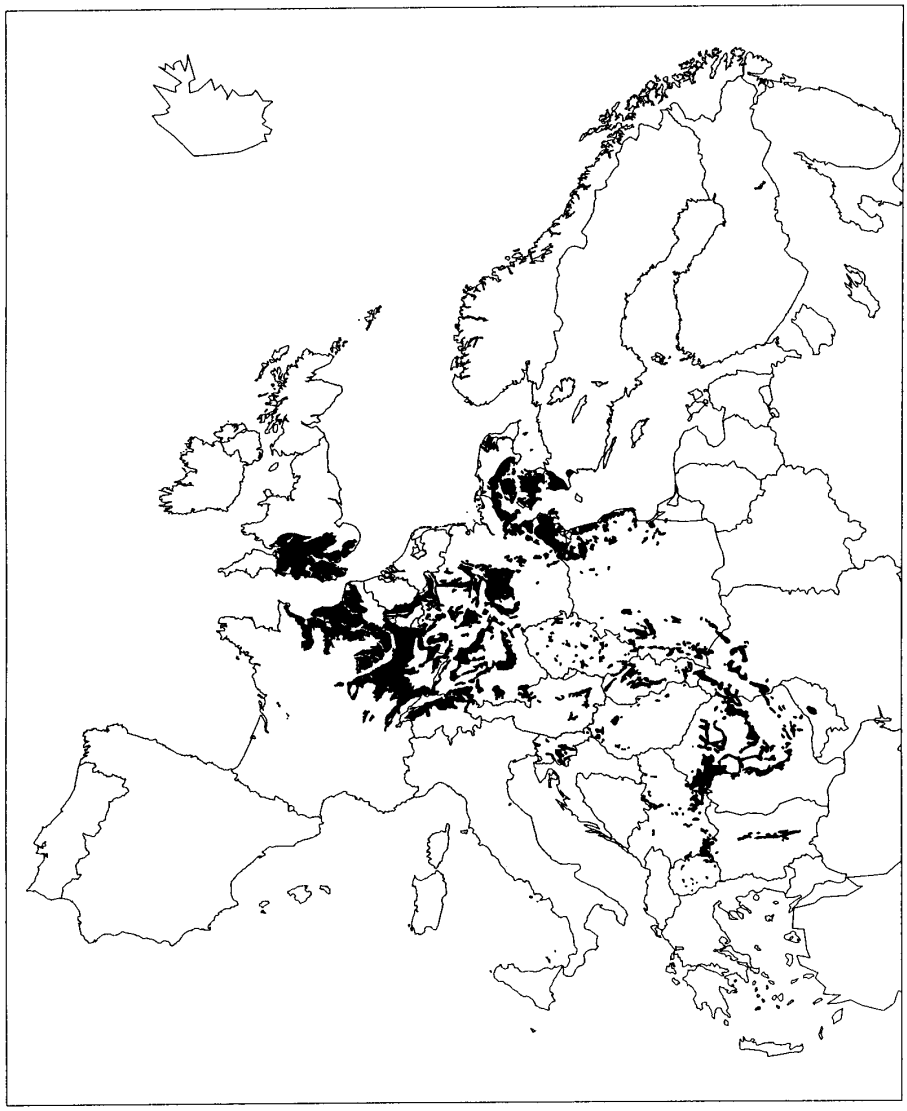


Figure 4 **Potential extent of north-European mesic beech and beech-spruce woods**



The figure is reproduced by kind permission of the Bundesamt für Naturschutz in Bonn and is an extract from the 1:2.5M Vegetation Map of Europe. To the south of this zone there is a further unmapped zone of mesic Asperulo-Fagion woodlands with a beech-spruce-fir canopy.

Figure 5 **Distribution of cSACs for 9130 Asperulo-Fagetum as at 1 January 2000**

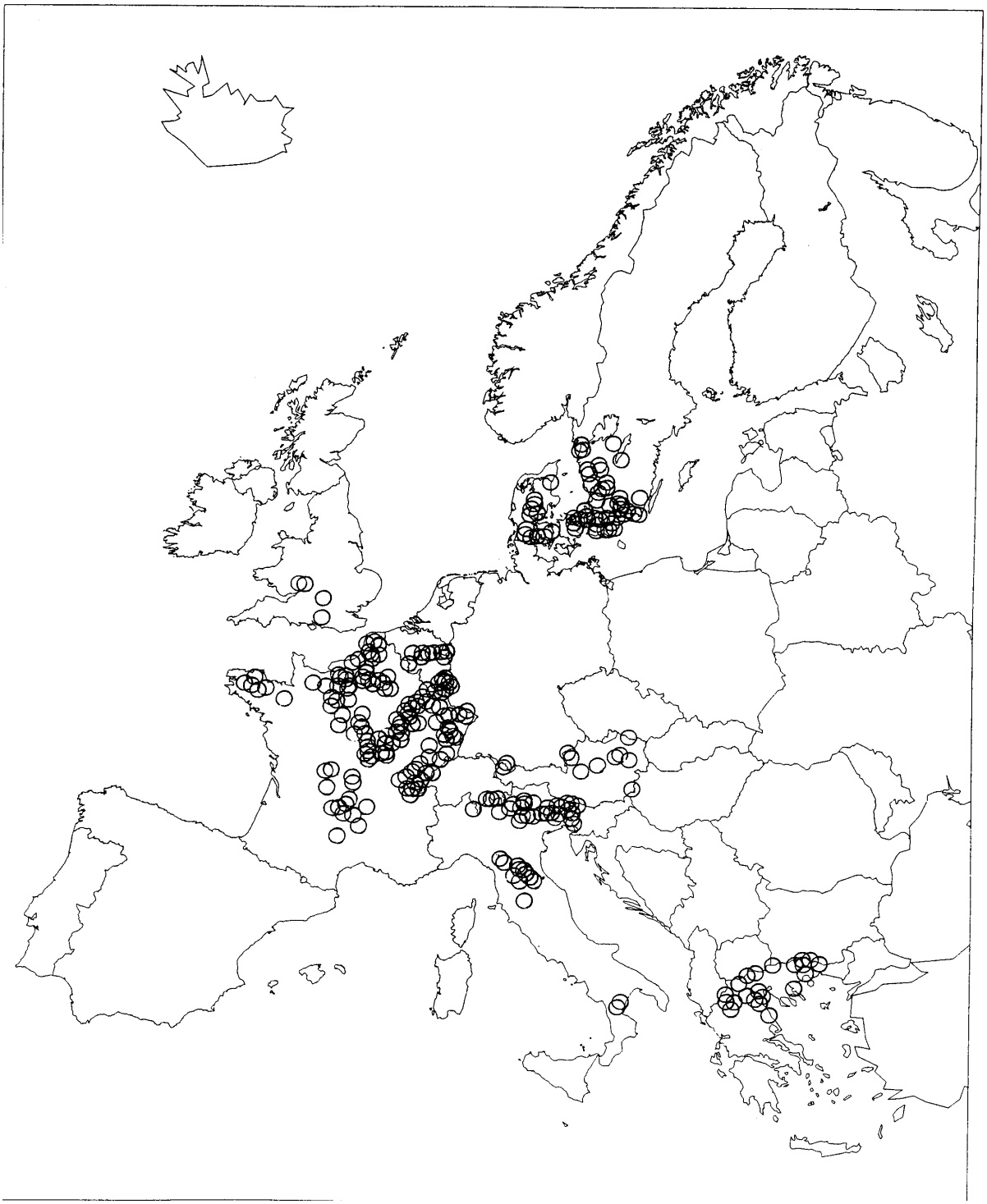
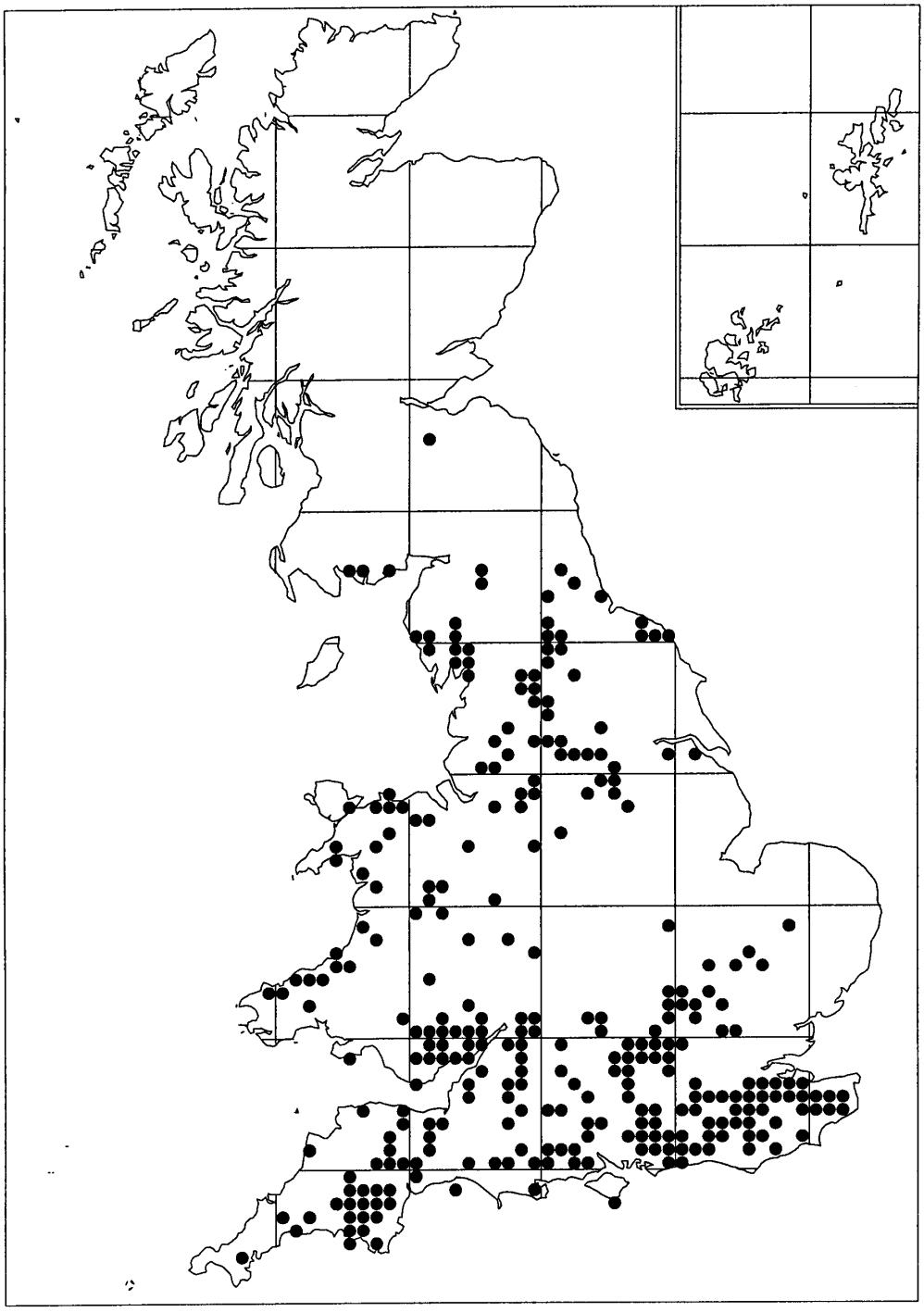


Figure 6 **Distribution of BAP Lowland Beech and Yew Wood**



2.2 Beech forest with *Ilex* and *Taxus*, rich in epiphytes (Ilici-Fagion)

Natura 2000 code 9120
Habitats Directive code 41.12
BAP Priority Habitat Lowland beech & Yew Woodland
NVC community W14 *Fagus-Rubus p.p.* & W15 *Fagus-Deschampsia* woodlands
Forestry Commission Guide Type 1. Lowland acid beech and oak woods
Peterken Stand Types 8A Acid sessile oak-beech woods, 8B Acid pedunculate oak-beech woods, 8D Acid pedunculate oak-ash-beech woods, 8E Sessile oak-ash-beech woods
Vegetation Map of Europe 5.1.1 Lowland oligotrophic and mesotrophic beech and mixed beech forests without Luzula luzuloides & 5.1.3 p.p. Montane beech forests with *Ilex*
EUNIS Habitat G1.6 Beech woodland & G1.C Mixed deciduous & coniferous woodland

Summary

The UK has a substantial proportion of European Ilici-Fagion woodlands which are a distinctive Atlantic form of acidophilous beech-oak forest with holly and oceanic herbs Along with the examples from north-west France, they show no additional distinctive floristic features compared with the Lusitanian character of the beech-holly woodlands of northern Spain, but the striking physiognomy and historical interest of some British stands gives them a particular character.

Coherence of interpretation of HD habitat

This alliance or more correctly, as in the Explicit Name of this habitat, the sub-alliance Ilici-Fagenion, is a well recognised kind of acidophilous beech-oak forest, outwith the range of the core Luzulo-Fagion forests.

Character and significance of the UK examples in a European context

Calcifuge beech forests of nutrient-poor, acid brown earths and podzols with moder or mor humus, derived from siliceous bedrocks and sandy superficials, are widespread across northern and central Europe but they are simpler and less varied than their mesic counterparts grouped in the Asperulo-Fagetum. Throughout the range, calcifuge sub-shrubs such as *Vaccinium myrtillus* and (with less shade) *Calluna vulgaris*, herbs like *Deschampsia flexuosa, Melampyrum pratense, Holcus mollis, Solidago virgaurea, Galium saxatile* and a range of acidophilous bryophytes are characteristic. A distinctive feature of the heartland of the range of these kinds of woodlands is the presence of *Luzula luzuloides*, the species which has given its name to the type alliance Luzulo-Fagion Lohmeyer & Tüxen in Tüxen 1954 in which these acidophilous beech forests of central Europe are grouped. Oak, especially *Quercus robur*, is a frequent canopy companion of beech in such woodlands and, on very impoverished acid soils can challenge its dominance. Also, under the less heavy shade cast by oak, the calcifuge flora is even better expressed and virtually indistinguishable from that found in acidophilous woodlands from which beech is totally absent. Such woodlands are therefore generally grouped within the order Quercetalia R.Tx (1931) 1937.

Towards and into the Atlantic zone of Europe, outwith the range of *Luzula luzuloides*, essentially similar beech-oak Quercetalia woodlands occur on the same kinds of nutrient-poor, acidic substrates. These are extensive in the Armorican massifs of France and in northern Spain and locally represented across southern Britain. In this zone, with the shift towards the western seaboard of Europe, the climate becomes increasingly Atlantic. The appearance of *Ilex aquifolium* as a subordinate tree beneath the beech canopy in these woodlands - a species that is also especially able to tolerate the denser shade of *Fagus* - is one particular indication of this climatic influence and its prominence has been recognised in the designation of a companion alliance to the Luzulo-Fagion, the Ilici-Fagion Br-Bl. 1967, or a sub-alliance within it, the Ilici-Fagenion (Br.-Bl.1967) Tx. 1979 *emend* Oberdorfer 1984.

Other floristic features in these Atlantic beech-oak woodlands are the increased frequency of *Blechnum spicant, Ruscus aculeatus, Lonicera periclymenum* and *Hypericum pulchrum* and the greater prominence of an epiphytic flora where the climate is more consistently humid and unpolluted. However, the presence of *Taxus* in such woodlands is not a simple reflection of the climate. This tree is likely to have been more widespread - and present in more woodland types - in the past (Ellenberg 1984) and tends to survive preferentially in inaccessible rocky situations and also to tolerate the dense shade of beech. In Britain, in fact, it is more common in calcicolous beech woodlands which are our equivalent of the Cephalanthero-Fagion.

British beech-oak woodlands with holly placed in the W15 *Fagus-Deschampsia* community and some W14 *Fagus-Rubus* woodlands on less mesic soils (Figure 7) can be readily accommodated within the Ilici-Fagion, being especially close to associations like the Rusco-Fagetum (Durin *et al.* 1967) characterised from Brittany and western Normandy. Our stands have no especially distinctive floristic features over and above the general definition of the alliance but the striking structural character and atmospheric quality of woodlands like the New Forest holms or 'hats', with their abundance of holly, and sites with beech and holly pollards, perhaps lends them a special value (Peterken & Tubbs 1965, Tubbs 1968).

More striking floristically are the beech-holly woodlands described from northern Spain (Rivas-Martinez *et al.* 1991, Herrera 1995, Loidi *et al.* 1997) where species like *Saxifraga hirsuta, Erica vagans, Scilla lilio-hyacinthus, Luzula henriquesii, Euphorbia dulcis, Ranunculus tuberosus* and *Lastraea limbosperma* become common in the Lusitanian climate.

With the shift towards the more Continental climate of the Massif Centrale, impoverished acid soils can sustain beech forests in which holly and *Blechnum* linger on only sporadically. *Luzula nivea* replaces *L. luzuloides* in the somewhat wetter climate than further east in the Continental zone, thus perhaps justifying including these stands in the Ilici-Fagion rather than the Luzulo-Fagion.

cSAC designation pattern

Again, compared with the large number of sites designated in northern France (Figure 8), where the woodland is no more distinctive than with us, the relatively few UK cSACs are not a fair representation of the extent and regional importance of this habitat with us. A more rigid interpretation of the importance of *Ilex* in the definition of the woodland type has perhaps encouraged a focus on those stands of W14 and W15 woodlands where holly is more

locally abundant. The vulnerability of holly to grazing and potential to regenerate with enclosure ought to encourage a broad view of the definition of this kind of woodland.

Few new sites were proposed for this type after the Kilkee meeting as the Agencies considered that the major complexes such as the New Forest, Epping Forest, Burnham Beeches and sites in the Weald were adequately represented. However, the type was registered as occurring within other cSACs such as Windsor Forest and sites in south Wales (Appendix 4).

Italy has designated some sites for the Ilici-Fagion in the Mediterranean zone but, though these woodlands with beech occur on leached brown earths in the cooler climate above 1000m along the west coast, they are floristically more like mainstream Fagion woodlands with little that is markedly acidophilous or Atlantic about them apart from the occurrence of holly and *Ruscus aculeatus* (Pignatti 1998). Likewise, it is difficult to understand how the Luzulo-Fagion woodlands of the Rodopi mountains of Mediterranean Greece could be classified as part of the Ilici-Fagion (Bergmeier & Dimopoulos 1999).

The BAP perspective

Within the Biodiversity Action Plan, the Beech forest with *Ilex* and *Taxus* is brought together with the Asperulo-Fagetum and *Taxus baccata* woodlands into an all-encompassing Lowland Beech & Yew Woodland. The NVC equivalents of this broad group are the W12 *Fagus-Mercurialis*, W14 *Fagus-Rubus* and W15 *Fagus-Deschampsia* woodlands, representing beech dominance on the full range of soil conditions, plus the W13 *Taxus* woodland where yew becomes pre-eminent in locally calcareous conditions.

Strictly speaking, the BAP category is a south-eastern woodland type which has been interpreted as coinciding more or less with the supposed natural limit of beech (Hall and Kirby 1998, Figure 6) but including a few outliers beyond (Rackham 1997). Beech would probably have spread beyond this line had not mixed broadleaf woodland already held sway when it crossed the land bridge to the Continent (the tree moves slowly into existing woodland and benefits from sporadic clearance into which it can invade) and had not later fragmentation of the forest cover then isolated its established populations. As it is, beech thrives in planted or secondary woodlands of the W12, W14 and W15 types beyond this limit, so it can be difficult to draw a hard and fast rule about the inclusion of particular stands. Hall & Kirby (1998), like Rodwell & Patterson (1994), favour focusing restoration and expansion within the natural limit. They also exclude more northerly W13 *Taxus* woodlands from this BAP category and place them in the Upland Mixed Ashwood.

The particular benefit for conservation in using the BAP category is that it includes in W12 the British equivalents of the Cephalanthero-Fagion, the alliance of European calcicolous beech forests on limestones whose significance has not been recognised within the framework of the Habitats Directive. This broader BAP unit is thus the British counterpart of the full range of calcicolous, mesophilous and acidophilous beech forests that have a very wide geographical spread across the lowlands and colline regions of Europe and remain regionally of great extent.

Figure 7 **Distribution of known British stands of 9120 Beech forest with Ilex and Taxus**

