SELECTION OF SALT-MARSH SITES FOR THE EUROPEAN NETWORK OF BIOGENETIC RESERVES

K.S. Dijkema

Report to the European Committee for the Conservation of Nature and Natural Resources, Council of Europe (contract 72/86)

RIN-report 87/9
Research Institute for Nature Management
Texel, The Netherlands

1987

CONTENTS

PREFACE

Salt marshes occur as a transitional belt between land and sea. Plant and animal life in this zone are highly specialized and the flora and invertebrate fauna species are exclusively found in these saline environments. In an earlier report a group of consultants of the Council of Europe concluded that so many areas of salt marshes have disappeared that all remaining sites are in urgent need of protection.

This report is the result of a request from the Council of Europe to the Research Institute for Nature Management, Texel, The Netherlands, to produce a list of salt-marsh sites for inclusion in the European Network of Biogenetic Reserves. The Research Institute for Nature Management is responsible for the list of sites in this report. The Council of Europe should develop this proposal into conservation of the remaining salt-marsh sites in Europe.

It was not possible to do this work without the cooperation of the experts mentioned in Appendix 1. Their help is greatly appreciated.

The Directors

1. SUMMARY

In 'Salt marshes in Europe' the Council of Europe has published a list of more than 600 salt-marsh sites. An important conclusion is that to maintain the complete range of halophytic flora and fauna and to ensure the dispersal of halophytic species, all these remaining salt-marsh sites are in urgent need of protection. In this report ca. 175 sites will be proposed to be included in the 'European network of biogenetic reserves'. All other sites should be protected on a national, regional or local scale.

2. INTRODUCTION

Salt marshes and salt steppes include (semi-)natural pioneer grassland and dwarf shrub communities, which are exclusively bound to these halophytic ecosystems. Coastal salt marshes and salt steppes occur on alluvial sediments or on peat, within the reach of tidally or seasonally fluctuating sea water. Inland salt marshes or salt steppes are associated with a saline or alkaline soil.

The vegetation of salt marshes and salt steppes has a similar appearance throughout the world (except for tropical mangrove swamps) caused by the abiotic factor salinity. The vegetation is characterized by its tolerance of the saline conditions and consists of halophytes. The resemblance in the vegetation can be seen in the adaptation to the extreme environment (succulence, dull foliage, small-leaf or grass type, etc.) and in the occurrence of the same genera and even species of plants (Chapman 1960). The halophytic flora is poor in species and mainly consists of perennial grasses, rushes, (dwarf-) shrub and some annuals (Salicornia, Suaeda), which are exclusively found in these saline environments. The halophytic invertebrate fauna (mainly insects) has a comparable high specialization and a species number ten times as large. Salt marshes are good biotopes for breeding, feeding and roosting birds, many of them migratory.

The Council of Europe has published a report 'Salt marshes in Europe' (by K.S. Dijkema, W.G. Beeftink, J.P. Doody, J.M. Gèhu, B. Heydemann & S. Rivas Martinez, 1984). In that report, a list and a map of more than 600 salt-marsh sites were published, including some precious information on each site (Table 2, pages 42-68). An important conclusion is that to maintain the complete range of halophytic flora and fauna and to ensure the dispersal of halophytic species, all these remaining salt-marsh sites are in urgent need of protection. An initial proposal of the sites to be included in the 'European network of biogenetic reserves' has been done (Table 15, pages 146-149). All other sites must be protected on a national, regional or local scale.

The Council of Europe Environment and Natural Resources Division has asked the Research Institute for Nature Management on Texel, The Netherlands, to bring up to date this proposal of sites for the European

network of biogenetic reserves, to collect some additional data on these sites and to formulate the motives for their designation. It was not possible to do this work without local knowledge. Therefore, the cooperation of ca. 40 experts throughout Europe has been asked and obtained (Appendix 1).

3. SIGNIFICANCE FOR NATURE CONSERVATION

In former times salt marshes as a transitional belt between the sea and terrestrial habitats must have been very extensive and provided a continuous landscape at least along flat coasts of the sedimentary or deltaic type. Large areas of salt marsh have been reclaimed first for agriculture, later on for other uses connected with urbanization. In order to maintain the complete range of halophytic flora and fauna and to ensure dispersal of halophytic species, all remaining coastal and inland sites are in urgent need of protection (Dijkema et al. 1984). Sites to be included in the European network of biogenetic reserves are proposed in chapter 5. The other sites must be protected on a national, regional or local scale. Salt-marsh conservation may go hand in hand with several forms of traditional land use.

Arguments for conservation of salt marshes and salt steppes are:

1. Salt marshes and salt steppes are natural or semi-natural areas. The plant and animal communities are mainly determined by hydrographical and geomorphological features and ecological processes. Such areas are irreplaceable for scientific research, education and outdoor recreation.
2. The flora and invertebrate fauna consist mainly of halophytic species, which are highly specialized organisms, exclusively bound to saline habitats. Disappearance of these habitats will mean the loss of the genetic resource.
3. Isolated salt marsh and salt steppe areas (e.g. arctic islands, Gulf of Bothnia, northern Adriatic, inland saline areas of western, central and eastern Europe) have a special conservation value, because of their potential for genetic deviation and the fact that they can aid in halophyte dispersal (Beeftink 1984).
4. Salt marshes provide resting, breeding and feeding grounds for

important numbers of birds. Many of these birds are migratory. Examples include birds visiting the Wadden Sea which breed in a large area in arctic and subarctic Europe, Asia and North America (Smit & Wolff 1981).

5. Salt marshes import silt and organic matter from the estuarine system. Dankers et al. (1984) found an import of 143 tons per ha per year for the Dollard. The silt will be incorporated into the salt marsh sediment and the organic matter mineralised.
6. Salt marshes are important in coastal defence, absorbing energy from waves, especially during storm surges.