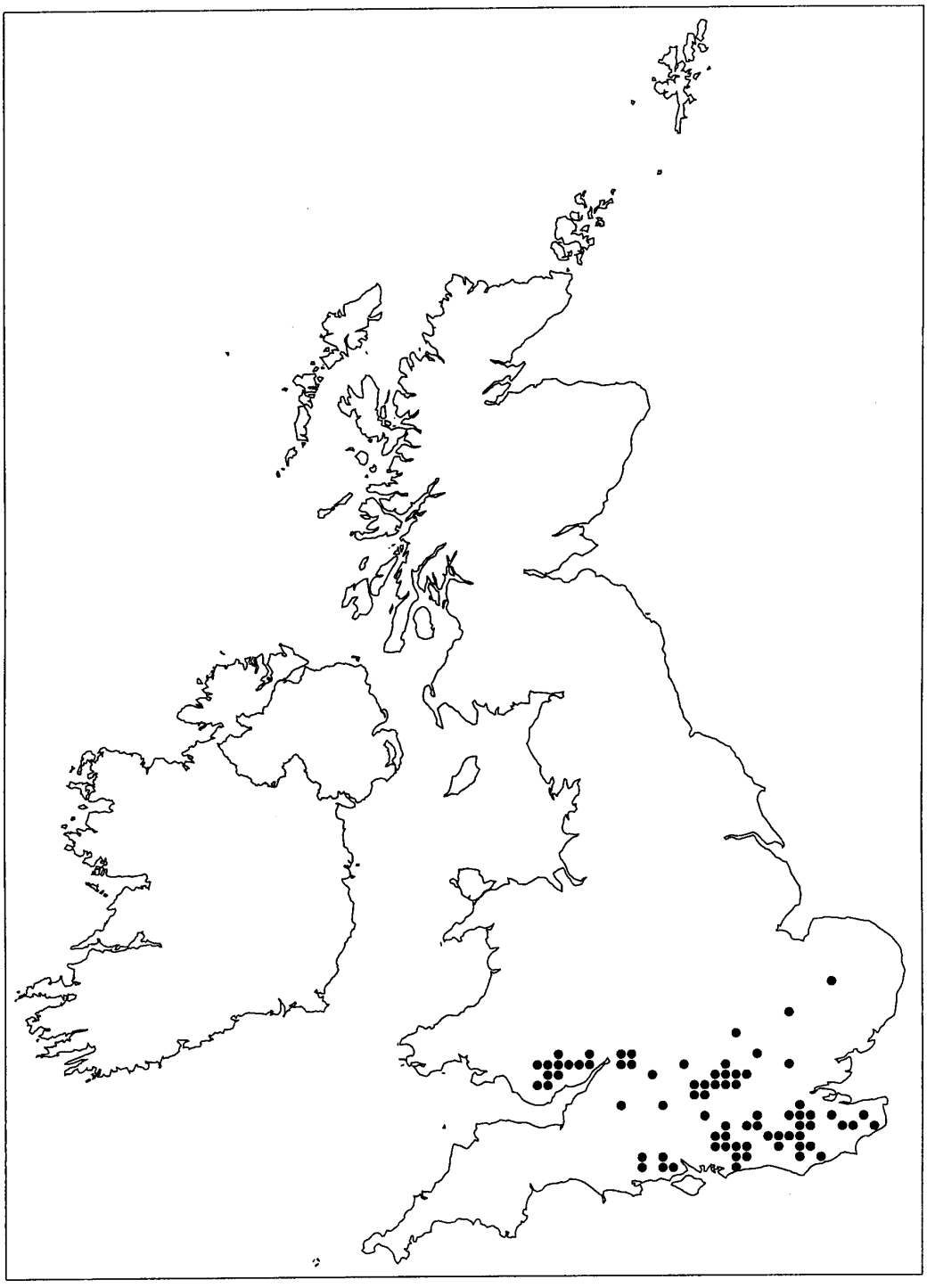
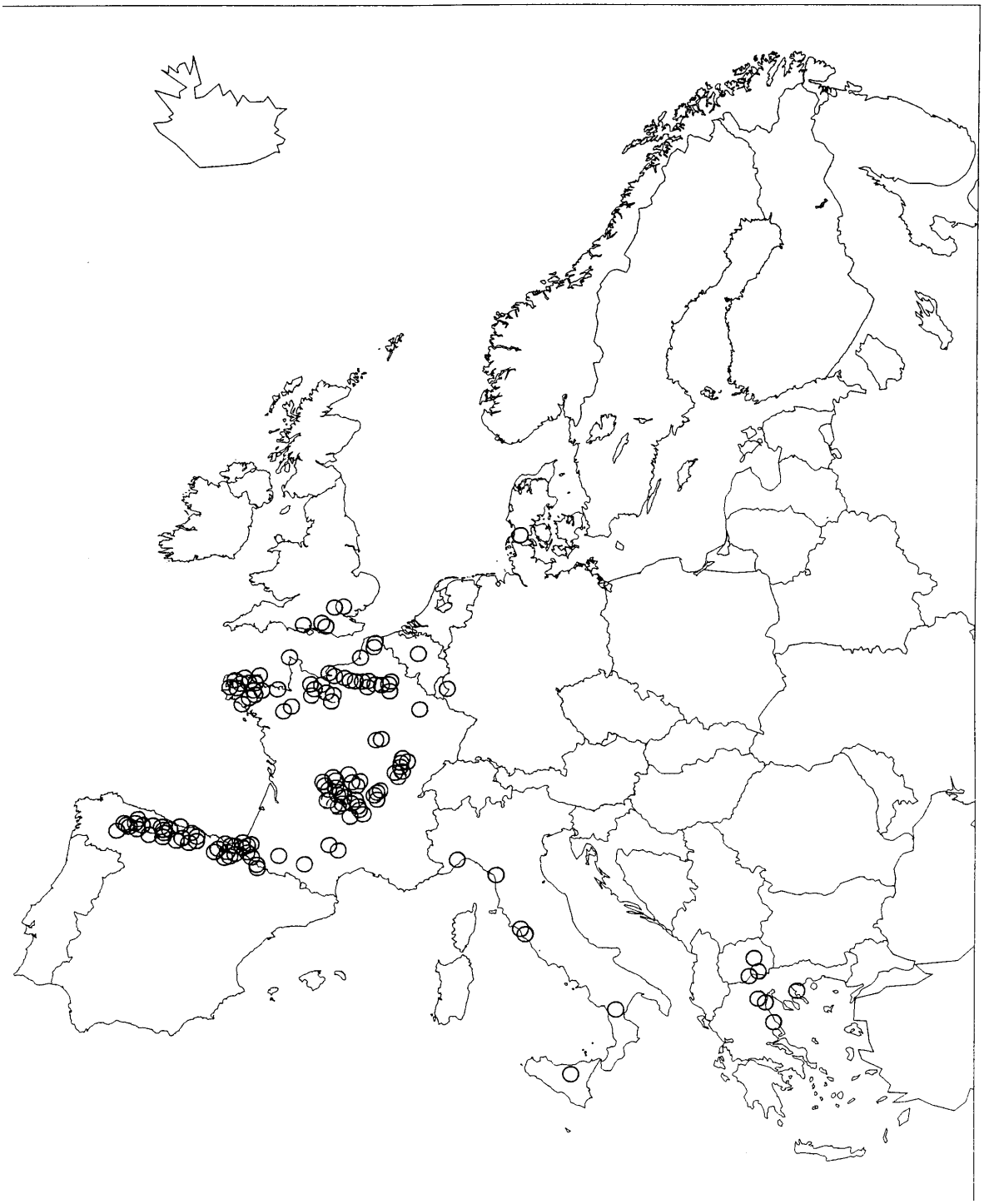


Figure 8 Distribution of cSACs for 9120 Beech forest with *Ilex* & *Taxus* as at 1 January 2000



2.3 *Taxus baccata* woodlands of the British Isles

Natura 2000 code 91J0
Habitats Directive code 42.A71
BAP Priority Habitat Lowland Beech and Yew Woodland
NVC Community W13 *Taxus baccata* woodland
Forestry Commission Guide Type 2 Lowland Beech-ash Woods
Peterken Stand Type 8C calcareous pedunculate oak-ash-beech woods
Vegetation Map of Europe included within various beech woods
EUNIS Habitat G3.9 Coniferous woodland dominated by Cupressaceae or Taxaceae

Summary

The *Taxus baccata* woodlands of the UK (and the very few stands in Eire) are unique in Europe in their extent and landscape character. They represent an especially striking form of the local abundance of yew that is probably a relic feature within a now limited range of calcicolous and mesic beech forests in the less Continental parts of Europe. The UK cSACs cover key sites in a range of different woodland and landscape contexts.

Coherence of interpretation of HD habitat

As originally described in the Interpretation Manual, this habitat was conflated with the yew-holly woodlands of the Mediterranean zone, so the definition gives a misleading impression of the important of *Ilex aquifolium* in this woodland type.

Character and significance of the UK examples in a European context

Taxus baccata is a broadly Atlantic tree with a wide but local distribution through western and central Europe and was probably much commoner and better represented in a wider range of woodland types is the past (Ellenberg 1982). It has a number of distinctive uses (for longbows, for example), has been revered or feared for its magical associations from time immemorial and is poisonous to some domesticated stock. It may therefore have been widely exploited or removed from woodlands for one reason or another. It is also palatable - indeed favoured - by roe deer (Klötzli 1965), so could also have been eaten out of more accessible woods, and its fruit is distributed by birds - two other features which might contribute to its tendency to survive in intractable rocky places. Less obviously, despite its often great age, yew is a somewhat uncompetitive tree (Ellenberg 1982), that is readily overtaken by other dominants in more fertile situations.

As it is, the commonest situations in which yew survives in some abundance across Europe are in beech woods of one sort or another, particularly those on more calcareous or neutral soils. It is mentioned as a particular feature in another habitat, the mesic 9120 Beech forests with *Ilex* and *Taxus*, woodlands that are well represented in the UK, but it also figures in - indeed, through Europe as a whole, is rather more characteristic of - various types of 9150 Cephalanthero-Fagion forest. Thus, the Carici albae-Fagetum Moor 1952 and the Seslerio-Fagetum Moor 1952 described from steep, dry limestone and marl slopes in Germany (Oberdorfer 1983, Pott 1992) and Switzerland (Ellenberg 1982), are generally similar to the

forms of the British W12 *Fagus-Mercurialis* woodland characteristic of drier, rubbly limestone slopes. In such situations, a locally dense under-canopy of yew occurs with beech and scattered *Sorbus aria* and a range of distinctive calcicolous herbs. Further south, in Italy, yew is a feature of another rather more mesic kind of beech forest, the Aquilegio-Fagetum Gentile 1969 in those parts of the Appennines whose local climate most closely approaches the sub-Atlantic (Pignatti 1998), though there the *Taxus* usually occurs as isolated aged individuals.

Other kinds of woody vegetation with yew include the isolated stands of *Taxus* and *Ilex*, sometimes with *Buxus sempervirens* (which can figure very locally with yew in Britain) from Corsica and Sardinia, and the yew scrub from cliffs along the Seine which was grouped in a Taxo-Prunetum mahalebis Delelis-Dusollier & Géhu 1972.

The need for a Taxo-Fagetum Elter 1947 to accommodate yew-rich beech woodlands is now generally dismissed, and Ellenberg (1982) raised the possibility that, even where *Taxus* dominates alone, it does not really constitute a distinct community at all, but rather a local yew-rich facies of various other kinds of woodlands. This would make sense in Britain where often small yew groves are found in close association with W8 *Fraxinus-Acer-Mercurialis*, W9 *Fraxinus-Sorbus-Mercurialis* and W12 *Fagus-Mercurialis* woodlands. Whatever their phytosociological status, the woodlands grouped together in the W13 *Taxus* community (Figure 9) are extremely striking for their atmospheric character and the individuality of the often venerable trees. Moreover, with scattered stands in Ireland, which are more open woodlands than ours, they are unique in Europe.

cSAC designation pattern

The proportions of British and Irish pSACs is a fair reflection now of the relative importance of this habitat in the two countries (Figure 10). Following the Kilkee Meeting, additional sites have been proposed in Oxfordshire and Cumbria and the type has been registered as present in other sites, for example on the North Downs (Appendix 4).

The BAP perspective

With the Biodiversity Action Plan, southern examples of the *Taxus baccata* woodland are brought together with the Asperulo-Fagetum and Beech forest with *Ilex* and *Taxus* into an all-encompassing Lowland Beech & Yew Woodland. As well as most W13 *Taxus* woodlands, the NVC equivalents of this broad group also include the W12 *Fagus-Mercurialis*, W14 *Fagus-Rubus* and W15 *Fagus-Deschampsia* woodlands, representing beech dominance on the full range of soil conditions.

Strictly speaking, the BAP category is a south-eastern woodland type which has been interpreted as coinciding more or less with the supposed natural limit of beech (Hall &Kirby 1998, Figure 6) but including a few outliers beyond (Rackham 1997). Beech would probably have spread beyond this line had not mixed broadleaf woodland already held sway when it crossed the land bridge to the Continent (the tree moves slowly into existing woodland and benefits from sporadic clearance into which it can invade) and had not later fragmentation of the forest cover then isolated its established populations. As it is, beech thrives in planted or secondary woodlands of the W12, W14 and W15 types beyond this limit, so it can be difficult to draw a hard and fast rule about the inclusion of particular

stands. Hall & Kirby (1998), like Rodwell & Patterson (1994), favour focusing restoration and expansion within the natural limit. More northerly W13 *Taxus* woodlands are placed in the Upland Mixed Ashwood.

Figure 9 **Distribution of known British stands of 91J0 *Taxus baccata* woodlands**

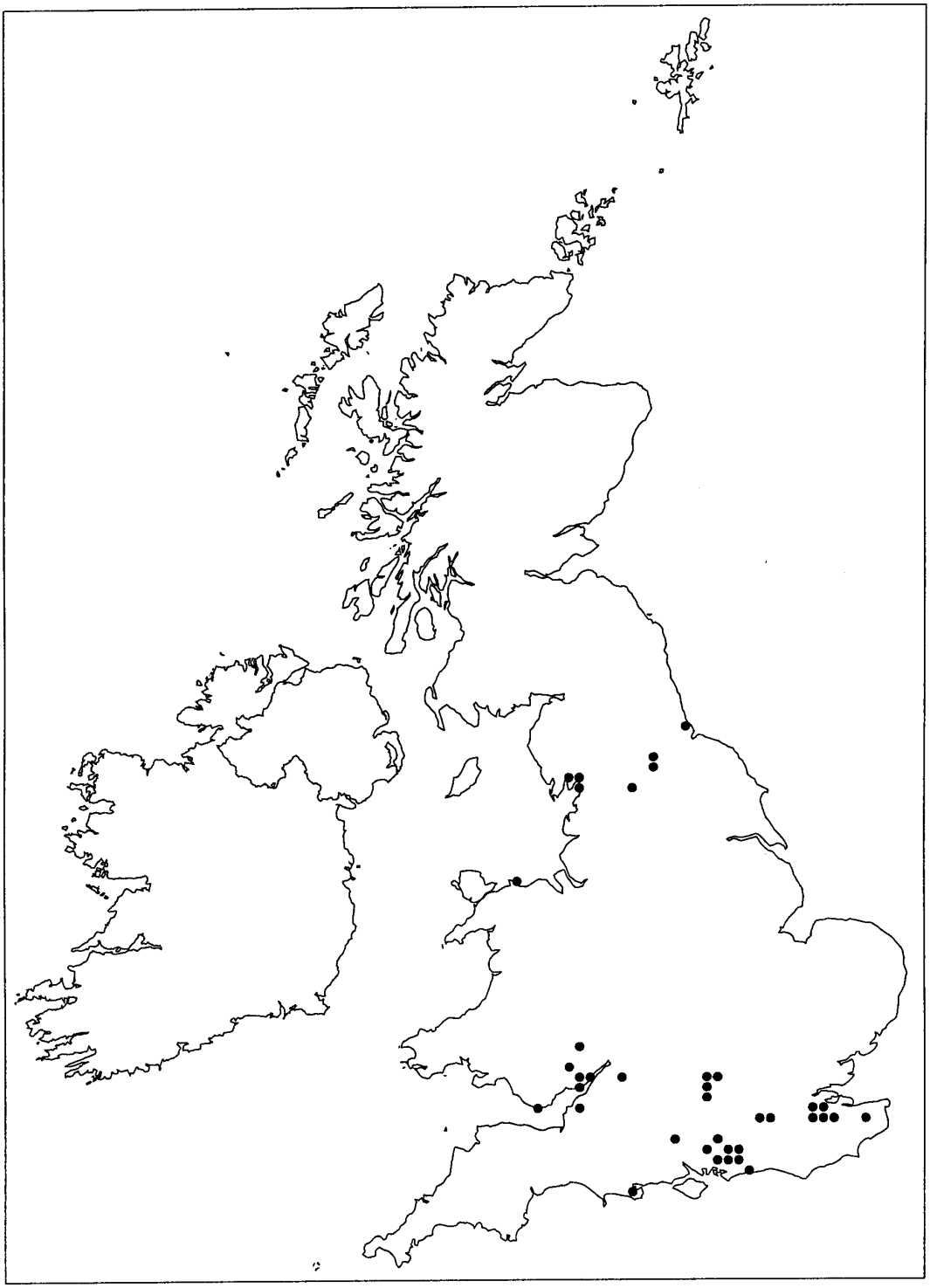


Figure 10 **Distribution of cSACs for 91J0 *Taxus baccata* woodlands in the British Isles as at 1 January 2000**

2.4 Old acidophilous oak woods with *Quercus robur* on sandy plains

Natura 2000 code 9190
Habitats Directive code 41.51
BAP Priority Habitat Lowland oak and mixed deciduous woodland
NVC Community W16 *Quercus-Betula-Deschampsia* woodland
Forestry Commission Guide Type 1 Lowland acid beech and oak woods
Peterken Stand Type 6C Lowland birch-oak woods
Vegetation Map of Europe F1.1 Lowland and colline acidophilous oak and mixed-oak forests
EUNIS Habitat G1.8 Acidophilous oak-birch woodland

Summary

Britain has relatively little of this now much reduced and fragmented woodland type characteristic of the extensive plains of impoverished acid sands across the North Sea/Baltic Plain, and it is a rarer landscape element with us than in some smaller EU Member States. The floristics, structure and context of these woodlands are rather consistent right across the range and British examples are quite typical - apart from the absence of a few species with us and in that the associated heaths in sites towards the west of Britain are somewhat more varied and species-rich than their Continental counterparts. In that part of the country, though, the woodlands themselves begin to acquire a more oceanic character that places them in 91A0 Old oak woods with *Ilex* and *Blechnum*. Strictly speaking, the type sites for this habitat should be from within the more south-easterly sector of the range of W16a, rather than in the upland fringes of south-west England and Wales. Our stands also often share the same history of exploitation as is seen elsewhere - for timber, pasture and, more recently, pine afforestation - and are likewise probably also vulnerable to eventual colonisation by beech.

Coherence of interpretation of HD habitat

Although the Definition of this habitat is graphic and informative, the list of Characteristic species could be fuller and it seems coy to avoid the obvious phytosociological identification with the Quercion. The Geographical Distribution should make plain that the clear UK equivalent is W16 *Quercus-Betula-Deschampsia* woodland, particularly the W16a sub-community which is concentrated in south-east England. The section on Habitats Associated should mention the likely successional threat from pine and beech.

Character and significance of the UK examples in a European context

Increasingly, on highly acidic and very impoverished soils at the northern and western edge of its range, beech is rivalled by *Quercus robur*. Such substrates, derived from siliceous sedimentary rocks or very often from aeolian, fluvio-glacial or morainic deposits, are especially extensive across the Baltic and North Sea plain, from Poland through Germany into the Netherlands, with more local areas in the Ardennes, middle Rhine, northern France, the Paris Basin and south-east England (Figure 11).

Here, for the most part beyond the range of *Luzula luzuloides* - the characteristic herb of the acidophilous beech woods in the European heartland - there is little difference between the flora of the Luzulo-Fagion and its oak-dominated counterparts in the Quercion. Calcifuge sub-shrubs like *Vaccinium myrtillus* and *Calluna vulgaris*, herbs such as *Deschampsia flexuosa*, *Holcus mollis*, *Galium saxatile* and *Melampyrum pratense*, together with acidophilous bryophytes, prevail in field and ground layers that are generally species-poor.

Even well within the range of the Luzulo-Fagion, as in northern Switzerland, beech woodlands were opened up and dwarfed by coppicing of the highly valued oak which is a characteristic canopy companion to beech. Such exploitation was much more widespread across the north European sandy plains where beech is at something of an edaphic disadvantage. Here extraction of oak timber, coppicing for tan-bark and fuel, combined with grazing with sheep and cattle, pasturing of pigs for the acorn crop and collection of litter for bedding of animals has exhausted and fragmented the Quercion woodlands.

In such stretches as remain, *Q. robur* is the leading oak, with *Q. petraea* making a minority contribution in locally humid places, and *Betula pendula* often prominent, especially in pioneer situations where fire or disturbance gives it an opportunity to spread. Other woody companions are few: *Sorbus aucuparia*, *Ilex aquifolium* and, often with local abundance, *Frangula alnus* and *Populus tremula*. With the frequently open or patchy canopy, *Calluna* is often the leading sub-shrub, thriving on soils which have become even more impoverished and strongly podzolised with long exploitation. Where there has been grazing, grasses often predominate or *Pteridium aquilinum* can become dense where the sands are deep and loose. In open, windy situations blown free of litter, bryophytes can be abundant.

Among the range of acidophilous oak-birch woodlands characterised from such places, the British W16 *Quercus-Betula-Deschampsia* type, particularly sub-community W16a (Figure 12) is absolutely typical, not only in its floristics, but in its often moribund structure and the occurrence of the stands among stretches of heathy grassland, now much fragmented among reclaimed farmland and forestry. Very similar woodlands have been described from Germany (Pott 1992), Denmark, south Sweden and south Norway (Dierßen 1993, Fremstad 1997, Lawesson 1999), The Netherlands (Stortelder *et al.* 1999), Belgium (Noirfalise & Sougnez 1963, Dumont 1975, Duvigneaud 1975, Sougnez 1975) and France (Frileux 1975, Tombal 1975), often as the type association Betulo-Quercetum roboris Tüxen 1937. Among the flora of these woodlands, it is frequently only the absence from our British examples of *Maianthemum bifolium* that distinguishes them.

Right across their range, these woodlands, and the heathlands derived from them, are now extremely local - sometimes, as in the Luneberger Heide, surviving because of military use. In other places, such sands as have not been reclaimed for agriculture or settlement have been converted to forestry because the impoverished soils are eminently suitable for growing *Pinus sylvestris*. Even from early in the industrial period, this was an important crop, for example for pit props in coal-mining areas. Pine will naturalise into any surviving nearby heaths and open Quercion woodlands and it often figures as a canopy companion in equivalents to the Betulo-Quercetum or in related Pino-Querceta (eg. Ellenberg 1986, Pott 1992, Stortelder *et al.* 1999).

In the longer term, these woodlands and their associated remnant landscapes may be threatened by the reassertion of the dominance of beech. In some places - around Nürnberg,

for example - where there are nearby seed-parents and where predation by deer is low, this tree is slowly re-invading. One persuasive view is that the dominance of oak in these woodlands is at least partly anthropogenic and that the potential natural vegetation is some kind of Luzulo-Fagion. As in Britain, where we distinguish a W15 Fagus-Deschampsia woodland on essentially similar substrates to our Quercion community, beech-dominated acidophilous woodlands outwith the core range of the Luzulo-Fagion have also been recognised. Associations like the Fago-Quercetum Tüxen 1955 and Deschampsio-Fagetum Passarge 1956 (Westhoff & den Held 1959, Géhu 1975, Pott 1992, Stortelder *et al.* 1999) often occupy the same habitat as the oak woodland across these sandy plains.

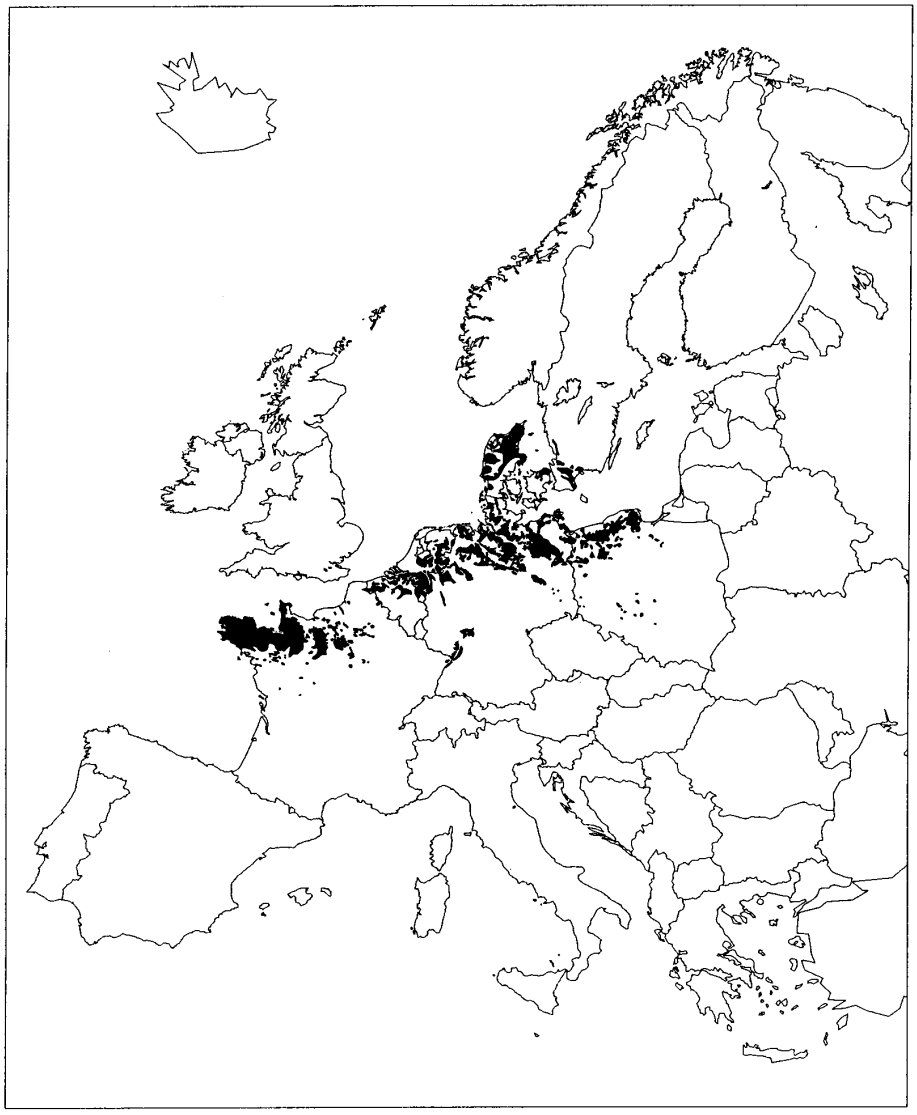
cSAC designation pattern

The small number of UK cSACs (Figure 13) is a reasonable reflection of the proportional scarcity of this habitat with us, though it would be satisfying to ensure the designation of areas large enough to include the characteristic landscape context of this woodland type. No additional sites were proposed following the Kilkee Meeting but this woodland type has been registered on some of the existing cSACs, often in association with heathland (Appendix 4).

The BAP perspective

The Old Acidophilous Oakwoods comprise a very small proportion of the BAP Lowland Oak and Mixed Deciduous Woodland category (Figure 24) where oak dominance extends on to impoverished acid sands in the lowland south and east of Britain. The wider European equivalents of this much more compendious unit are described under the account of the Stellario-Carpinetum.

Figure 11 Potential extent of 9190 Old acidophilous oak woods on sandy plains



The figure is reproduced by kind permission of the Bundesamt für Naturschutz in Bonn and is an extract from the 1:2.5M Vegetation Map of Europe. It shows the most extensive areas of the kinds of acidic sands which sustain these woodlands elsewhere in Europe

Figure 12 **Distribution of known British stands of 9190 Old acidophilous oak woods**

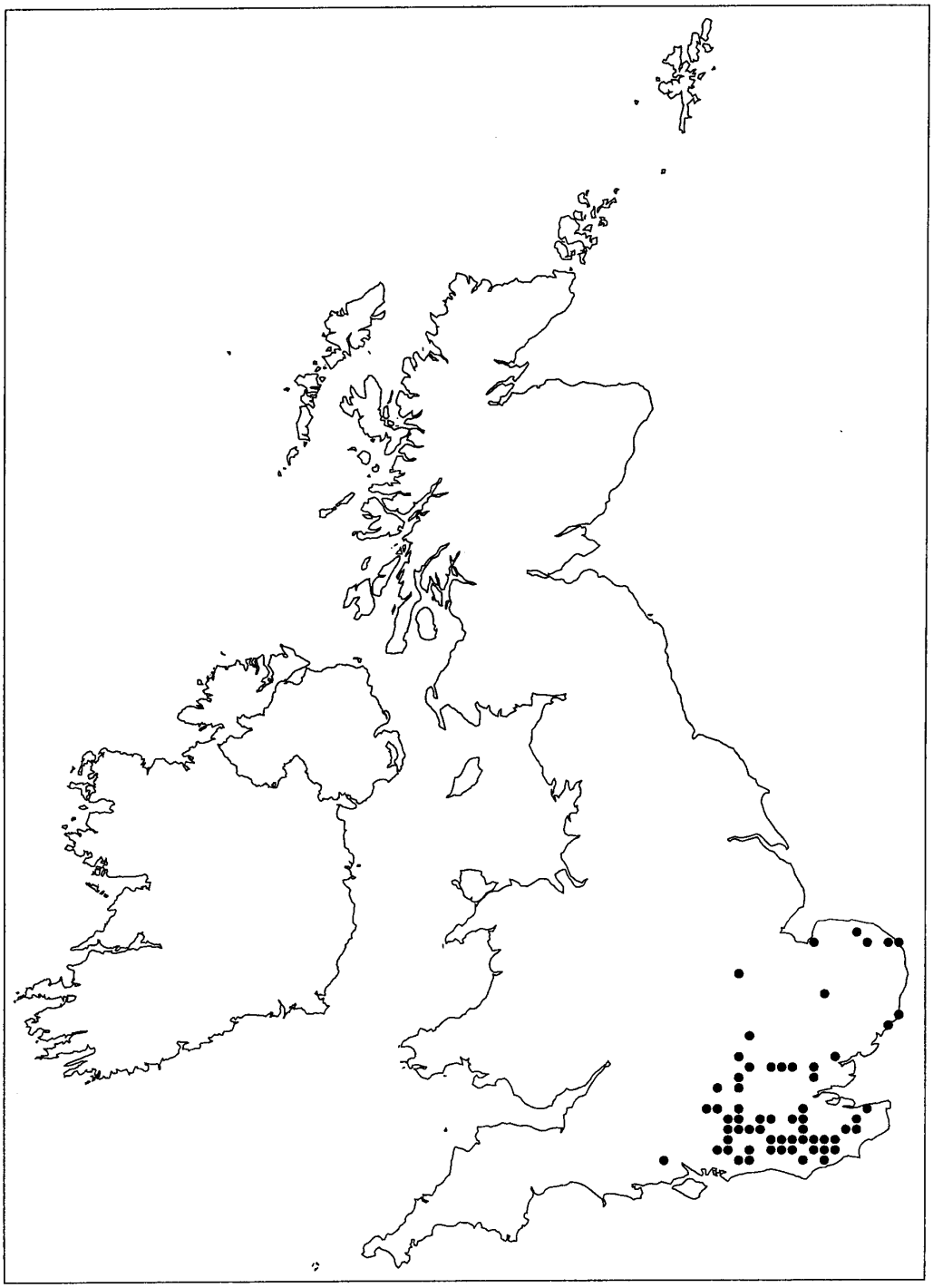


Figure 13 **Distribution of cSACs for 9190 Old acidophilous oak woods on sandy plains as at 1 January 2000**

2.5 Old oak woods with *Ilex* and *Blechnum* in the British Isles

Natura 2000 code 91A0
Habitats Directive code 41.53
BAP Priority Habitat Upland Oak Woodland & Northern Birchwoods
NVC Community W10 *Quercus-Pteridium-Rubus*, W11 *Quercus-Betula-Oxalis*, W16 *Quercus-Betula-Deschampsia* & W17 *Quercus-Betula-Dicranum* woodlands
Forestry Commission Guide Type 5 Upland oakwoods & 6 Upland birchwoods
Peterken Stand Type 6A Upland sessile oak woods & 6B Upland pedunculate oak woods
Vegetation Map of Europe 1a West Irish-British oak forests & 1 East Irish-British oak forests
EUNIS Habitat G1.8 Acidophilous oak-birch woodland

Summary

Old oak woods with *Blechnum* and *Ilex* represent the most strikingly Atlantic of a sequence of European acidophilous Quercion communities found on acidic impoverished soils outwith the zone of beech dominance. They are confined to the UK and Eire and are especially distinctive in the very humid and equable climate towards their west coasts, where the fern and bryophyte flora brings a unique level of enrichment. The British cSACs span the geographical range in the more oceanic west and include some of our most striking sites.

Coherence of interpretation of HD habitat

This habitat correctly recognises the Atlantic trend within the Quercion woodlands of north-west Europe, though the list of Characteristic Species could give more emphasis to the bryophytes which comprise much of the really distinctive floristic element. The Geographical Distribution includes W10 *Quercus-Pteridium-Rubus* woodland as part of the definition and though this vegetation often has *Ilex*, it does not express the features noted in the Definition. Morever, the Atlas of UK Habitats Directive Biotopes (Hall 1999) does not include this woodland community in the distribution map for 91A0. It is also arguable as to whether the eastern Scottish sub-communities of both W11c and W17d woodlands can be rightly considered Atlantic: they are probably a transition to Boreal birch woods. Some of the woodlands described from north-west Iberia are equally Atlantic to some of our own western Quercion are not included here and may also have been omitted from 9230 Galicio-Portuguese oak woods with *Quercus robur* and *Q. pyrenaica*.

Character and significance of the UK examples in a European context

The oak-birch Quercion woodlands of north-west Europe reach a species-poor and decrepit extreme on the highly impoverished sands of the North Sea/Baltic plain (as in 9190 Old oak woods on sandy plains) and, to the more Continental east, they grade into the oak-pine woods of the Dicrano-Pinion (see 91C0 Caledonian Forest). On somewhat better quality acid soils in this region, *Quercus petraea* increases its representation and such herbs as *Oxalis acetosella*, *Teucrium scorodonia*, *Convallaria majalis* and *Solidago virgaurea* make an appearance. Then, north-westwards through Britain and into western Ireland, there is an increasing influence of the oceanic climate characteristic of the Atlantic seaboard of Europe.

Sub-Atlantic plants such as *Ilex aquifolium, Lonicera periclymenum, Corydalis claviculata and Galium saxatile* actually occur in the acidophilous oak woodlands of central Europe but they become more consistent with the shift to the Atlantic biogeographic zone. *Hyacinthoides non-scripta* is also a very characteristic vernal herb in this climatic zone though, in Quercion woodlands in this region, it is limited to better quality mull brown earths. The more consistent humidity also sustains a richer and often winter-green fern flora in these acidophilous woodlands with *Blechnum spicant, Dryopteris dilatata, D. filix-mas, D. pseudomas, Polystichum setiferum* and *P. aculeatum*. In the most Atlantic situations with annual precipitation approaching 3000mm and frost-free winters, *D. aemula* and the filmy ferns *Hymenophyllum wilsonii* and *H. tunbrigense* are characteristic.

The other increasingly prominent floristic element in these woodlands is the bryophytes. Where the ground in more open windy Quercion woodlands in more Continental parts of Europe is blown free of litter, some larger calcifuge mosses like *Polytrichum formosum, Hylocomium splendens, Pleurozium schreberi, Dicranum scoparium and Leucobryum glaucum* are already quite frequent but they become more consistent here and are joined by a wealth of species demanding of higher humidity. Some of these actually occur quite widely through the European sub-montane zone where orographic rainfall maintains higher humidity, although Ratcliffe (1968) gave them the name Western British - *Bazzania trilobata, Dicranodontium denudatum, Hypnum callichroum, Scapania umbrosa, Tritomaria exsecta, Harpanthus scutatus* and *Sphagnum quinquefarium*. Others are more strictly Widespread Atlantic such as *Saccogyna viticulosa, Plagiochila punctata, P. tridenticulata* and *Dicranum scottianum* or Southern Atlantic such as *Sematophyllum micans, S. demissum* and *Adelanthus dicipiens*.

In south-west Ireland (where woodland is extremely scarce but from where this vegetation was first described by Braun-Blanquet & Tüxen (1952)), along the north-west coast of the Scottish mainland and at a few sites in the Lake District and north-west Wales, this enrichment reaches an extraordinary peak - a feature recognised on the European Vegetation Map by the delineation of a separate mapping unit (Figure 15). However, the remaining range of both W17 *Quercus-Betula-Dicranum* and W11 *Quercus-Betula-Oxalis* woodland can be seen as more broadly characteristic of the type (Figure 16).

Such richness is seen nowhere else along the west European coast although, in western France, certain Atlantic or sub-Atlantic/Mediterranean elements - *Erica cinerea, Ruscus aculeatus, Luzula forsteri* and *Peucedanum parisiense* - increase in such Quercion woodlands as remain. More strikingly, in the foothills and mountain valleys of Portugal and northern Spain, there is a parallel series of associations to those found in the British Isles. Here, *Quercus robur, Q. petraea* or the sub-Atlantic oak *Q. pyrenaica* dominate, with *Ilex* and *Blechnum* often common along with a range of plants such as *Holcus mollis, Teucrium scorodonia, Hypericum pulchrum* and *Lonicera periclymenum* familiar from the moderately Atlantic acidophilous woodlands of north-west Europe. Associations such as the Blechno-Quercetum roboris Tuxen & Oberdorfer 1958, the Hyperico pulchri-Quercetum roboris Rivas-martinez *et al.* 1991 and the Melampyro-Quercetum pyrenaicae Rivas-Martinez in Rivas-Martinez *et al.* 1984 also have distinctively Lusitanian species as *Erica vagans, Euphorbia dulcis, Ranunculus toberosus, Thymelea ruizii* and *Pulmonaria longifolia*. Sadly, since it is common to omit bryophytes from relevés in Spain, it is not possible to make a

comparison of their role there with the prominent contribution they make to our own Atlantic woods.

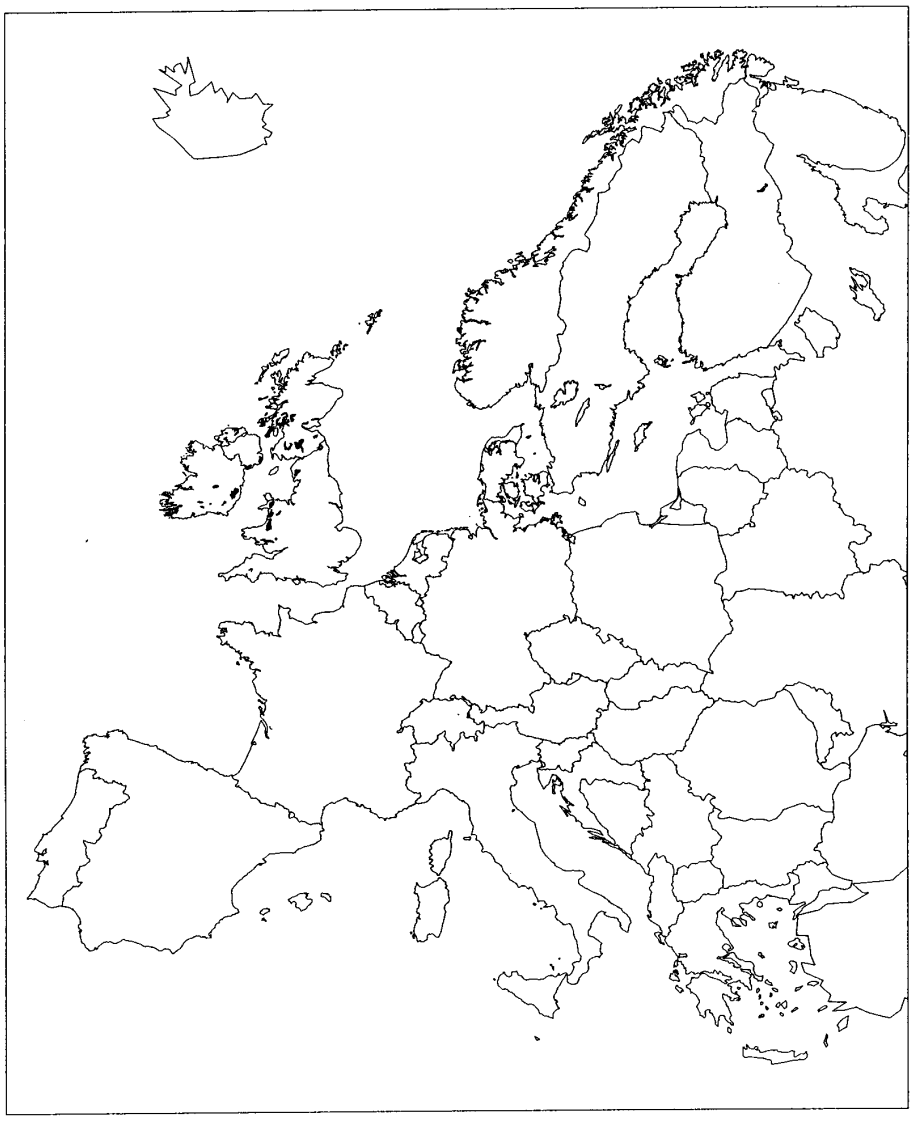
cSAC designation pattern

Considering the proportion of this habitat represented in the UK, the number of sites designated as at 1 January 2000 (Figure 16) might appear parsimonious compared with certain endemic habitats confined to other countries. Following the Kilkee Meeting, the number of sites proposed for this type in the UK has gone up considerably, both through the addition of new sites and the registering of the occurrence of the woodland on existing cSACs, for example along the north Cornwall coast (Appendix 4).

The BAP perspective

In the BAP classification, Old Oak Woods with *Ilex* and *Blechnum* fall within Upland Oak Woods (Figure 17) or Northern Birchwoods according to which trees dominate. Although the scarcity of oak in woodlands to the north of Scotland is partly an anthropogenic effect, it also reflects the distinctively cold climate of higher altitudes, especially in the boreal zone. Both the associated vascular flora and the cryptogams of the two BAP categories can be virtually identical. Additionally, the Old Oak Woods include upland fringe stands of W10e *Quercus-Pteridium-Rubus* woodland and W16b *Quercus-Betula-Deschampsia* woodland (W16b) where the influence of the cooler and wetter climate of the north-west is beginning to make itself felt. On a landscape scale, woodlands included in these BAP categories can also take in transitions to W4 and W7 wet woodlands.

Figure 14 **Potential extent of more or less Atlantic forms of 91A0 Old oak woods with *Ilex* and *Blechnum* in the British Isles**



The figure is reproduced by kind permission of the Bundesamt für Naturschutz in Bonn and is an extract from the 1:2.5M Vegetation Map of Europe.

Figure 15 **Distribution of known 91A0 Old oak woods with *Ilex* and *Blechnum* in the British Isles**

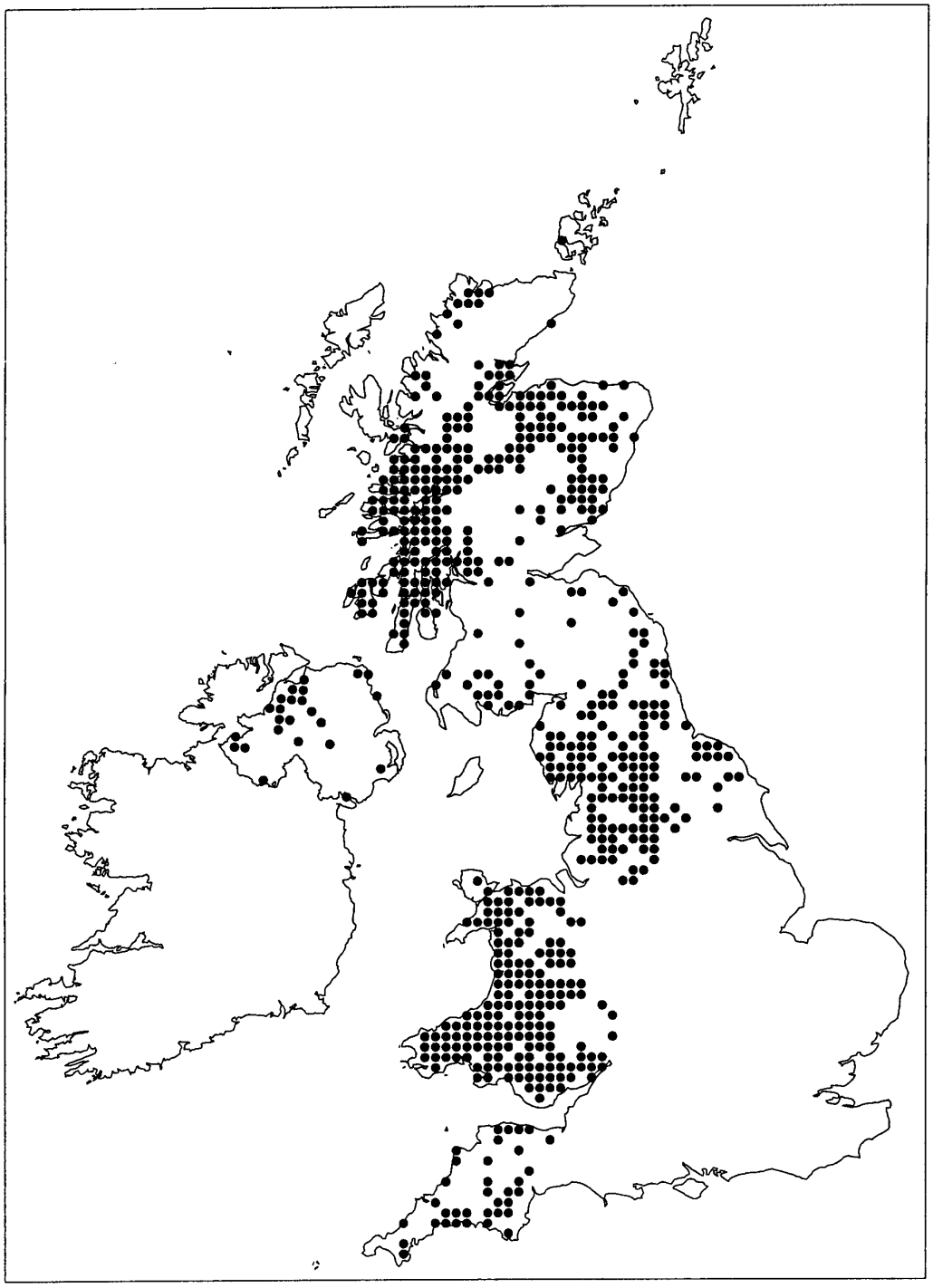
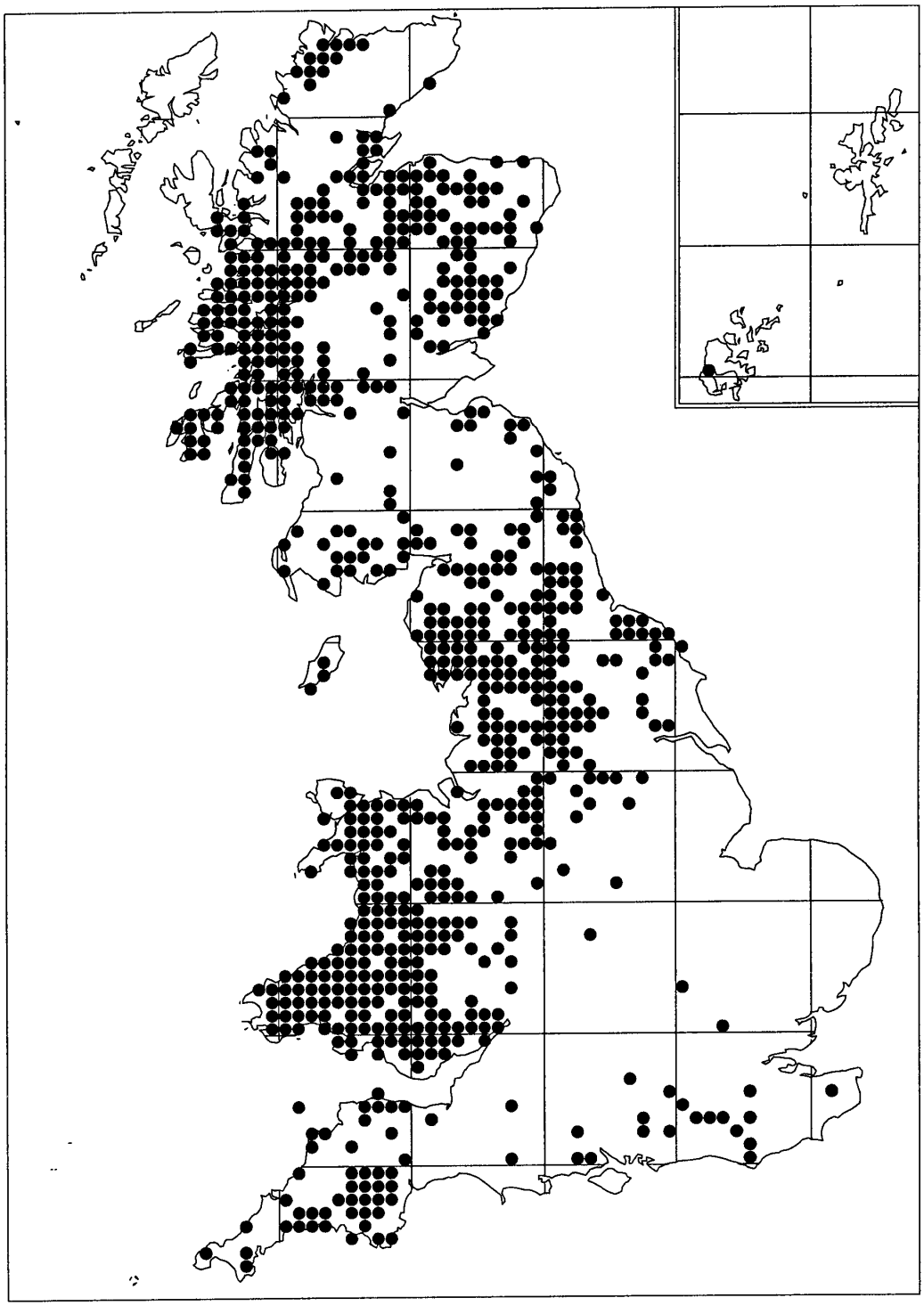


Figure 16 **Distribution of cSACs for 91A0 Old oak woods with *Ilex* and *Blechnum* in the British Isles at as 1 January 2000**

Figure 17 **Distribution of BAP Upland Oak Woodland**



N.B. Sites in the south-east are not included in the definition

2.6 Caledonian Forest

Natura 2000 code 91C0
Habitats Directive code 42.51
BAP Priority Habitat Native Pine Woodlands
NVC Community W18 *Pinus-Hylcomium* woodland
Forestry Commission Guide Type 7. Native Pinewoods
Peterken Stand Type 11 Acid birch-pine & 11B Acid oak-pine stands
Vegetation map of Europe D24 Scottish pine forests
EUNIS Habitat D24 Scots pine woodland south of the taiga

Summary

Though greatly reduced in extent and much fragmented, the Caledonian Forest forms an important and distinctive western outlier of the heathy *Pinus sylvestris* woodlands that extend right across the Boreal zone of northern Europe on impoverished acid sands and drier peaty soils. Despite obvious anthropogenic influence and more floristic and structural uniformity than might once have been the case, they show a striking combination of boreal and oceanic features that is seen otherwise only in the pine forests of western Norway. Even long-established plantations have some floristic interest. A large total area has been encompassed in an array of cSACs from across the range.

Coherence of interpretation of HD habitat

Despite their high wildlife and landscape value, Scottish pinewoods are not so distinct in their floristics from other heathy pinewoods as the name 'Caledonian forest' might imply. The existence of a *Pinus sylvestris* var. *scotica* is not supported by taxonomic or biochemical analysis and the overwhelming dominance of *P. sylvestris* in these woodlands is partly an artefact. Though naturally a colonial tree, particularly in its regeneration after fire (probably a natural element of the dynamics in many boreal pine woods), its abundance in Scottish stands is probably related in part to the preferential abstraction of oak over a long period. Local dominance of birch and/or juniper among the pine would be a normal feature of this woodland type at the landscape scale.

Character and significance of the UK examples in a European context

Though geographically isolated from the rest of Europe, the native pine woodlands of Scotland are an integral part of a complex spectrum of variation among *Pinus sylvestris* woodlands that extends right across northern Europe (Rodwell & Cooper 1994). In general terms, this woodland type belongs among the heathy acid pinewoods of the alliance Dicrano-Pinion Matuskiewicz 1962, sharing most of its constants (*P. sylvestris, Calluna vulgaris, Vaccinium myrtillus, Deschampsia flexuosa, Dicranum scoparium, Hylcomium splendens, Pleurozium schreberi, Cladonia rangiferina,* though not *Picea abies* beyond whose present western limit Scotland now lies) with the group of central and north European associations that stretches from Scotland eastwards through Fennoscandia, Germany and into Poland and European Russia (Figure 18).

The British examples of this kind of woodland (Figure 19) are closest to the pinewoods of Scandinavia in their combination of species which reflect the generally boreal climate of this part of Europe - such as the Continental Northern or Northern Montane *Listera cordata*, *Goodyera repens*, *Pyrola minor*, *P. media*, *P. rotundifolia*, *Moneses uniflora* and *Orthilia secunda* - together with indicators of the increased oceanicity that prevails along the Atlantic seaboard - plants like *Sphagnum quinquefarium*, *Scapania gracilis*, *Diplophyllum albicans* and *Anastrepta orcadensis* (Aune 1977, Dierssen 1996, Fremstad 1997). The most similar associations are the west Norwegian Bazzanio-Pinetum sylvestris Aune 1977, which also lies beyond the limit of spruce, and the Barbilophozio-Pinetum sylvestris Aune 1977: here species such as *Barbilophozia lycopodioides*, *B. floerkii*, *B. attenuata*, *S. quinquefarium* and *Sphagnum capillifolium* appear in the ground layer.

Interestingly, in moving eastwards through the pinewoods of Norway and Sweden, there is a similar shift in the balance between these climate-related floristic elements as can be seen among Scottish stands. Sandy soils in the less humid parts of Norway, Sweden and Finland have the Vaccinio-Pinetum sylvestris Aune 1977 which represents a transition to the pine-spruce woods of Fennoscandia and a northern outpost for the kind of steppe pinewood that continues through Poland and beyond. There, in the increasingly Continental climate, the Peucedano-Pinetum Matuskiewicz 1962 has a pine-spruce canopy, often with *Juniperus communis* where pasturing of sheep and goats has created an open woodland, and a field layer in which drought-resistant grasses are often prominent. The really distinctive element, however, is provided by such central European herbs as *Peucedanum oreoselinum*, *Scorzonera humilis* and *Chimaphila umbellata*. Even here, though, there can be seen such familiar Scottish pinewood species as *Trientalis europaea* and *Ptilium crista-castrensis*.

Pinus sylvestris reaches its competitive peak in the Continental climate on the impoverished acid sands that are so extensive across the north European plain but, with the shift southwards, oak can become quite frequent in the canopy as the pine woodlands abut onto the zone of the kinds of Quercion woodlands included in 9190 Old Oak Woods on sandy plains. In the Leucobryo-Pinetum Matuskiewicz 1962, mixtures of pine, *Quercus robur*, *Q. petraea*, *Frangula alnus* and *Sorbus aucuparia* dominate with such familiar herbs as *Trientalis europaea*, *Luzula pilosa* and *Melampyrum pratense* in the field layer and *Leucobryum glaucum* prominent in the moss carpet have been described from Poland (Matuskiewicz 1984), Germany (Pott 1992) and France (Muller 1992). On somewhat better soils and with the shift towards a more oceanic climate in western Europe, the balance of dominance moves definitively against pine until the tree is reduced to an occasional by the combined shading of *Quercus robur* and *Fagus sylvatica* and the field layer acquires such familiar Quercion plants as *Deschampsia flexuosa* and *Holcus mollis*.

cSAC designation pattern

The lichen-rich pine woods described subsequent to the NVC by Watson & Birse (1991) also deserve consideration in any range of cSACs (Figure 20). They are similar to the *Cladonio-Pinetum* (Cajander 1921) Kielland-Lund 1967 characterised from Fennoscandia, Poland and the Russian Republic (Matuskiewizc 1984, Dierßen 1993), though in Scotland this woodland type has been encountered mainly in plantations. Furthermore, in the UK, native *P. sylvestris* persists as a dominant on a narrower range of substrates than are colonised elsewhere in northern Europe where, for example, there are pinewoods of the *Empetro-Pinetum* on long-stabilised dune sands and of the *Vaccinio uliginosi-Pinetum* on lowland raised

mires. Following the Kilkee Meeting, some changes to the proposed site list have been made (Appendix 4).

The BAP perspective

The somewhat more generous definition of Native Pine Woods in the BAP classification (Figure 21), including not just the Habitats Directive Caledonian Pine Forest of W18, but also birch- and juniper-dominated stands of W11 *Quercus-Betula-Oxalis*, W17 *Quercus-Betula-Dicranum* and W19 *Juniperus-Oxalis* woodland and some wetter W4 *Betula-Molinia* woodlands, is a valuable recognition of the large-scale patterning associated with this kind of Scottish landscape (Rodwell & Cooper 1994). Elsewhere in Europe, a similar diversity can be seen in pinewoods on a broader scale.

Figure 18 **Potential extent of boreal and hemi-boreal pinewoods**

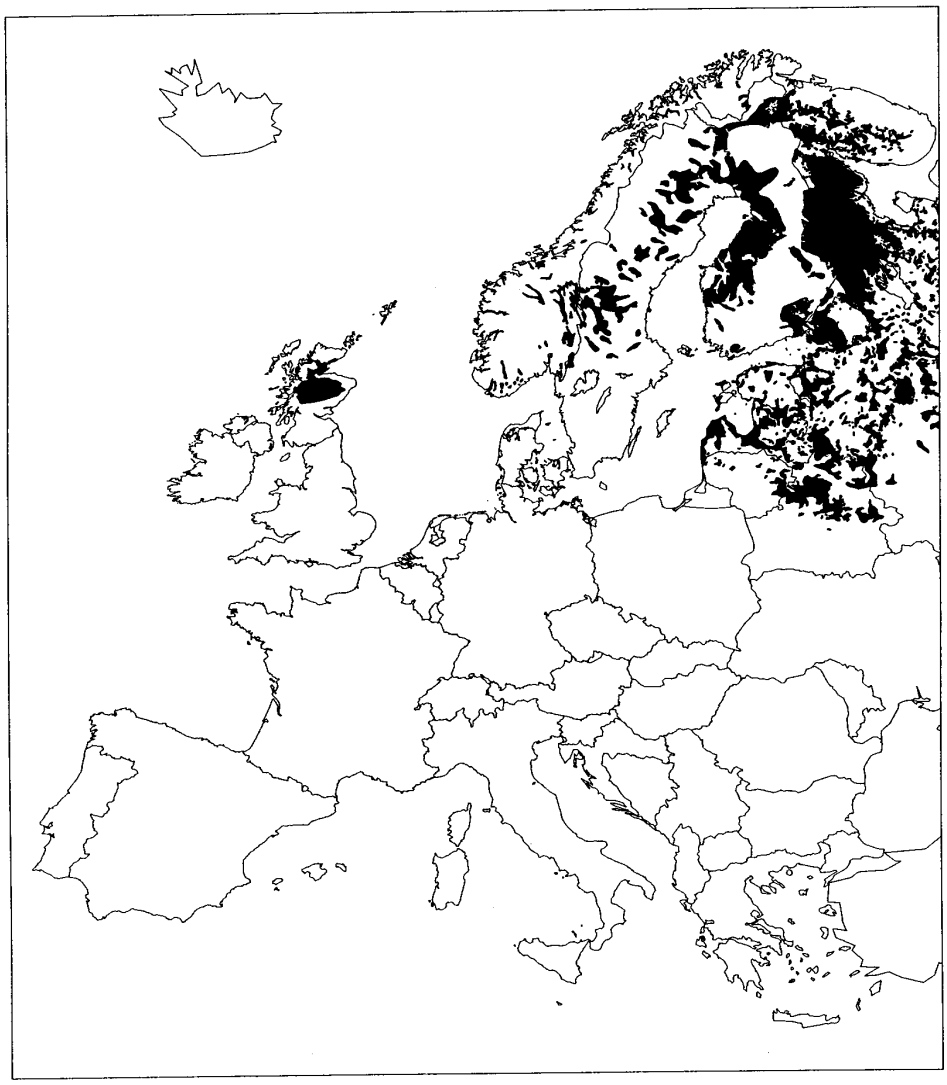


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Figure 19 **Distribution of known British stands of 91C0 Caledonian Forest**

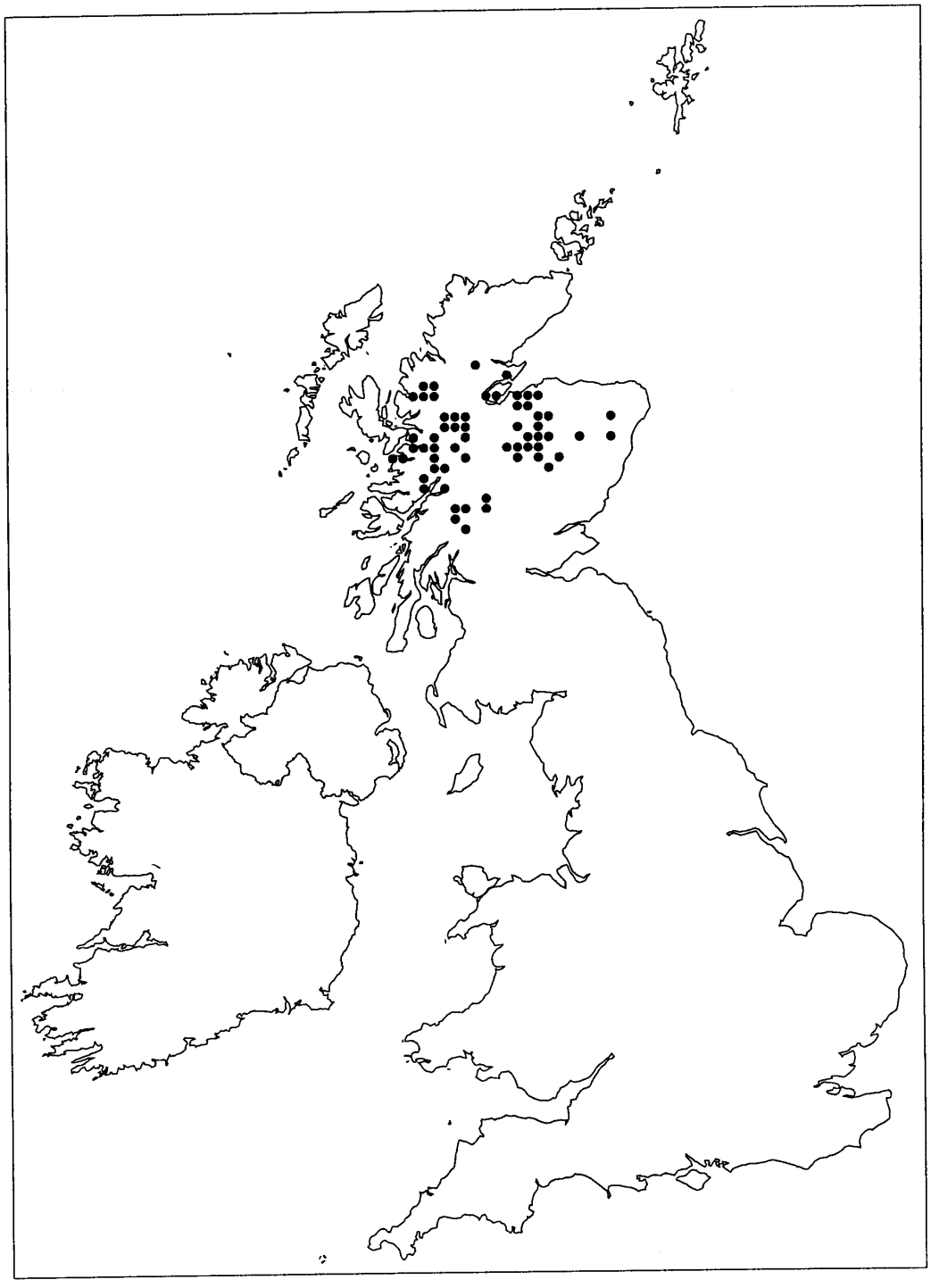


Figure 20 **Distribution of cSACs for 91C0 Caledonian Forest as at 1 January 2000**

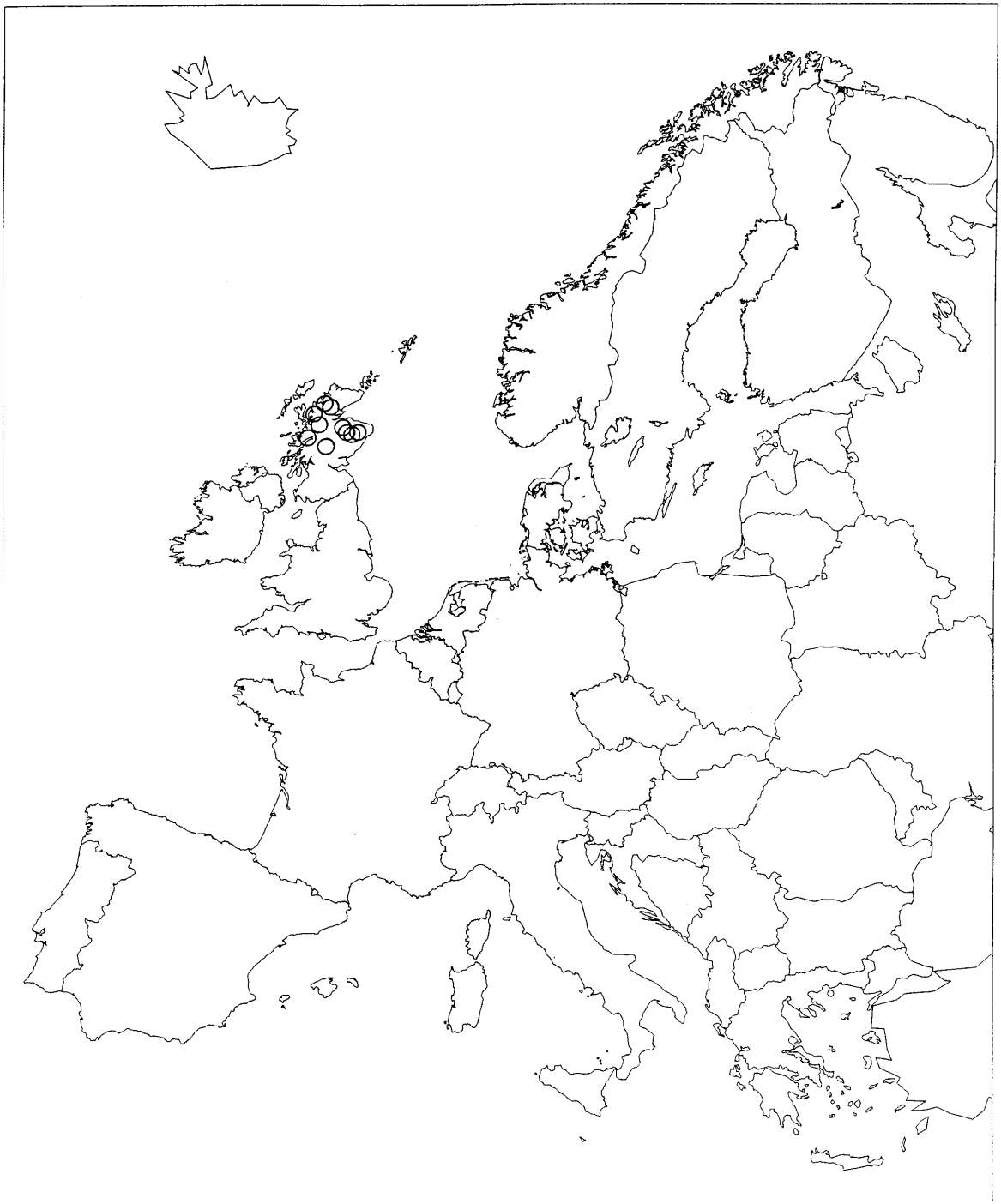
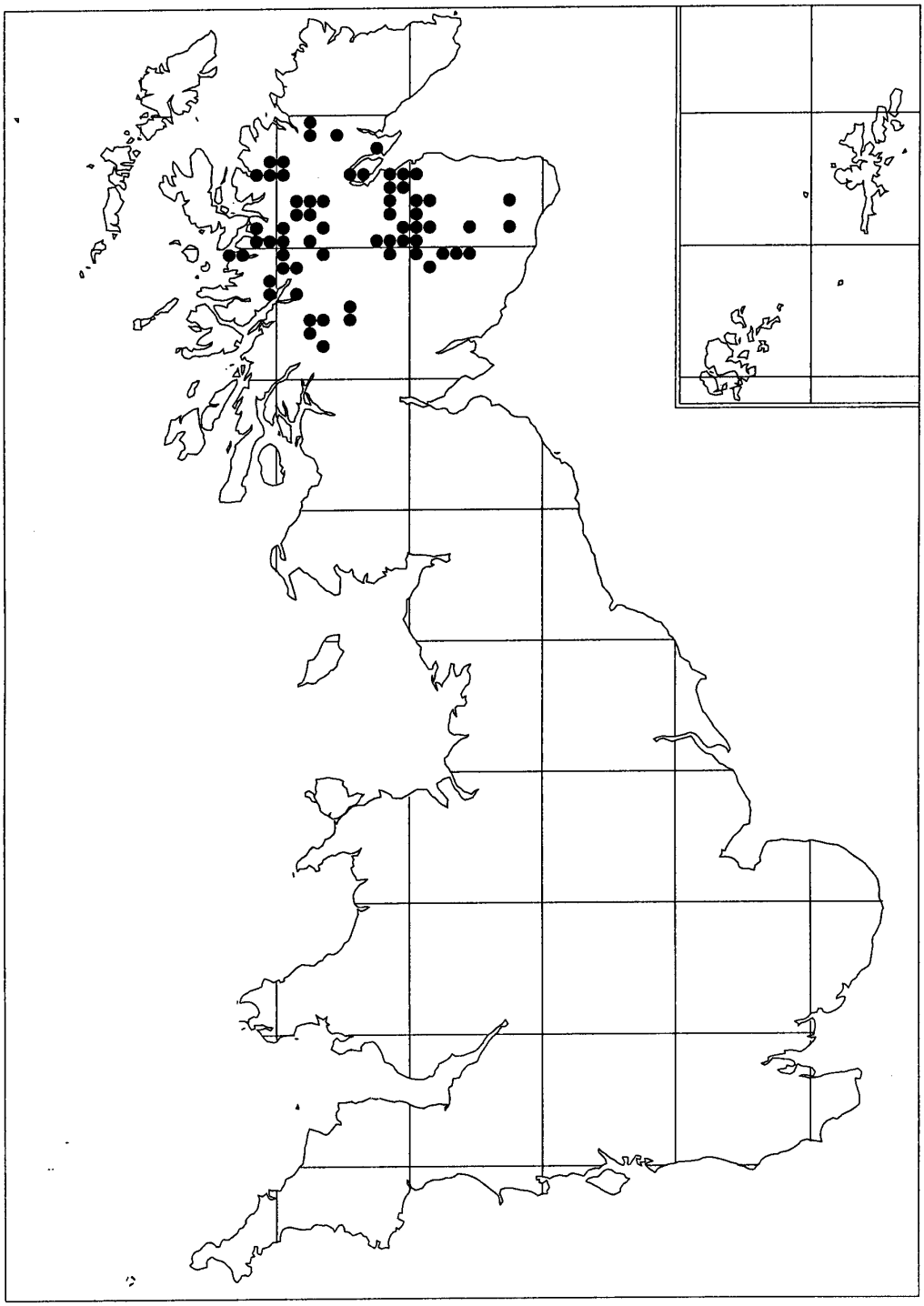


Figure 21 **Distribution of BAP Native Pine Woodlands**



2.7 Stellario-Carpinetum oak-hornbeam forests

Natura 2000 code 9160
Habitats Directive code 41.24
BAP Priority Habitat Lowland oak and mixed deciduous woodland
NVC Community W10 *Quercus-Pteridium-Rubus* woodland *p.p.*
Forestry Commission Guide Type 3 Lowland mixed broadleaf woodlands
Peterken Stand Type 9 Hornbeam woods
Vegetation Map of Europe F2.1 Lowland and colline mixed oak-ash forests & F3 mixed oak-hornbeam forests
EUNIS Habitat G1 Broadleaved deciduous and mixed woodland

Summary

Among the range of oak-hornbeam Carpinion woodlands that replace the Galio odorati-Fagion in north-west Europe where the dominance of beech is challenged on better quality soils, the British examples - among our commonest and most distinctive lowland woodland types - are, along with those in north-west France, particularly Atlantic. They can be seen as belonging to the Stellario-Carpinetum type only in situations where *Hyacinthoides* is absent. Since this often happens with us for local edaphic reasons rather than under climatic influence, it is hard to describe such woodlands as being more continental in character, even if they have happen to have more *Carpinus*. Although the distinction between the Stellario-Carpinetum and the Atlantic Endymio-Carpinetum can sometimes turn on the absence or presence of *Hyacinthoides*, designating atypical sites seems to be a poor basis for ensuring the protection of what is one of our main contributions to the variety of broadleaf woodland in Europe.

Coherence of interpretation of HD habitat

If the Habitats Directive is able to distinguish between this Stellario-Carpinetum and the 9170 Galio-Carpinetum among the north European oak-hornbeam woodlands and if the transition to the more xerophilous oak woodlands of southern Europe is included among the Pannonic oak woods (91G0), it is much to be regretted that a separate Endymion-Carpinetum could not be included as an unambiguous category for the distinctive oak-hornbeam woodlands with *Hyacinthoides* that are confined to the north-west lowlands of the Atlantic zone. The definition in the Interpretation Manual is clear enough and specifically excludes woodlands with *Hyacinthoides*, so the mention of the UK among the countries in the distribution section is therefore optimistic. The note under Habitats Associated about the relationship with beech-oak forests is not very informative considering how much the balance between the oaks and beech is influenced by sylviculture.

Character and significance of the UK examples in a European context

In west and central Europe, oak species will generally be out-competed by beech unless the latter is disadvantaged in some way (Ellenberg 1986). In the Continental and Atlantic biogeographic zones, this happens on very impoverished acid sands, such as are extensive over the Baltic/North Sea plain where acidophilous Luzulo-Fagion beech woods (included in 9110) are replaced by Quercion oak woods (in 9190), and on damp to wet soils, where various more moisture-tolerant and nutrient-demanding trees find a place in forests. This latter shift away from beech-dominance is accentuated towards the climatic limit of the tree, when it loses ground even on well-draining fertile soils, and is much increased by the widespread sylvicultural preference for oak. Especially across north-west Europe, where exploitation of oak for tan-bark, charcoal and timber has a long history in the agricultural lowlands, it is *Quercus robur* and *Q. petraea*, rather than beech, that dominate such woodlands as remain.

This complex shift can be summarised phytosociologically as a move from the mesic Asperulo-Fagion (included in 9130) to a range of woodlands included in the alliance Carpinion Issler 1931 - the name reflecting the prominence of *Carpinus betulus* along with the oaks through much of the range of the alliance (Figure 22). Other important trees in these woodlands are *Fraxinus excelsior, Acer pseudoplatanus, A. campestre, Tilia cordata, Prunus avium* and various *Ulmus* spp. with *Corylus avellana, Crataegus monogyna, Euonymus europaeus, Viburnum opulus* and *Cornus sanguinea* frequent in the understorey. *Fagus* can continue to play a subordinate role in the canopy.

Variation within the oak-hornbeam woodlands of the Carpinion across north-central Europe is complex and tends to grade into various forms of mesic Asperulo-Fagion forest, particular towards the more mountainous heartland of Europe. However, many of the floristic contrasts in the Carpinion can be summarised by recognising four main types of oak-hornbeam woodlands. The core of the alliance can be defined as a Stellario-Carpinetum type which is centred on better quality brown earths in the relatively cool sub-Atlantic region of Europe that includes much of Germany, south Scandinavia, Austria, The Netherlands, Luxembourg, Belgium and western parts of France. Broadly oceanic plants such as *Stellaria holostea, Hedera helix* and *Lonicera periclymenum* are distinctive here, though much of the character of this central type is defined by the absence of species which are either more Continental or more Atlantic. Many descriptions from this part of Europe refer to a type association, the Stellario-Carpinetum Oberdorfer 1957 (Oberdorfer 1983, Pott 1992, Stortelder *et al.* 1999). In eastern Denmark and southern Sweden, essentially similar woodland has been described by Lawesson (1999, see also Diekmann 1994) as a *Quercus robur-Fraxinus excelsior* woodland. Far to the south, remaining fragmentarily on uncultivated brown soils in the cool foothills of the Po valley and extending into the Italian pre-Alps can be found related oak-hornbeam woodland, characterised as the Ornithogalo pyrenaici-Carpinetum Marincek *et al.* 1982 (Pignatti 1999).

To the east, with the shift into a sub-Continental zone with relatively warm, dry summers, more thermophilous trees and shrubs such as *Sorbus torminalis, S. domestica, Viburnum lantana* and *Ligustrum vulgare* appear in a Galio-Carpinetum type. Beyond there, into Poland, Russia and the Ukraine, where the climate becomes increasingly boreal, *Tilia cordata* increases its contribution and *Acer platanoides* and *Picea abies* start to play an important role in the Tilio-Carpinetum lime-hornbeam forests seen, *par excellence*, in Bialowieza.

More relevant for the UK - but rather problematic for interpreting the Habitats Directive - is the change westwards from the Stellario-Carpinetum. Here, with the increasing oceanicity of climate in Belgium, through northern France and into the British Isles, *Hyacinthoides non-scripta* becomes the characteristic vernal herb of a distinctive Endymio-Carpinetum type of oak-hornbeam woodland. By definition, *Hyacinthoides* is absent from, at most very rare in, the Stellario-Carpinetum and any well-informed phytosociological view would have to group the UK W8 *Fraxinus-Acer-Mercurialis* woodland and W10 *Quercus-Pteridium-Rubus* woodland (at least sub-communities a-d) within the former section of the Carpinion. Similar woodlands to these types have been described under the heads of Endymio-Carpinetum, Quercetum atlanticum, and as part of a broader Querceto-Carpinetum medioeuropaeum Tüxen 1937 from France (Lemée 1937) and Belgium (Le Brun *et al.* 1949, Dethioux 1955, Noirfalise & Sougnez 1963) and reviewed by Noirfalise (1968, 1969). Although *Carpinus* has a limited range in the UK, there seems no reason to regard the distribution of this tree, rather than the general extent of mixed broadleaf woodland with *Hyacinthoides*, as setting the bounds of the Carpinion with us (*cf.* Neuhäusl 1977).

Scrutiny of detailed profiles of the Stellario-Carpinetum Oberdorfer 1957 described from parts of mainland Europe that are geographically closest to us but beyond the range of *Hyacinthoides* - best seen in the account by Stortelder *et al.* (1999) of the mixed broadleaf woodlands of The Netherlands - shows just how similar these are to their counterparts in the UK. The overall character of the canopy, understorey, field and ground layers and the various sub-associations recognised (often, as with us, soil related) all clearly reflect the variation included in the NVC W8 and W10 woodlands. A similar situation is seen with the woodlands described from Germany by Oberdorfer (1983).

cSAC designation pattern

The distribution of cSACs (Figure 23) through the Continental zone and, with the Atlantic zone, in the eastern parts of France and Belgium, is a fair reflection of the distribution of the Stellario-Carpinetum. Considering the difficulty of recognising the type in the UK, even two sites seems an achievement. Given the uncertainty about the occurrence and limits of this woodland type in the UK, no additional sites were proposed after the Kilkee Meeting.

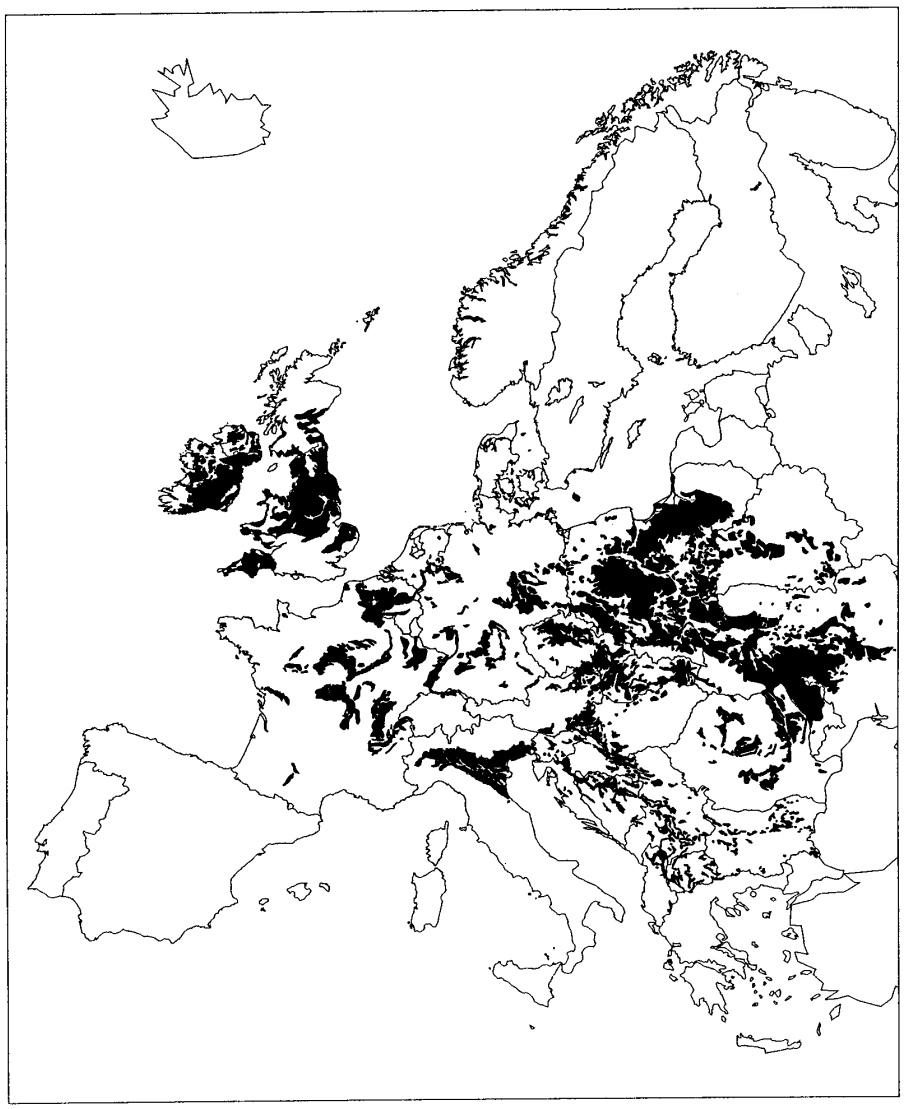
The BAP perspective

In the BAP classification, the Stellario-Carpinetum (along with the Old Acidophilous oakwoods and the Tilio-Acerion) are minority components in a somewhat cumbersome Lowland Oak and Mixed Deciduous Woodland category. This includes most of the semi-natural woodland of southern and eastern Britain, including lowland Wales and Scotland - in NVC terms, overwhelmingly of the W8 *Fraxinus-Acer-Mercurialis* and W10 *Quercus-Pteridium-Rubus* types (Figure 24). These are essentially the British examples of the Carpinion, the alliance of woodlands surviving on the less acidic and more fertile soils of the whole western European lowlands through the Atlantic and Continental zones, and the Quercion equivalents of W16a on more acidic impoverished terrain.

The advantage of the broader BAP definition is that it recognises the importance of the Endymio-Carpinetum bluebell woodlands so characteristic of the Atlantic north-west of Europe and more calcicolous Carpinion woodlands not dominated by beech that occur on

chalk and other limestones and lime-rich superficials elsewhere in Europe. This broader perspective applied elsewhere in Europe would also take in woodlands for which we have no direct equivalent, like the Habitats Directive 9170 Galio-Carpinetum and 91G0 transitions to the Pannonic oakwoods.

Figure 22 **Potential extent of the Carpinion oak-hornbeam woodlands**



The figure is reproduced by kind permission of the Bundesamt für Naturschutz in Bonn and is an extract from the 1:2.5M Vegetation Map of Europe.

Figure 23 **Distribution of cSACs for 9160 Stellario-Carpinetum as at 1 January 2000**

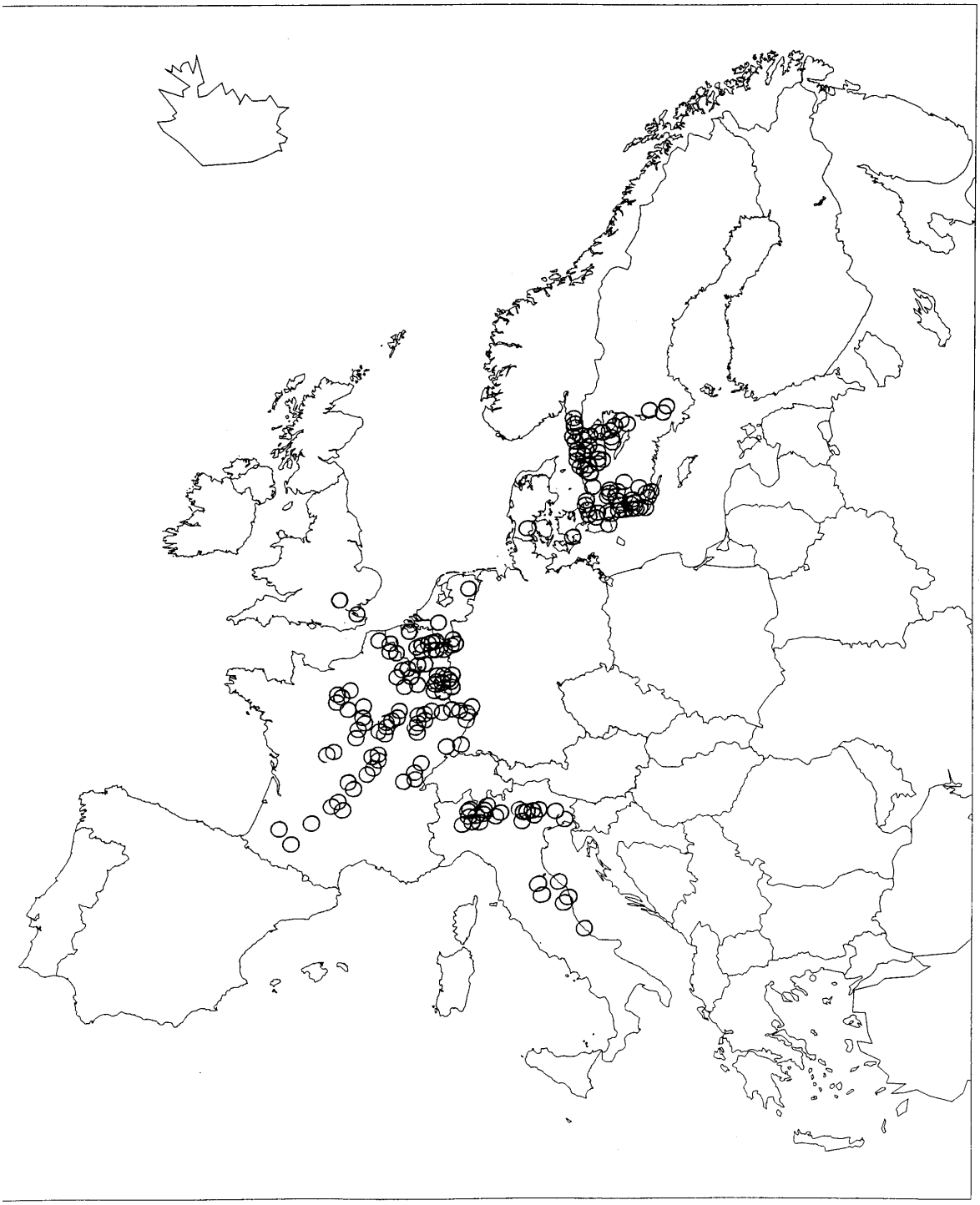
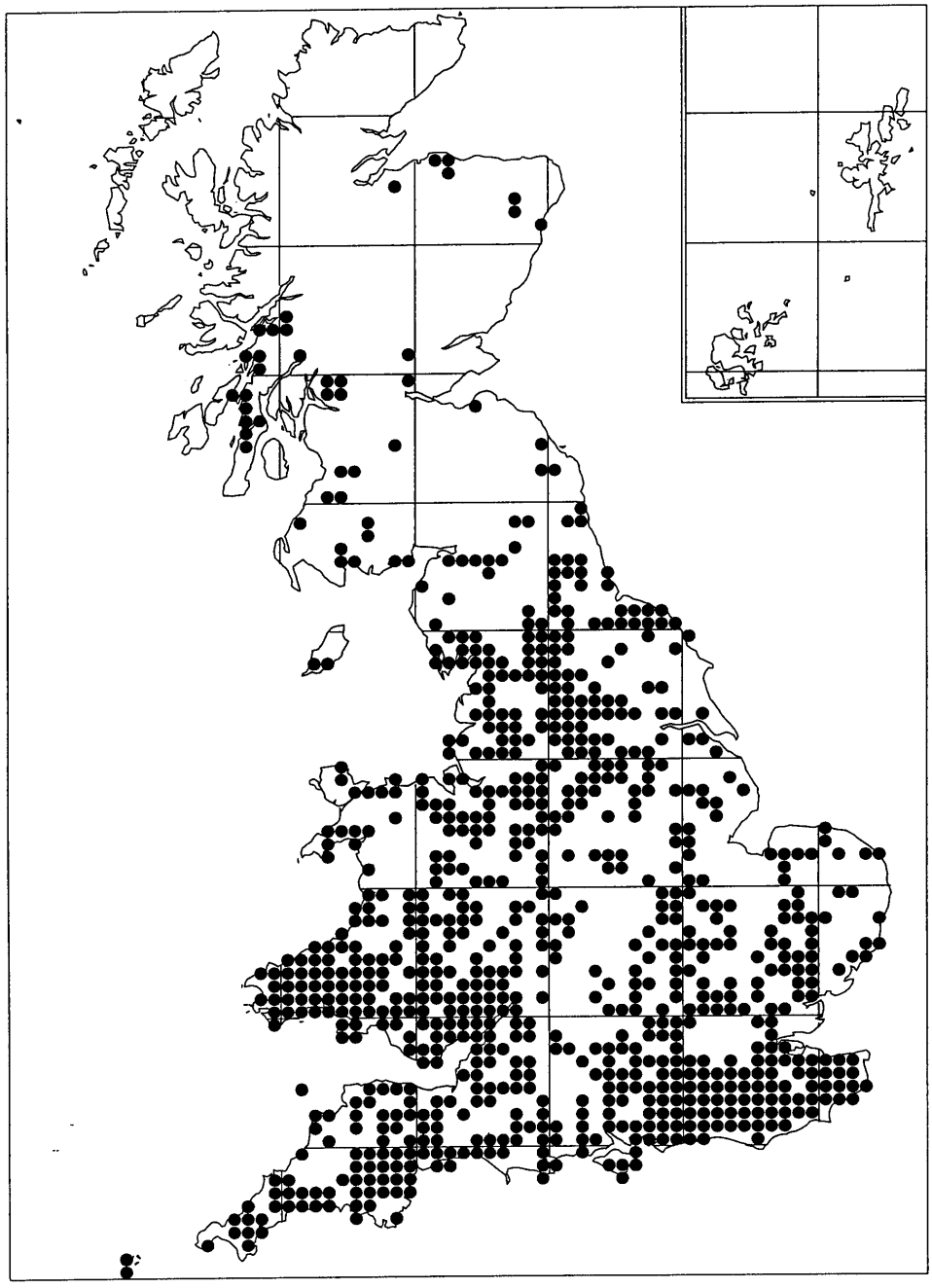


Figure 24 **Distribution of BAP Lowland Oak and Mixed Deciduous Woodland**



2.8 Tilio-Acerion ravine forests

Natura 2000 Code 9180
Habitats Directive Code 41.4
BAP Priority Habitat Upland Mixed Ash Woodland
NVC Community W8e-g *Fraxinus-Acer-Mercurialis* & W9 *Fraxinus-Sorbus-Mercurialis* woodlands
Forestry Commission Guide Type 4 Upland mixed ashwoods
Peterken Stand Type 1A,C & D Ash-wych elm woods, 3C & D hazel-ash woods & 4C Western maple-ash-lime woods
Vegetation Map of Europe locations unmappable at 1:2.5M
EUNIS Habitat G1.A Woodland with chestnut, hornbeam, lime or rowan & G1.B Mixed deciduous woodland

Summary

Despite the local or rare occurrence with us of *Tilia cordata* and *T. platyphyllos* and the non-native status in the UK of *Acer pseudoplatanus* and *A. platanoides*, there is no doubt that we have many good stands of woodlands that could be broadly defined, on both their floristics and ecology, as belonging to the alliance Tilio-Acerion. Among the numerous associations characterised from this widely distributed woodland type of ravines and rocky slopes throughout Europe, British examples span the northern limit of more Continental plants and the southern boundary of Northern Montane and Continental Northern species characteristically found in these communities. On balance, our stands are most similar to the Tilio-Acerion woodlands of south Scandinavian river valleys. Considering the spread of good ravine sites we have in north-western England, the number of cSACs as originally proposed was small but this has been considerably increased since the Kilkee Meeting.

Coherence of interpretation of HD habitat

The Definition of the habitat is reasonably clear though it does not stress the important role of *Acer platanoides* in these woodlands, particularly at higher altitudes, nor does it give a good account of the role of the different species of lime. The sub-alliances mentioned do not exhaust the variation within this kind of woodland. According to Stortelder *et al.* (1999), the Tilio-Acerion does not occur in The Netherlands, despite the occurrence of this country in the Distribution list. Under Habitats Associated, the biggest problem of definition is with the mesic Asperulo-Fagion and Carpinion, not with the beech forests of more impoverished substrates.

Character and significance of the UK examples in a European context

One striking kind of situation in which beech and the oaks can all be out-competed by such fast-growing trees as *Fraxinus excelsior, Acer pseudoplatanus, A. platanoides, Ulmus glabra* and *Tilia cordata* is on the nutrient-rich soils that accumulate in the humid micro-climate of shady slopes and ravines. Here, with downwash and percolation of ground water, the soils

may be deep and moist, but usually they are free-draining and show a brisk turnover of nutrients. Typically, such situations are associated with base-rich (though not always calcareous) rocks and occur widely in the steep-sided immature river valleys of the colline, sub-montane and high mountain belts right across Europe.

Woodlands of this type have been grouped in a distinctive alliance, the Tilio platyphylli-Acerion pseudoplatani Klika 1933 within the Fagetalia. In addition to the above-mentioned trees, *Sambucus nigra* is a characteristic shrub and the field layer is typically dominated by luxuriant nitrophilous herbs like *Urtica dioica, Aegopodium podograria* and *Impatiens noli-tangere*, moisture-loving vernal plants such as *Allium ursinum*, ferns like *Phyllitis scolopendrium, Polystichum aculeatum, P. setiferum* and *Gymnocarpium robertianum* and bulky mosses which thrive on the bare ground exposed by the rapid breakdown of herbage and litter at the close of the growing season. The terrain is typically complex and rocky, with a heterogenous soil cover and the physiognomy of the woodland has been vividly described as 'impetuous' (Etter 1947). On floristic and general ecological grounds, it is clear that many stands of the northern and western sub-communities (e-g) of the UK W8 *Fraxinus-Acer-Mercurialis* woodland and W9 *Fraxinus-Sorbus-Mercurialis* woodland belong here (Figure 25), despite the fact that, with us, neither *Acer pseudoplatanus* nor *A. platanoides* is native and even *Tilia cordata* is becoming scarce to the west and north where suitable sites are more common.

The kind of terrain and topoclimate necessary to sustain the Tilio-Acerion means that throughout Europe these woodlands have a basic floristic and structural similarity, but the variations in climate from region to region sustain a distinctive contingent of more Continental, Boreal, Alpine, Mediterranean or Atlantic species according to the prevailing climate of the zone. There is also some variation within the alliance according to whether the habitat is colluvial and very moist, is humid primarily because of shade or gets some warmth in sunny ravine tops or by virtue of being in more southerly latitudes, and different sub-communities have sometimes been proposed to recognise these trends.

A large number of associations have been characterised and, not surprisingly, the most similar to British examples of the Tilio-Acerion occur in southern Norway and Sweden (see, for example, Klötzli 1970, Dierßen 1995, Diekmann 1994 & Lawesson 1999). Here, the Corylo-Fraxinetum Br.-Bl. & Tx. 1952 (first described from western Ireland and very similar to Pennine woodlands of this type) has been reported by Øvstedal (1985) and an Ulmo-Tilietum K-Lund *apud* Seibert 1969 by Kielland-Lund, both associations similar to our W9, but with species such as *Hepatica nobilis* and *Dentaria bulbifera* giving a more particular Scandinavian feel.

Through Germany, Austria, Switzerland and France, associations like the Ulmo-Aceretum Beger 1922, Aceri-Tilietum Faber 1936, Aceri-Fraxinetum Tuxen 1937 Corydalido-Aceretum Moor 1938, Scolopendrio-Aceretum Schweickerath 1938, Aceri-Tilietum Trepp 1947 nom invers., Sorbo-Aceretum Moor 1952, Lunario-Aceretum Richard ex Schluter in Gruneberg & Schluter 1957 and the Cynancho-Tilietum Winterhoff 1963 (Ellenberg 1986, Mucina *et al.* 1993) all show some general floristic similarities to British Tilio-Acerion woodlands, though there is a tendency for montane types to be dominated by *Acer platanoides* and those at lower altitudes to have prominent lime (Moor 1975, Clot 1990, Oberdorfer 1992). More particularly, *Tilia platyphyllos* emerges as the lime more confined to

the Tilio-Acerion ravine forests, while *Tilia cordata* is also broadly distributed through the Carpinion.

At warmer latitudes further south in Europe, and particularly in sunny ravines at lower altitudes, there is a tendency for species of the downy oak Quercetalia pubescenti-patraeae forests to appear in these woodlands. Sometimes, it has been suggested that such communities as the Seslerio-Tilietum Chytry & Sadlo 1997 from Czechia, the Mercuriali-Tilietum Zolyomi & Jakucs *ex* Fekete & Jarai-Komlodi 1962 from northern Hungary, the Tilio-Fraxinetum Zolyomi *ex* Ratiu *et al.* 1966 from east Hungary and Romania and the Poo-Tilietum Romo 1989 from the south-western Pyrenees should be included in that order. However, Chytry & Sadlo (1997) make a convincing case for these woodland types to be retained within a broadly defined Tilio-Acerion, perhaps as a separate sub-alliance. The Tilio-Acerion also occurs into the Italian pre-Alps and reaches its southern limit in humid, north-facing ravines of the Appennines as the Cirsio erisithali-Ulmetum Antonietti 1968 (Pignatti 1998).

Among this wide range of woodland types, the British examples of the Tilio-Acerion are distinctive in spanning the north-western limit of more Continental species represented in the alliance - *Tilia cordata, Acer campestre, Cornus sanguinea, Rhamnus catharticus* and *Euonymus europaeus* - and also including some Northern Montane and Continental Northern plants - *Prunus padus, Rubus saxatilis, Actaea spicata, Trollius europaeus, Crepis paludosa, Cirsium helenioides, Geranium sylvaticum* - which emphasise the links with the Boreal zone.

cSAC designation pattern

W8e-g and W9 woodlands are widespread in the upland fringes of the UK and the more restricted distribution of the original SAC selection for this woodland type reflects an emphasis on sites including *Tilia* spp. (Figure 26). Following the Kilkee Meeting, numerous additional sites have been identified in the cSAC series across the rest of the range, frequently in association with the 91A0 Old oak woods with *Ilex* and *Blechnum* (Appendix 4). The cSACs in southern Italy where, on a strict interpretation, the Tilio-Acerion does not exist, are probably mesic beech-maple ravine forests.

The BAP perspective

Among the BAP Priority Habitats, our Tilio-Acerion ravine forests constitute an important element of the Upland Mixed Ash Woodland category: most can be included there, although outlying stands on the Sussex and Hampshire chalk (Abraham & Rose 2000) have been placed in the Lowland oak and Mixed deciduous Woodland (Hall & Kirby 1998). In fact, nomination of cSACs for the Tilio-Acerion has tended to focus on sites rich in limes, so the BAP category is a useful frame for highlighting the importance of many examples of W8e-g *Fraxinus-Acer-Mercurialis* and W9 *Fraxinus-Sorbus-Mercurialis* woodlands which have no lime (Figure 27). Despite the name of the BAP category, low altitude stands of these kinds of woodland are widespread: a better name for the Priority Habitat would be North-Western Mixed Ashwood - or perhaps North-western Mixed Ash and Yew Woodland, acknowledging the very sensible inclusion in the category of W13 *Taxus* woodlands on limestone crags and pavements in northern England. Elsewhere in Europe, towards the heartland of the ranges of the limes and within the natural distribution of *Acer*

pseudoplatanus and *A. campestre*, this broader category coincides more specifically with the Tilio-Acerion, whose definition is not so contentious.

Figure 25 **Distribution of known British stands of 9180 Tilio-Acerion ravine forests**

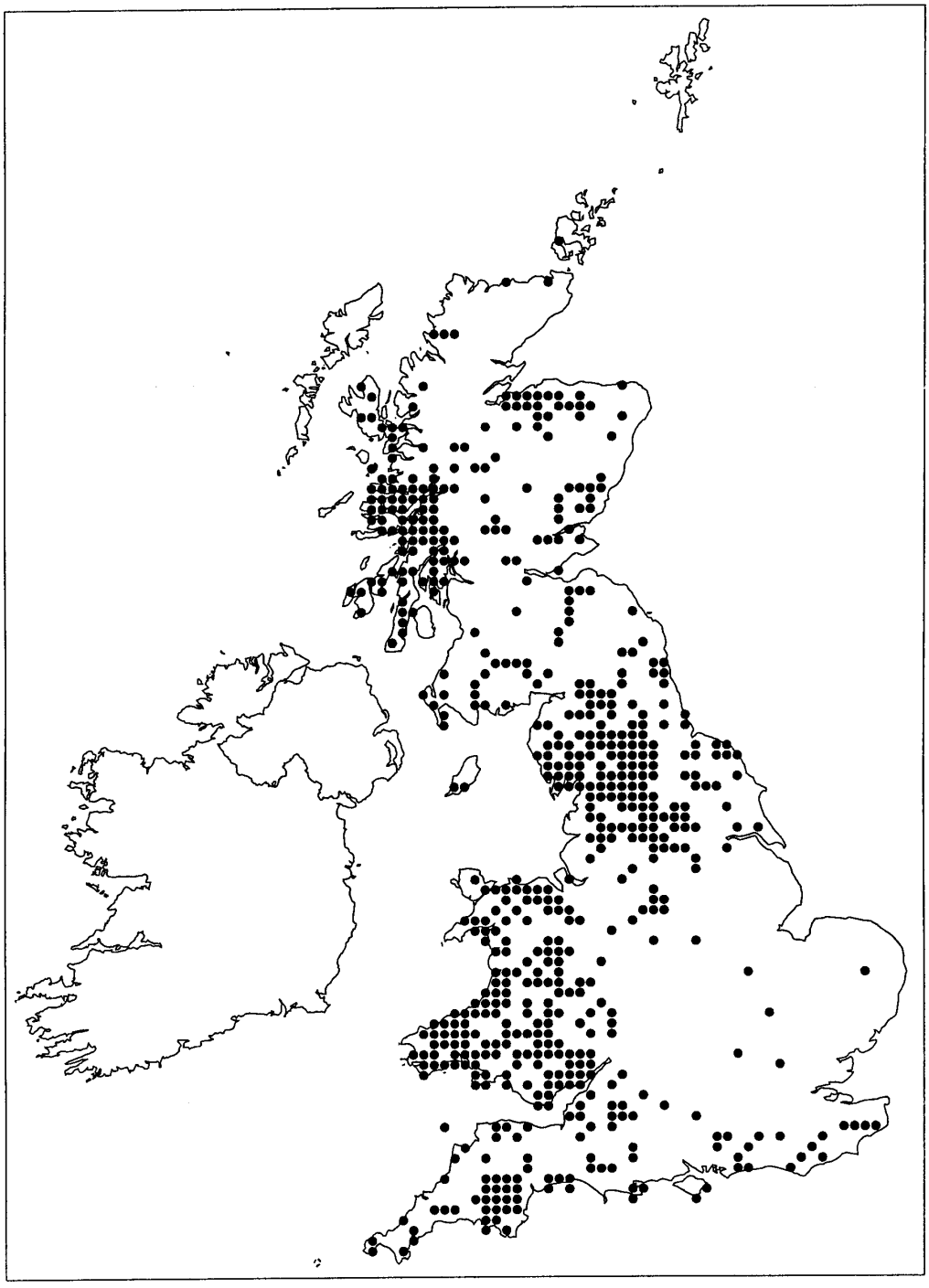
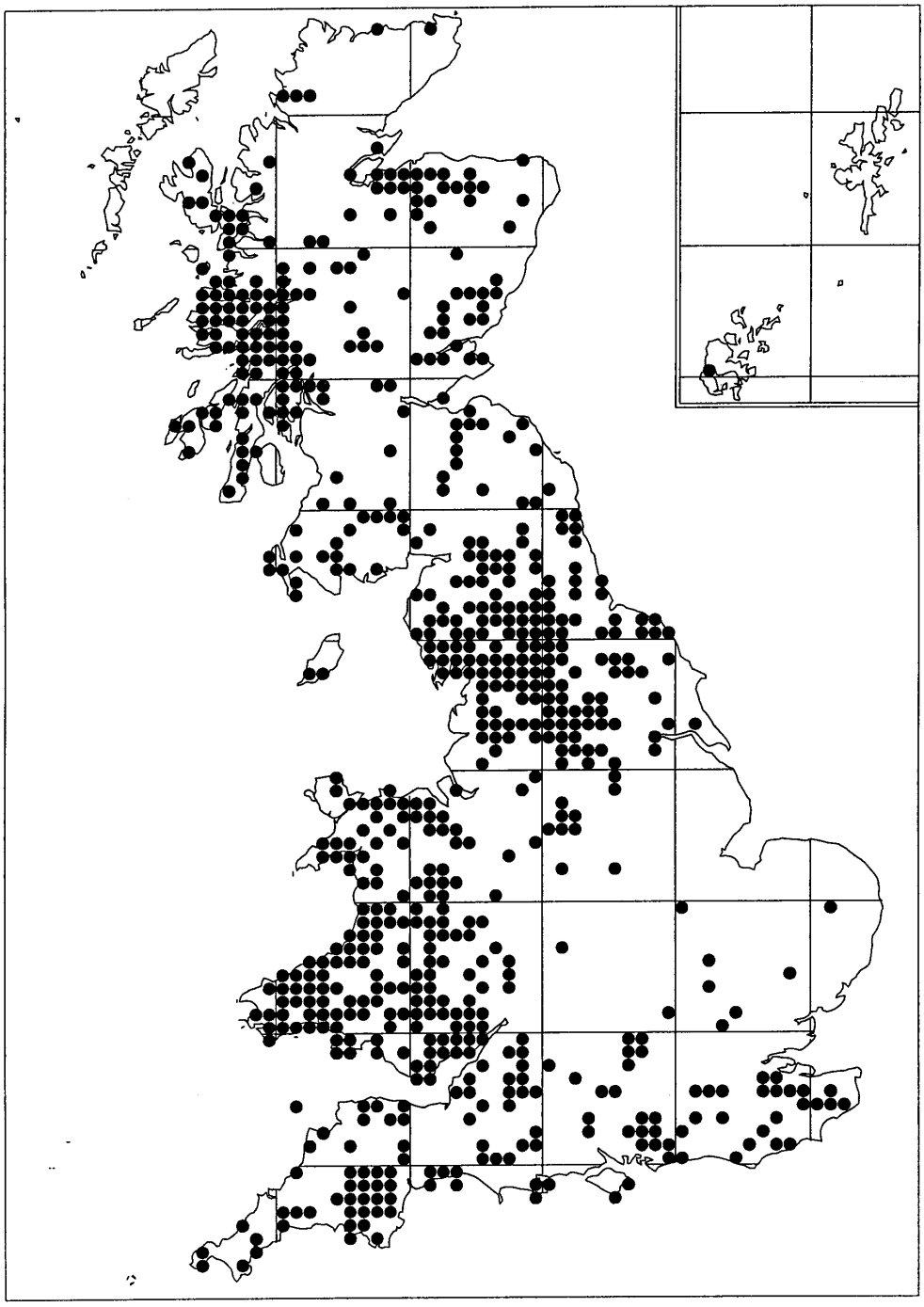


Figure 26 **Distribution of cSACs for 9180 Tilio-Acerion ravine forests as at 1 January 2000**

Figure 27 **Distribution of BAP Upland Mixed Ash Woodland**



2.9 Residual alluvial forests (Alnion glutinosae-incanae)

Natura 2000 code 91E0
Habitats Directive code 44.3
BAP Priority Habitat Wet Woodland
NVC Community W6 *Alnus-Urtica*, W7 *Alnus-Fraxinus-Lysimachia* and W5 *Alnus-Carex* woodland p.p.
Forestry Commission Guide Type 8 Wet Woodlands
Peterken Stand Type 7 Alderwoods
Vegetation Map of Europe U Woodlands of flood-plains, estuaries and freshwater polders *p.p.*
EUNIS Habitat G1.1 Riparian woodland with willow, alder or birch and G1.2 Fluvial ash-alder and oak-elm-ash woodland

Summary

As with many other parts of the lowlands of north-west Europe, the UK now has very few remaining examples of the truly riverine Salicion albae woodlands that are included in this Habitat. Dynamic colonising sites are very rare with us, and the somewhat older fragments of woodland as do survive are typically hemmed in by intensive agriculture. Nonetheless, apart from the scarcity of *Salix alba*, they are similar in their floristics to the various associations of this alliance described from elsewhere in the range. The Alno-Padion flush woodlands are much more widespread and absolutely characteristic of the type though, as elsewhere in Europe, they comprise a minor element within other woodlands.

Coherence of interpretation of HD habitat

This is a broad but quite well-defined category of wetter willow, alder and ash woodlands that can neither be strictly defined as 'alluvial' (since it includes flush and brook valley woodlands in situations that are never flooded) nor seen as equivalent to the Alnion glutinosae-incanae (which, even if it were a valid phytosicological name, would not include younger alluvial willow woodlands). However, the ecological and floristic elements of the Definition are quite informative. The Interpretation Manual makes clear that, as defined, the habitat does not extend into the Mediterranean, where it is replaced by 92A0 and 92B0, though *Populus alba* becomes prominent in alluvial woodlands in southern Europe before that zone is reached. It is not very accurate to say in Habitats Associated that the Tilio-Acerion is the usual contact community: in the lowlands, most remaining stands survive amid intensive agriculture or among the Carpinion and mesic beech woodlands of more mature riverine landscapes and, in the montane zone, are associated with coniferous and mixed woodland or replacement meadows and pastures.

Character and significance of the UK examples in a European context

This is a broad and complex category that includes riverine and flush woodlands from right across Europe outside the Mediterranean. They are to some degree azonal, occurring on alluvium and at seepage lines along river valleys that cut through the major biogeographic

regions, though they still show some broad climatic and altitudinal differences in the dominant trees and the associated flora. Throughout, but especially in the more intensively agricultural and long-settled lowlands where flooding is now largely controlled and woodlands much reduced in cover, such alluvial communities are often fragmentary or replaced by poplar plantations or, more recently, by high biomass willow coppice.

Through much of the lowlands and colline areas of north-west Europe and extending into the sub-montane, *Salix alba* is the most important early colonist of river shoals and terraces following the initial invasion by osiers like *Salix triandra, S. viminalis* and *S. purpurea* and, with the accumulation of sediments above the zone of frequent flooding, it comes to dominate in willow woodlands. *S. fragilis* is also characteristic of these wet woodlands though, according to Ellenberg (1986), it is limited to smaller rivers with lime-deficient waters. *P. nigra* is widely planted in such alluvial habitats right through north-west Europe but strictly speaking it is Pannonic in its range and does not assume a natural prominence in wet woodlands of this kind until the Danube and Tisza basins. *Populus alba* becomes frequent with the shift towards the Mediterranean zone and, where woodlands remain on river alluvium in southern France, north-west Italy and parts of Spain, it can dominate in wet poplar woods of essentially the same type. Truly Mediterranean riverine willow and poplar woodlands and similar habitats in the Balkans with *Platanus orientalis* are included within habitats 92A0 and 92B0.

Alnus glutinosa, the commoner alder through virtually all the lowland and sub-montane parts of Europe, is usually a somewhat later invader of such alluvial flats but becomes a frequent canopy companion in established riverine woodlands. Associated understorey species include *Sambucus nigra* and *Prunus padus* and the dominant field layer plants are bulky nitrophilous herbs like *Urtica dioica, Symphytum officinale* and *Alliaria petiolata,* with such sprawlers as *Galium aparine, Calystegia sepium* and *Solanum dulcamara.*

Traditionally, such woodlands have all been grouped in one of the alliances included in this habitat, the Salicion albae Sóo 1930, though some authorities place the white poplar woodlands centred on the Mediterranean in a separate alliance, the Populion albae Br.-Bl. *ex* Tchou 1948. Among the associations that persist fragmentarily in the lowlands of Germany and France are the Salicetum albae Issler 1926, the Salicetum albo-fragilis Issler 1926 and the Salicetum fragilis Passarge 1957 (Ellenberg 1986, Oberdorfer 1992, Pott 1992) which all show a general similarity with the UK W6 *Alnus-Urtica* woodland (Figure 28). More recently, a range of associations of local occurrence has been described from The Netherlands (Stortelder *et al.* 1999) - the Irido-Salicetum Passarge & Hofmann 1968 *emend* Hommel *et al.* 1999, the Cardamino-Salicetum Hommel *et al.* 1999 and the Artemisio-Salicetum Hommel *et al.* 1999 - and these include a comparable range of floristic variation to that found in the British association, apart from the scarcity with us of *Salix alba.* Typical examples of related poplar woods from close to the Mediterranean zone are the Salici-Populetum (Tx. 1931) Meijer-Drees 1936 and the Populetum albae Tchou 1949 which survive locally in Languedoc and along the Rhone, in some valleys in northern Spain and along the rivers of the Apennines (Pignatti 1998).

Where alluvial flats dry out somewhat, the dominance of the earlier invading willows is eclipsed and *Alnus glutinosa* is joined by *Fraxinus excelsior* and, on deeper finer sediments, by *Ulmus minor* and *U. laevis* in woodlands that have been included in associations like the Stellario-Alnetum Lohmeyer 1957, the Alno glutinosae-fraxinetum Mikyski 1943, the

Pruno-Fraxinetum Oberdorfer 1953 and the Pruno-Fraxinetum Herrera *et al.* in Herrera 1989 reported from Belgium, Germany, France and northern Spain. Our nearest equivalent to this kind of vegetation is included as part of the W7 *Alnus-Fraxinus-Lysimachia* woodland (the alluvial flat sub-community a). Such associations have sometimes been separated from the Salicion albae and grouped with the swamp and fen alderwoods of the Alnion glutinosae, which they closely resemble (see, for example, Table 46 in Ellenberg 1986). Strictly speaking, these latter woodlands (among which the UK W5 *Alnus-Carex* community belongs) do not appear to be included within this habitat type, though they can occur as part of mosaics with the other woodlands here.

With the shift into the foothills of central European mountains and into the Boreal zone, *Alnus glutinosa* is replaced by *A. incana* as the leading alder in alluvial woodlands and this species tends to enter the succession earlier. Along the stony beds of mountain torrents, the distinctive initial colonisers are *Salix eleagnos* and *S. daphnoides*, along with *Myricaria germanica* (in the sorts of woodland included in habitats 3230 and 3240) but these can be quickly overtaken by the grey alder which can maintain itself even on substrates that are still immature. Such riverine alder woodland has generally been placed in another of the alliances included in this habitat, the Alnion incanae Pawlowski in Pawlowski & Wallisch 1928 and, sometimes more specifically, to distinguish them from related flush woodlands, in a sub-alliance Alnenion glutinosae-incanae Oberdorfer 1953 (whence, presumably, comes the misleading bracketed sub-title for this whole habitat).

Among the coniferous forests that prevail at high altitudes in European mountains, this grey alder woodland often represents the only kind of deciduous broadleaf cover. The field layer has much in common with the kinds of moister woodlands included in the Carpinion and Tilio-Acerion alliances - with plants such as *Circaea lutetiana, Stachys sylvatica, Scrophularia nodosa* and *Aegopodium podagraria* - and the Alnion incanae has therefore been grouped within the drier broadleaf woodlands of the Fagetalia as opposed to the Salicetalia purpureae where the Salicion albae and younger willow-dominated woodlands and scrubs of high mountain streams are placed. The type association here is the Alnetum incanae Ludi 1921 described from Germany, Austria, France and Italy (Oberdorfer 1992, Pott 1992, Mucina *et al.* 1993, Pignatti 1998). As in the north-western lowlands of Europe, *Fraxinus* and *Ulmus* spp. enter into these woodlands as the sediments dry somewhat and separate communities have sometimes been designated from such situations, as with the Alno incanae-Fraxinetum K.-Lund *apud* Seibert 1969 described from the northern part of the range of the grey alder in Scandinavia (Fremstad 1993, Dierßen 1993).

The third kind of wet woodland included within this habitat occurs in flushes on the slopes of middle-aged river valleys or along so-called 'brook channels' which are not inundated by flooding but where ground water emerges and maintains the soils in a saturated and usually quite base-rich and eutrophic condition. Here, it is again *Alnus glutinosa* and *Fraxinus excelsior* that are the characteristic canopy dominants, the latter often with the greater cover. The type association is the Carici remotae-Fraxinetum Koch *ex* Faber 1936, which retains its floristic integrity right through the lowland and sub-montane zone of western and central Europe, and good accounts have been provided from The Netherlands (Westhoff & den Held 1969, Stortelder *et al.* 1999), Belgium (Dethioux 1955), France (Noirfalise 1952), Germany (Oberdorfer 1953, 1957, Pott 1992), Austria (Mucina *et al.* 1993), Poland (Matuskiewicz 1981) and Czechia (Neuhauslova-Novotna 1977).

In this community, tussock sedges such as *Carex remota, C. pendula* and *C. laevigata* are prominent, along with *Chrysosplenium oppositifolium, Cardamine amara,* colourful tall fen herbs and a range of plants more widely characteristic of damp Carpinion woodlands. The UK W7 *Fraxinus-Alnus-Lysimachia* woodland is absolutely typical of this kind of vegetation which is grouped in the third of the alliances specifically embraced by this habitat, the Alno-Padion Knapp 1942. More recent syntaxonomic revisions have replaced the alliance by the Alno-Ulmion Br.-Bl. & Tx. 1943 or subsumed it within the Alnion incanae. Such woodland vegetation survives widely as a minority element in wetter places within other Carpinion forests.

cSAC designation pattern

Even allowing for the fragmentary survival of the alluvial woodlands of the Salicion albae in the UK, our pSACs are vastly outnumbered by those elsewhere, even in parts of north-west Europe (like the agricultural lowlands of northern France) where there is a similar patchy occurrence of the habitat (Figure 29). Of course, the site lists and maps do not discriminate these kinds of riverine woodlands from the Alno-Padion flushes of which we certainly, like many other areas on the European lowlands and sub-montane, have numerous excellent examples. Following the Kilkee meeting some new sites have been put forward for this type and its presence has been registered on many existing cSACs across its range (Appendix 4). Though this habitat does not technically extend into the Mediterranean zone, Spain, France, Italy and Greece have all designated pSACs there for these woodlands as well as for the more specifically Mediterranean 92A0 and 92B0.

The BAP perspective

Residual Alluvial Forest and Bog Woodland are just two types of wet woodland included within the very broad BAP category of this name. This is a floristically and hyrdologically very diverse grouping of nearly all the vegetation covered by the NVC communities W1-W7 with, in total, a very wide distribution throughout the UK (Figure 32). Drier types of W4 in the north and included in Northern Birchwoods rather than here and transitions from drier forms of W6 and W7 included in the Habitats Directive category to Lowland Oak and Mixed Deciduous Woodland can be problematic. The advantage of the broader BAP category is twofold: more generally, it focuses attention on the vulnerable character of much wet woodland and, more particularly, it highlights those British wet woodlands which fall outside the Habitats Directive - notably W1 *Salix-Galium*, W2 *Salix-Betula-Phragmites* and W3 *Salix-Carex rostrata* woodlands. These provide a distinctive contribution to the European understanding of wet woodlands, the first especially distinctive as a sub-maritime scrub in south-west England, the second a terrestrialising community around open-water transitions and on incipient raised mires, the third a northern Continental basin mire woodland. Generic guidelines for quality and management of the group as a whole would be very misleading. Were this kind of broader approach to be adopted elsewhere in Europe, a similar very broad range of Salicion cinerea and Alnion glutinosae woodlands would be covered, including Habitats Directive priorities which are not found in the UK.

Figure 28 **Distribution of known British stands of 91E0 Residual alluvial forests**

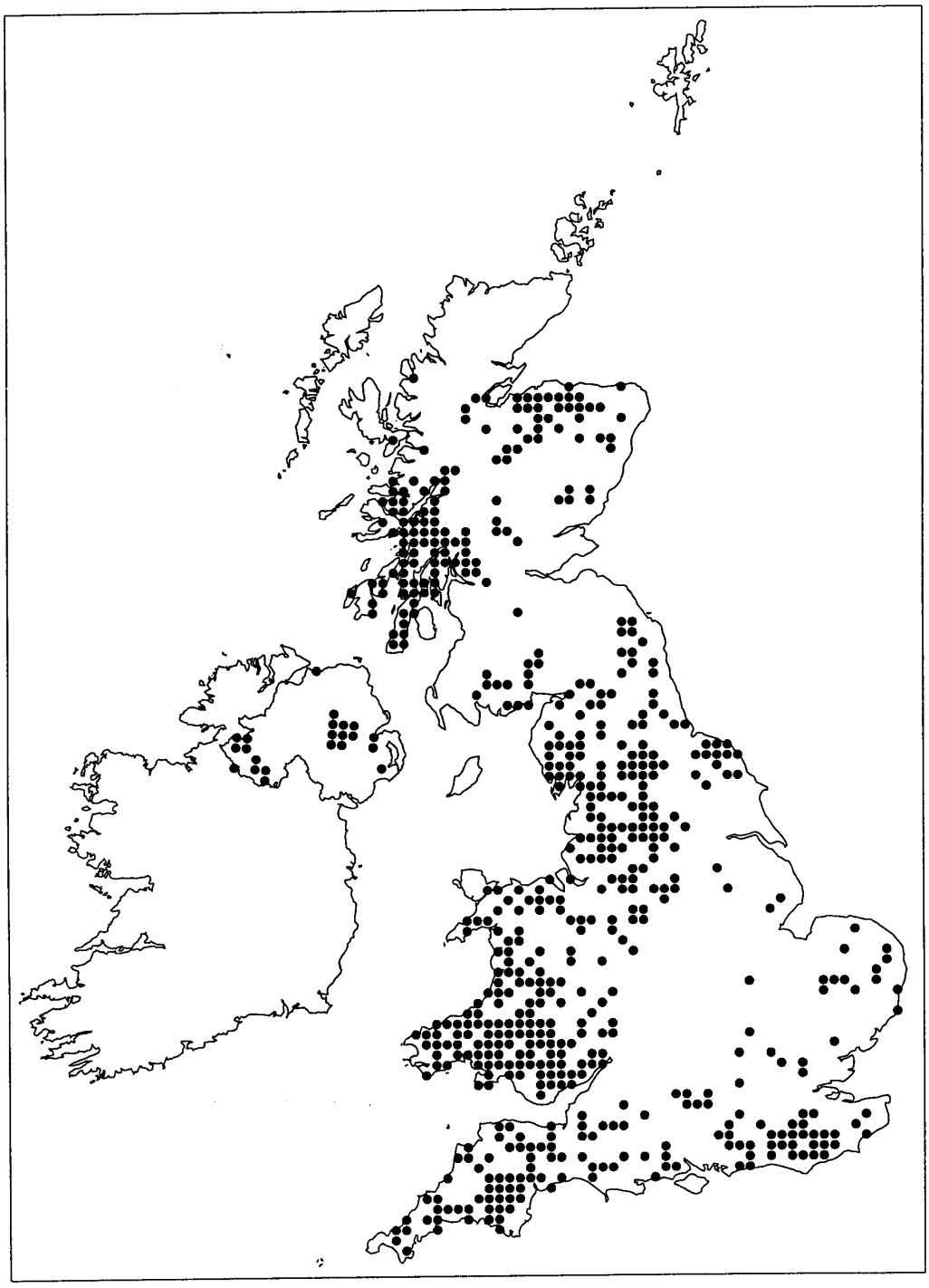
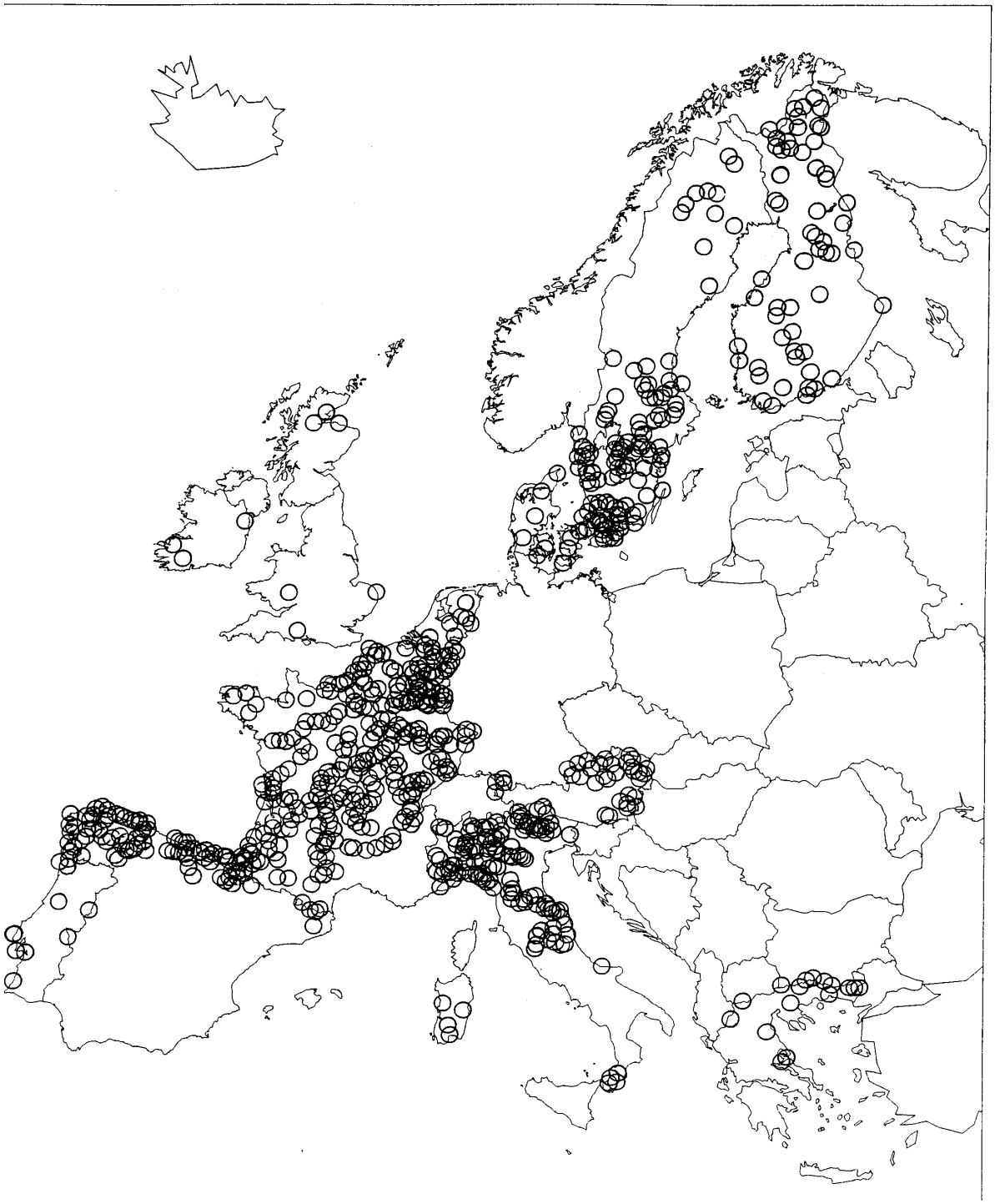


Figure 29 **Distribution of cSACs for 91E0 Residual alluvial forests as at 1 January 2000**



2.10 Bog woodland

Natura 2000 code 91D0
Habitats Directive code 44.A1-44.A4
BAP Priority Habitat Wet Woodland
NVC Community W4 *Betula-Molinia* woodland, W18 *Pinus-Hylocomium* woodland *p.p.*
Forestry Commission Guide Type 8 Wet Woodlands
Peterken Stand Type 1 Pine woods, 12 Birch woodland
Vegetation Map of Europe C Sub-arctic, boreal and nemoral-montane birch woodlands *p.p.*, D Mesophytic and hygro-mesophytic coniferous and mixed forests *p.p.* & T.2 Birch carrs and swamp forest
EUNIS Habitat G1.5 Acid peatland broadleaved swamp woodland & G3.D & E Bog conifer woodland

Summary

The UK has a small proportion of one kind of bog woodland, the birch-dominated Betulion pubescentis, which prevails among this habitat towards the wetter Atlantic zone on wet acidic peats of ombrogenous mires, valley bogs and flushes but which, with drainage and cutting of our larger lowland raised bogs, often shows a tendency to progress to Quercion vegetation. We also have some outlying and fairly typical examples of the more Boreal pine-dominated bog woodlands that increasingly replace birch communities further east, becoming hugely extensive in Fennoscandia. Compared with other Member States in lowland north-west Europe, where raised bogs are now equally scarce as with us, our original contingent of cSACs seemed rather small but some additions have been made following the Kilkee Meeting.

Coherence of interpretation of HD Habitat

The definition of the habitat is generally informative though could make more clear the broad shift from birch to pine/spruce-dominated examples in moving through the Atlantic and Continental zones into the Boreal. The remarks about Ireland under Geographical Distribution are more widely applicable to many areas of the north-west European lowlands.

Character and significance of the UK examples in a European context

Willows and *Alnus glutinosa* are too nutrient-demanding to effectively colonise the sort of impoverished wet habitats associated with the accumulation of acid peat in ombrogenous, topogenous or soligenous mires. Here, it is *Betula pubescens* and *Pinus sylvestris* which are the most important invaders, the former especially in more Atlantic parts of Europe, the latter in the more Boreal. In the latter zone, too, and with the shift to cooler winter temperatures at higher altitudes in the mountains of central Europe, *Picea abies* also plays a role in such bog woodlands, with *Pinus mugo* in the pre-Alps and high mountains where this habitat occurs very locally. Traditionally, such woodlands have been included in the order Vaccinetalia uliginosi Tx.1955, sometimes placed among the pine-spruce woodlands of the Vaccinio-

Picetea Br.-Bl. In Br.-Bl. *et al.* 1939, now often located among the bogs and wet heaths of the Oxycocco-Sphagnetea Br.-Bl. & Tx. *ex* Westhoff *et al.* 1946.

The mire surface over which such invasion takes place characteristically has some *Sphagnum* spp., which play an important role in the accumulation of the peat in many of the more active mires included here, and various sub-shrubs like *Vaccinium myrtillus, V. vitis-idaea* and *V. uliginosum* which tends to be more prominent in drier situations, as on the hummocks of patterned bogs. Boreal herbs such as *Trientalis europaea* and *Andromeda polifolia* can also figure prominently, even outside the strictly Boreal zone where they benefit from the low competition that characterises this kind of acidic and impoverished habitat. In mires maintained more by the soligenous input of water, more minerotrophic plants like *Molinia caerulea* and *Juncus effusus* and poor-fen herbs like *Viola palustris* can be prominent under the tree canopy.

Where downy birch is the leading invader, the characteristic woodland type that develops here is the Betuletum pubescentis R.Tx. 1937 (=Vaccinio uliginosi-Betuletum Libbert 1932), the type association of the first alliance mentioned as included here - the Betulion pubescentis Lohm. & Tx. in Tx, *ex* Oberd. 1957. In western Europe, this vegetation is characteristic of those mires which remain wet enough to prevent the peat becoming mineralised but dry enough to sustain a cover of trees. The community has been reported from the raised bogs which survive now very locally throughout the lowlands of Germany, Belgium, The Netherlands and France and in less minerotrophic valley bogs and ungrazed poor-fens (Schwickerath 1944, LeBrun *et al.* 1949, Tüxen 1955, Westhoff & den Held 1969, Pott 1992). It characteristically has an open and somewhat decrepit birch canopy, sometimes with a little *Sorbus aucuparia* and *Frangula alnus*, and a field layer whose precise floristics reflect the kind of mire surface on which the succession is taking place. The UK W4 *Betula-Molinia* woodland is clearly of this type and can be found in the whole range of mire habitats in which birch invasion naturally occurs, though the W4c *Sphagnum* sub-community is the most strictly boggy form (Figure 30). More recently from The Netherlands, two communities, the Erico-Betuletum Hueck *ex* Tüxen (1937, de Waal *et al.* 1998) and the Carici curtae-Betuletum Stortelder *et al.* 1998 have been described as including the sort of floristic variation subsumed in the various sub-communities described from Britain (Stortelder *et al.* 1999).

Birch invasion (often also involving *B. pendula)* and the more rapid development of Quercion woodland has been widespread on drained and cut-over raised bogs (the majority) throughout the Atlantic zone but, in the drier climate of the Boreal parts of Europe, raised bogs can be found which are maintained naturally in an extensively wooded state (Matuszkiewicz 1963). These extend westwards from Poland, Brandenburg and Slovakia into Hölstein and Lower Saxony, as well as having some outposts in the pre-Alps but, increasingly to the east, it is pine and spruce which are the dominant trees in the bog woodlands rather than birch. The Vaccinio uliginosi-Pinetum is the characteristic association here, reported from Germany, Poland, the Czech and Slovak republics and Fennoscandia (Matuszkiewicz 1962, Neuhäusl 1969, 1972, Aune 1977, Vasari 1977, Dierßen & Dierßen 1984, Pott 1992). This has often sparse and ill-growing pine with some spruce and birch, a heathy understorey and, increasingly towards Fennoscandia species such as *Betula nana, Rubus chamaemorus* and *Sphagnum fuscum*. Sometimes, among these woodlands, a Ledo-Pinetum (Hueck 1929) R.Tx. 1955 has been distinguished with *Ledum palustre* as a character species. Some authorities also place these pine-dominated bog woodlands in the

second alliance mentioned under this habitat, the Ledo-Pinion Tx. 1955. Some stands included within the W18 *Pinus-Hylocomium* woodland approach the boggy character of the Vaccinio-Pinetum.

In the Boreal zone, especially on the extensive plains to the north of Finland, with the huge extent of peatlands in the distinctive aapamires, the number and total extent of such bog woodlands increases enormously on the drier peaty ridges between the flarks. Further south, at the opposite extreme of their distribution, in the mountains of central Europe, bog woodlands occur only very locally in communities like the Sphagno-Piceetum subalpinum Ellenberg & Klötzli 1972 and the Homogyno-Piceetum sphagnetosum Zukrigl 1973 (see, for example, Pignatti 1998).

cSAC designation pattern

The overall pattern of cSAC designation (Figure 31) fairly reflects the huge preponderance of sites for this habitat in Fennoscandia and its increasing scarcity in moving into the north-western lowlands of Europe. Nonetheless, the small number of UK sites initially proposed may not do justice to the proportion of stands surviving with us. Following the Kilkee Meeting, some additional sites have been proposed for this type (Appendix 4). However, the Agencies consider it would be illogical to propose areas of partially drained bog where their aims are to restore unwooded bog habitat.

The BAP perspective

Bog Woodland is a minority constituent of the very broad Wet Woodland BAP category. This is a floristically and hydrologically very diverse grouping of nearly all the vegetation covered by the NVC communities W1-W7. Drier types of W4 in the north and included in Northern Birchwoods rather than in this category and transitions from drier forms of W6 and W7 included in the Habitats Directive category to Lowland Oak and Mixed Deciduous Woodland can be problematic. The advantage of the broader BAP category is twofold: more generally, it focuses attention on the vulnerable character of much wet woodland and, more particularly, it highlights those British wet woodlands which fall outside the Habitats Directive - notably W1 *Salix-Galium*, W2 *Salix-Betula-Phragmites* and W3 *Salix-Carex rostrata* woodlands. Generic guidelines for quality and management of the group as a whole would be very misleading. Were this kind of broader approach to be adopted elsewhere in Europe, a similar very broad range of Salicion cinerea, Alnion glutinosae woodlands would be covered, including Habitats Directive priorities which are not found in the UK.

Figure 30 **Distribution of known British stands of 91D0 Bog woodland**

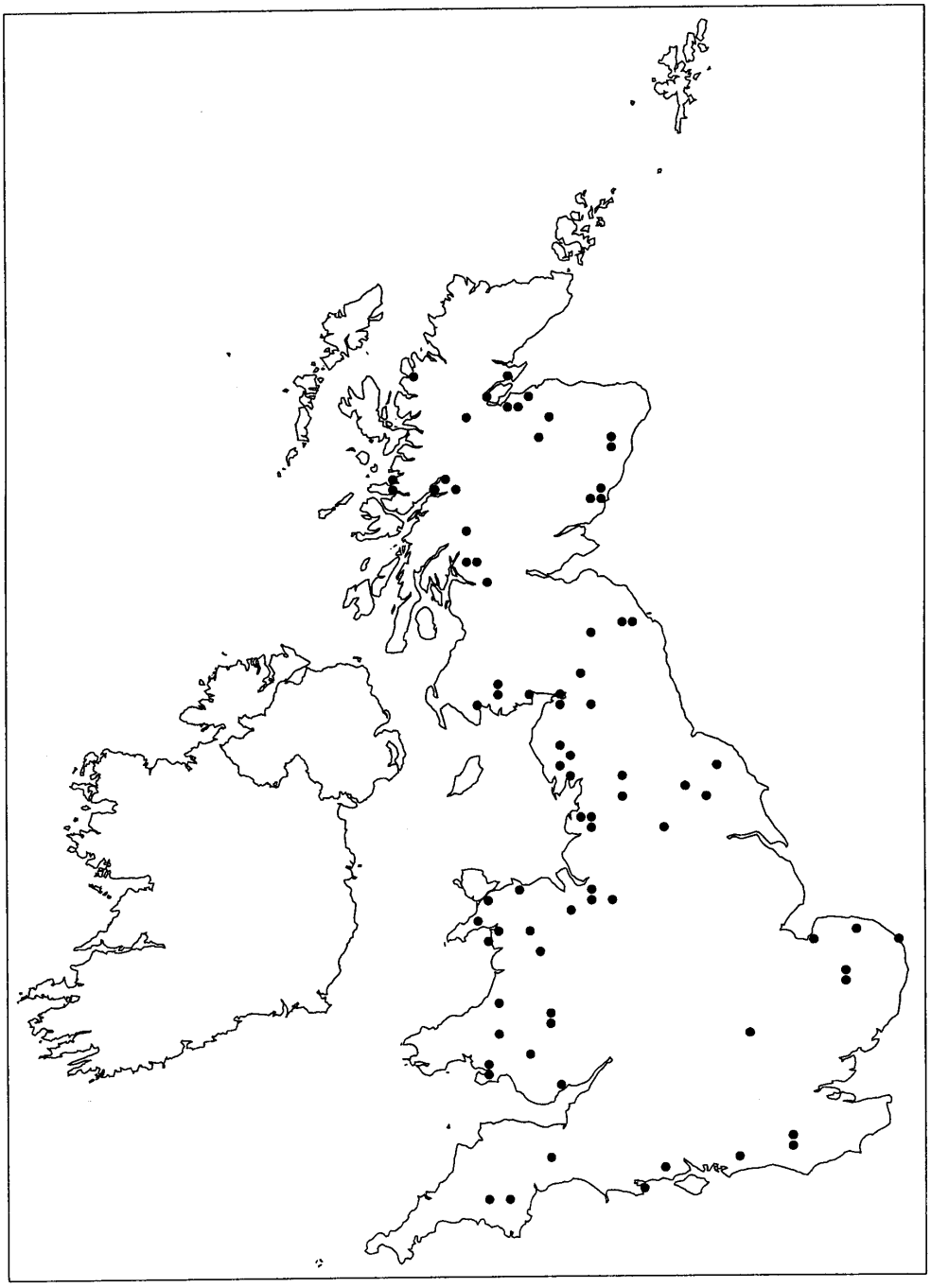


Figure 31 **Distribution of cSACs for 91D0 Bog woodland as at 1 January 2000**

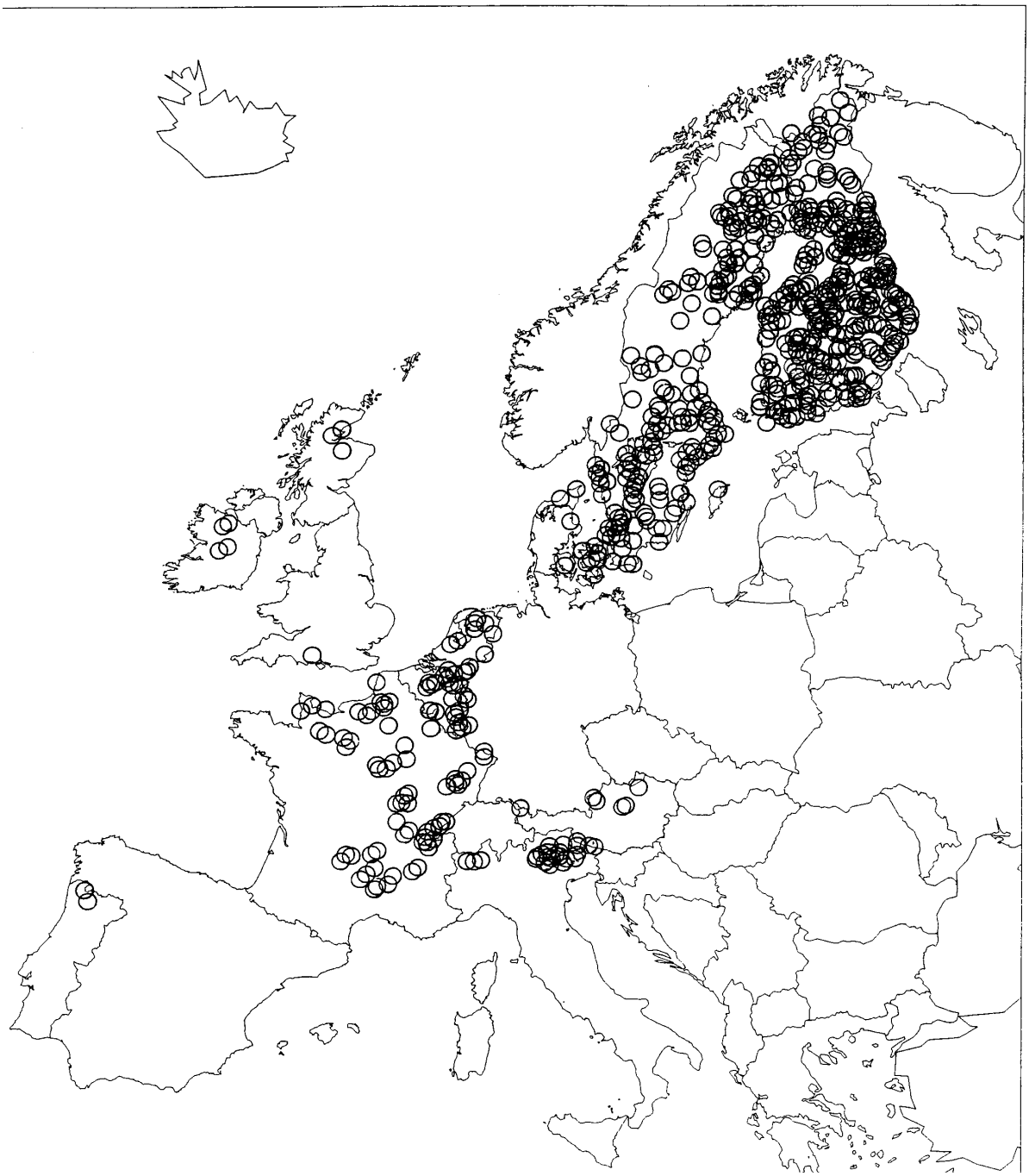
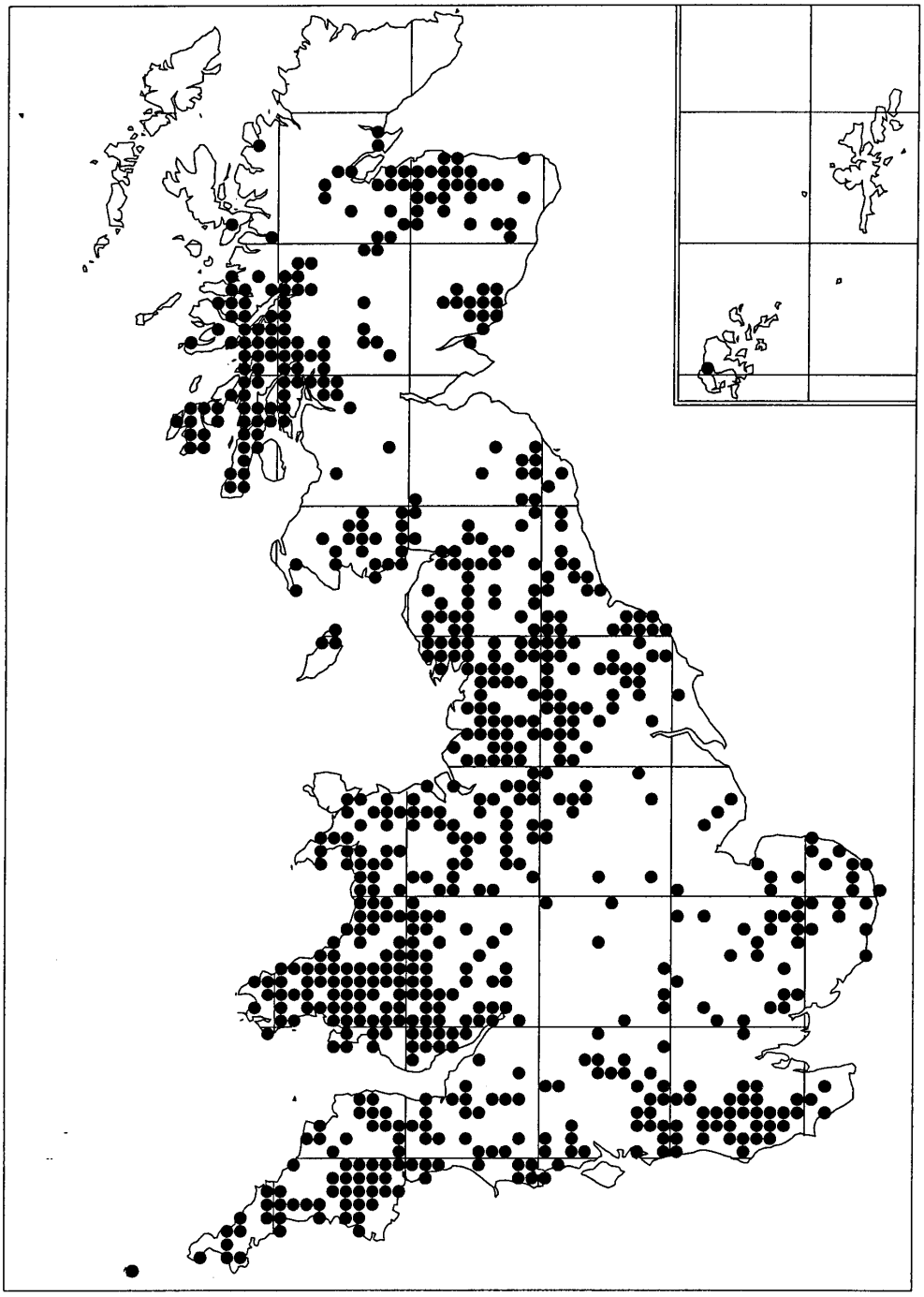


Figure 32 **Distribution of BAP Wet Woodland**



2.11 *Juniperus communis* formations on calcareous heaths or grasslands

Natura 2000 code 5130
Habitats Directive code 31.88
BAP (Priority) Habitat Scrub
NVC Community W19 *Juniperus communis-Oxalis acetosella* woodland, W21d *Crataegus-Hedera* scrub, plus various calcicolous grasslands and some heath with scattered juniper
Forestry Commission Guide Type none
Peterken Stand Type none
Vegetation Map of Europe in replacement grasslands and heaths for various forest types
EUNIS Habitat E1 Dry grasslands *p.p.*, F1.3 Temperate thickets and scrub & F4.2 Dry heaths

Summary

Juniperus communis is a local, sometimes prominent, feature of a wide variety of calcicolous grasslands and heaths through the Atlantic and Continental zones of Europe into the Boreal and Mediterranean, often reflecting episodes of forest clearance and fluctuations in pasturing. Britain has some juniper scrub which represents later stages in colonisation in situations that, as elsewhere, are very different from one another in their climate and landscape characteristics - and also a range of calcicolous grasslands (and rarely heaths) in which juniper is a sporadic occasional.

Coherence of interpretation of HD Habitat

This is a floristic-cum-structural unit that has little phytosiological coherence, but which is a recognisable landscape feature. Under the Definition and Habitats Associated, some reference to other relevant habitats, such as 6210 Semi-natural dry grasslands and 4030 Dry heaths would be helpful.

Character and significance of the UK examples in a European context

Juniperus communis ssp. *communis* is (a) a light-demanding pioneer, (b) tolerant of a wide range of climatic conditions, (c) able to colonise and perform well on soils of both low and high acidity, (d) which, when established, is not very palatable to stock and many wild herbivores and (e) is potentially long-lived. This accounts for its striking role as scattered bushes, clumps and scrub in among a wide variety of calcicolous grasslands and heaths from the Atlantic zone, through the Continental into the Boreal and into the mountains and coasts of the Mediterranean. At these warmer latitudes, it is replaced by a variety of other juniper species which form matorrals (included in habitat 5210) that are of a different character.

J. communis is therefore essentially a successional bush or small tree whose abundance is a passing event (albeit slowly passing in some cases) or a feature whose persistence is due to some arrest or regression of succession, very frequently connected with fluctuations in grazing or episodes of clearance and neglect. This, together with the suggestion of exploitation (for gunpowder charcoal, for example) may be responsible for the peculiar

variations in local or regional abundance that the plant can show (Gilbert 1980, Ellenberg 1986). In some situations regarded as a pasture weed, the striking individuality of the bushes (partly genetic) can give landscapes with juniper an extraordinary sense of place.

Towards the calcicolous extreme, *J. communis* is a common feature of a wide range of semi-arid grasslands of the Festuco-Brometea Br.-Bl. & Tx. in Br.-Bl. 1949, right across Europe. These are the equivalents of the British communities included in CG2 *Festuca-Avenula* grassland and its *Bromus erectus* and *Brachypodium pinnatum* analogues, where lime-demanding or -tolerant grasses and herbs dominate in often species-rich swards that are a replacement for Cephalanthero-Fagion beech forest or drier forms of Carpinion mixed broadleaf woodland. At more southerly latitudes in the central European mountains and Apennines, juniper shows the same pattern of behaviour among the sub-alpine calcicolous grasslands of the Elyno-Seslerietea Br.-Bl. 1948 where various *Sesleria* species are characteristic, a situation parallel to the Pennine limestone where it is locally abundant among CG9 *Sesleria-Galium* grassland.

Juniper also figures in the Koelerio-Corynephoretea swards of arid infertile sands, not always calcareous, in the more Continental parts of Europe, the kinds of grasslands whose nearest equivalents with us are the mosaics of the CG7 *Festuca-Hieracium-Thymus* and U1 *Festuca-Agrostis-Rumex* grasslands that can be seen in Breckland. On the alvar landscape of Oland off the Swedish coast, such juniper habitats are extremely striking (Dierßen 1993).

To the calcifuge extreme, *J. communis* also figures as a locally abundant occasional in a variety of lowland heaths of the Calluno-Ulicetea Br.-Bl. & Tx. *ex* Westhoff *et al.* 1946, vegetation types which are replacements for beech and oak-dominated Luzulo-Fagion and Quercion woodlands on impoverished sands right across the north European plain. This kind of situation in very rare in the lowland heaths of the UK, though juniper can sometimes be found growing a prostrate form among coastal heaths of the W7 *Calluna-Scilla* type (Coombe & Frost 1956, Hopkins 1983), good examples of this kind of habitat can be seen locally in The Netherlands and across north-west Germany (Oberdorfer 1983, Tüxen 1937, Pott 1992).

Among pastures of these kinds, juniper can provide considerable protection for more palatable woody plants which, with reduction in stocking or loss of wild herbivores, can develop into scrub of some kind or another. In The Netherlands and through Jutland into southern Norway, for example, the Roso-Juniperetum R.Tx. 1964, occurs patchily among dry sandy grasslands and heaths, with *Rosa* spp., *Berberis vulgaris* and *Cotoneaster integerimus* contributing to a low mixed canopy (Dierßen 1993, Stortelder *et al.* 1999). Such shrubs sometimes figures as garden escapes in scrub on limestone in Britain but our more usual type of vegetation with juniper is that described by Watt (1934) as the classic 'juniper sere' of our southern chalklands and included within the W21 *Crataegus-Hedera* scrub (Figure 33).

Further east in Europe, where *Pinus sylvestris* begins to rival oak as a coloniser of poor acidic soils, juniper is a common associate which, with the clearance or loss of pine, can persist among heathy landscapes. With their Boreal character, this situation resembles more closely the other British example in which juniper is abundant - among the one-time pine dominated landscapes of Scotland and the Lake District, where extensive stands of W19 *Juniperus-Oxalis* woodland occur.

cSAC designation pattern

The distribution of pSACs (Figure 34) includes some of the most striking north-west European landscapes of this type and, though British sites are relatively few, they include a reasonable area of this Habitat within the Atlantic zone. Some Member States such as Ireland have included some calcicolous grasslands with juniper within pSAC designations for orchid-rich Festuco-Brometea grasslands.

Figure 33 **Distribution of known British stands of 5130 Juniperus communis formations on calcareous heaths or grasslands**

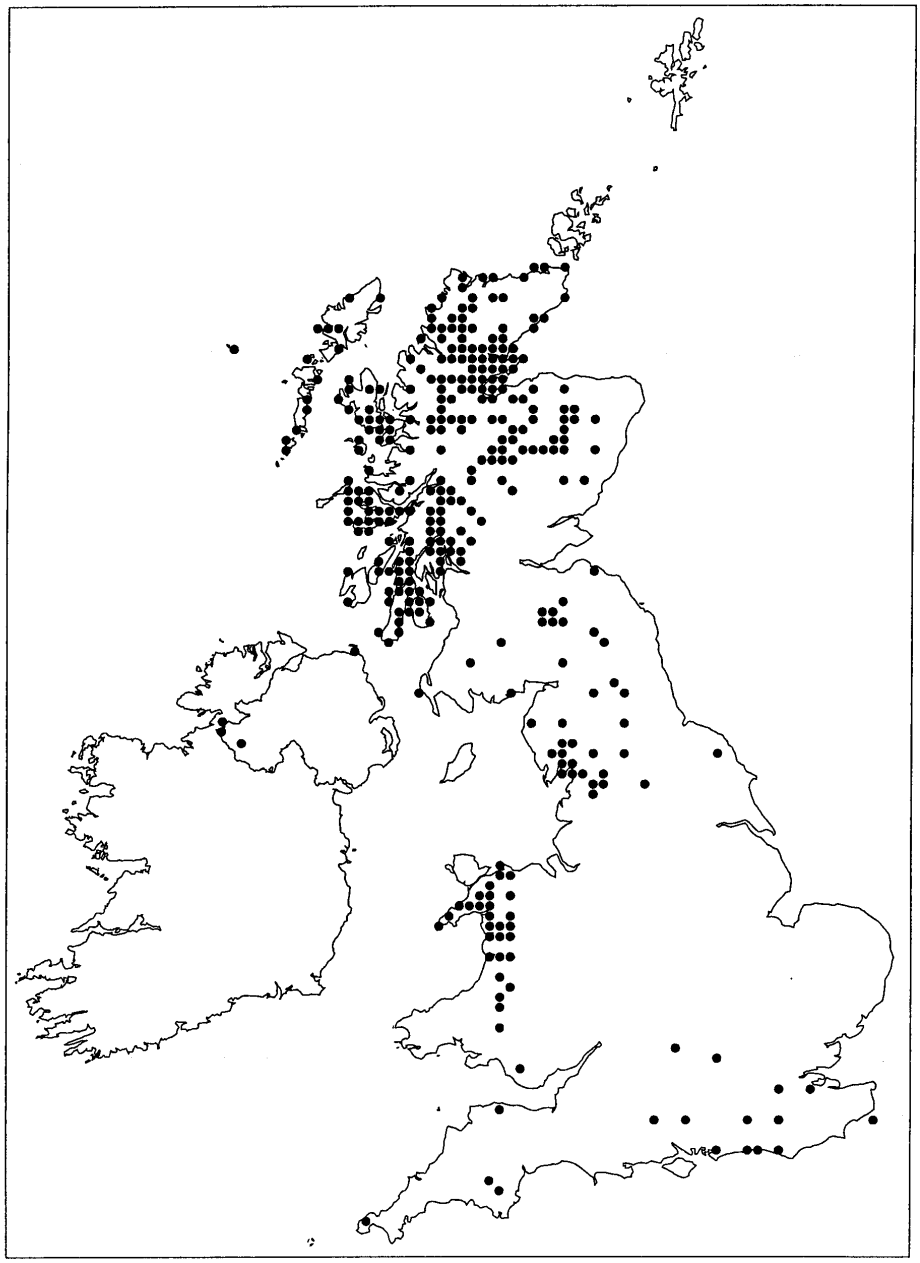
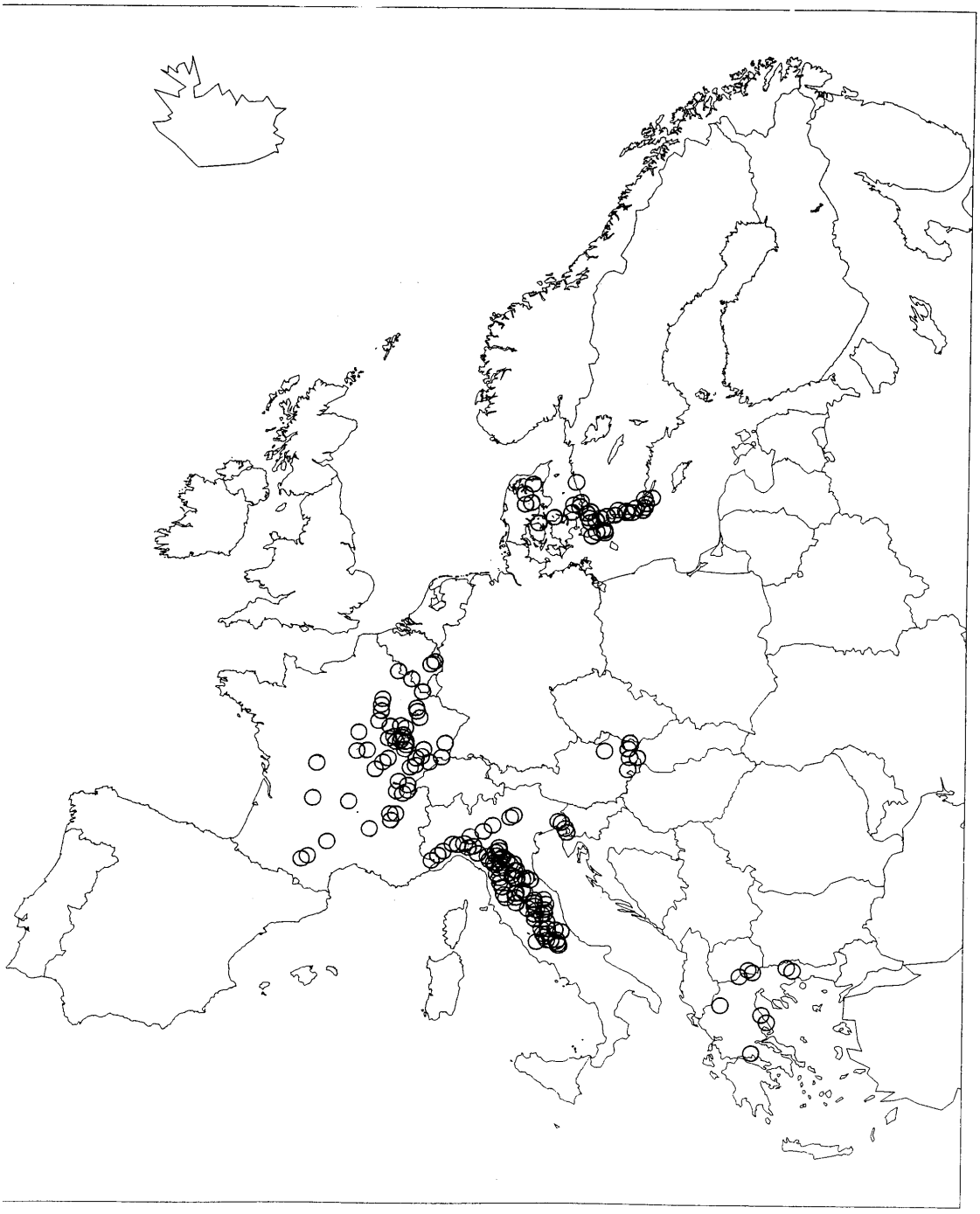


Figure 34 **Distribution of cSACs for 5130 *Juniperus communis* formations on calcareous heaths or grasslands as at 1 January 2000**



2.12 Lowland Wood-pasture and parkland

Natura 2000 code not applicable
Habitats Directive code mainly 41.12 Beech forests with *Ilex* and *Taxus* rich in epiphytes and 41.51 Old acidophilous oak woods with *Quercus robur* on sandy plains
BAP Priority Habitat
NVC Community for the wooded areas, mainly W10 *Quercus-Pteridium-Rubus* woodland, W14 *Fagus-Rubus* woodland, W15 *Fagus-Deschampsia* woodland and W16 *Quercus-Betula-Deschampsia* woodland
Forestry Commission Guide Type 1 Lowland acid beech and oak woods, 3 Lowland mixed deciduous woods
Peterken Stand Type 6C lowland birch-oakwoods, 8A Sessile oak-beechwoods, 8B Acid pedunculate oak-beech woods, 8D Acid pedunculate oak-ash-beech woods
Vegetation Map of Europe not applicable
EUNIS Habitat 84.4 Bocage & 84.5 Parkland

Interpretation of the BAP definition

Lowland wood-pasture and parkland is a vegetation structure derived from a particular management process, that is, a land-use category, and therefore it is not strictly equivalent to the other BAP Priority Habitats which are mutually exclusive land-cover types. Rather, it includes such examples of other woodland Priority Habitats (or of NVC woodlands, Peterken stand types and so on) as have been treated as wood pasture. Because of the coincidence of such treatment - or survival of stands which still carry the signs of wood-pasturing - with the distribution of particular woodland types, its effects are seen more strikingly in some of these woodlands than others. Lowland wood-pastures and parklands also often include non-woodland habitats: where there has been some continuity of use, surviving wood pastures and parklands usually have grassy, heathy or bracken-dominated vegetation in more open areas. Among the surviving trees, there may be veterans which are of as much interest for their individuality and associated biota, as because they are part of any intact woodland ecosystem. Although use by stock, for grazing and shelter, has long been a feature of upland oak and birch woods, these are not included in this category, even though their structure and conservation interest may be identical to certain lowland wood-pastures.

Character and significance of the UK examples in a European context

In the sense of Peterken (1996), wood pasture comprises woodlands which were in more or less constant use as pasturage for stock, though often also a source of timber, fuel wood and other forest products. Use (and rights, usually held in common) in such landscapes began in prehistoric times and, where sustained, had an effect on forest composition and structure. Regeneration was often problematic (and only partly circumvented by pollarding) and less palatable trees such as oak and beech gained a pre-eminence, with the more palatable members of the woody flora often surviving patchily in enclaves. Also, since wood pasture tended to be concentrated on less fertile terrain - where clearance or other silvicultural uses

were not a priority - continuous exploitation tended to soil impoverishment, further encouraging the loss of more nutrient-demanding trees and shrubs.

Since medieval times, wood pasture in the British lowlands has declined greatly in extent, remaining timber trees in surviving stretches have been harvested, pollarding has been generally abandoned and any possible successions poorly managed. Less derelict stretches of wood-pasture have often been converted to high forest, landscaped parks or public amenity areas. Though many impressive remnants survive - notably the New Forest, Staverton Park and Woodstock - the traditional wood-pastures of the UK are but a small fragment of their former extent.

Wood-pasture exploitation of similar beech and oak woodlands as survive within British landscapes of this type was very widespread in Europe in the past. Across the north-European sandy plain, timber and fuel-wood extraction and tan bark production was commonly combined with the grazing of cattle and sheep, pasturing of pigs and the harvesting of bedding material for stock or heathland sub-shrubs and grasses for manuring neighbouring arable fields. As with us, the survival of these kinds of landscapes is patchy. In Germany, military use protects the Luneberger Heide, while in the Netherlands, the Hoch Weluwe is an amenity and nature protection area. In Denmark, remnants of forest-heath transition of this type also persist in Jutland (Lawesson 2000). In Finland, *metsälaidun* and *haka*, previously held in common for spring-autumn grazing of cattle and sheep some distance from the settlements, have largely fallen into disuse but some sites are being restored for nature management. Here abandoned areas have progressed to birch, though in Denmark, a resurgence of oak is striking (Nielsen 1982) and, in Germany, beech. In the intensively agricultural landscape of northern France, wood-pasture scarcely survives and the ancient parklands of the aristocracy became doma forests at the Revolution, managed for timber by the department or the national government, though often preserving common rights of timber extraction and hunting.

Further south in Europe, in the German pre-Alps, around 70,000 hectares of *Waldweide* remain, forests which were previously grazed by cattle or, where oak was more important than beech, by pigs. In the corresponding landscape in Italy, at the altitudinal transition from the Carpinion to the Fagion, there are still open grasslands with scattered oak, beech and maple which are grazed by sheep. In the Appenines, wood-pastures also remain an important source of grazing for animals moved each year along the *tratturi* or transhumance routes to the alpine pastures. With the shift to the Mediterranean zone, there are some striking traditional kinds of wood-pasture where essentially the same kind of management is applied but in very different ecological and cultural contexts - such as the Algarve cork-oak *dehesa* and their equivalents in Spain and Sardinia, and the oak pastures of Apulia and the Tyrrhenian coast of Italy where *mozzarella* oxen graze.

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