4. PRINCIPLES FOR SELECTION

Dijkema et al. (1984) state that all 600 sites listed in their Table 2 are important for nature conservation. Here proposals are made for a selection of the sites to be included in the European network of biogenetic reserves. It is recommended that an integrated conservation and management program for salt marshes, intertidal areas and adjacent terrestrial landscape (e.g. sand dunes) should be aimed at. Such complete systems can be found e.g. in some brackish sites near Oulu in Finland, in the Danish-German-Dutch Wadden Sea, along the North Norfolk coast in Great Britain, perhaps in some sites in Portugal, in Andalucia in Spain, in the Camargue in France, and in the Evros Delta at the Greek-Turkish border.

Principles for selection are found in the Council of Europe resolution (76) 17. The important ones are discussed below:

1. Area

The size of biogenetic reserve is not subject to any limit. However, the long term viability of habitats, biocenoses and ecosystems should be ensured. This may be fulfilled either by large areas, or a larger number of small sites. Beeftink (1984) proposes an area of at least 10-20 km^2 to maintain reproduction and survival of the complete range of plants and animals. As hardly any such sites are left, all larger sites (e.g. larger than 5 km^2) will be proposed for the European network of biogenetic reserves. Nevertheless, smaller sites are necessary too: for maintaining the complete variety of geomorphological and biogeographical types (Fig.

1 and 2) and, even more important, to ensure dispersal of halophytic flora and invertebrate fauna species by acting as stepping stones. For example, studies of the dispersal of seeds of halophytic plants (Beeftink in prep.) reveal that genetic exchange between different sites and colonization of new sites may take place over tens of kilometers.

2. Number of sites

Several habitats, biocenoses or ecosystems of each type should be designated for the biogenetic network. Together with the demand for dispersion of species, this will result in a long list of sites for the biogenetic network.

3. Naturalness

The habitat must be natural and not seriously disturbed. The habitat may have been altered by man to some extent. Management for conservation or restoration purposes is possible.

4. Characteristics

At least one of the following characteristics should be present:

a. Typical flora and fauna species of a given region, country or (part of) Europe. They may be widespread regionally or nationally, but rare elsewhere in Europe, or the reverse. In this report, a complete zonation and gradual transitions to other natural ecosystems are important, amongst others.

b. Endangered ecosystems for one country, but not necessarily for another one.

c. Unique ecosystems with respect to limited distribution (e.g. rare transitions to other natural landscapes), biogeographical factors etc. Examples from areas where genetic speciation or isolation may occur are quoted from Beeftink (1984):

   - Speciation, and in general genetic drift, appears to be encouraged in areas rich in environmental gradients and in zones where species from different phytogeographic regions meet. In the first, many species may approach the limit of their distribution range. Those areas are thus mostly relatively rich in taxa too. For the European coasts such areas are northern Norway and surroundings, the coast around the Skagerrak and related parts of northern Great Britain, the west coast of France and the south, southeast and

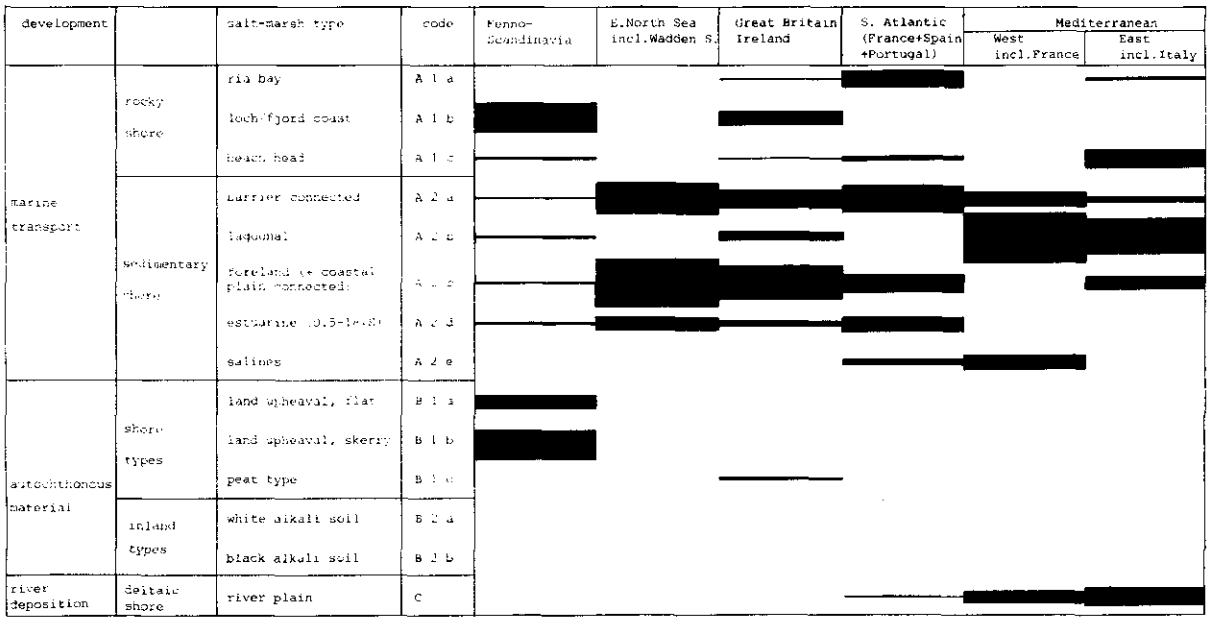

Fig. 1 Salt-marsh biotopes on a geomorphological base. For the coastal salt marshes the proportional distribution of sites per region is shown, based on site numbers. After Dijkema (1984).

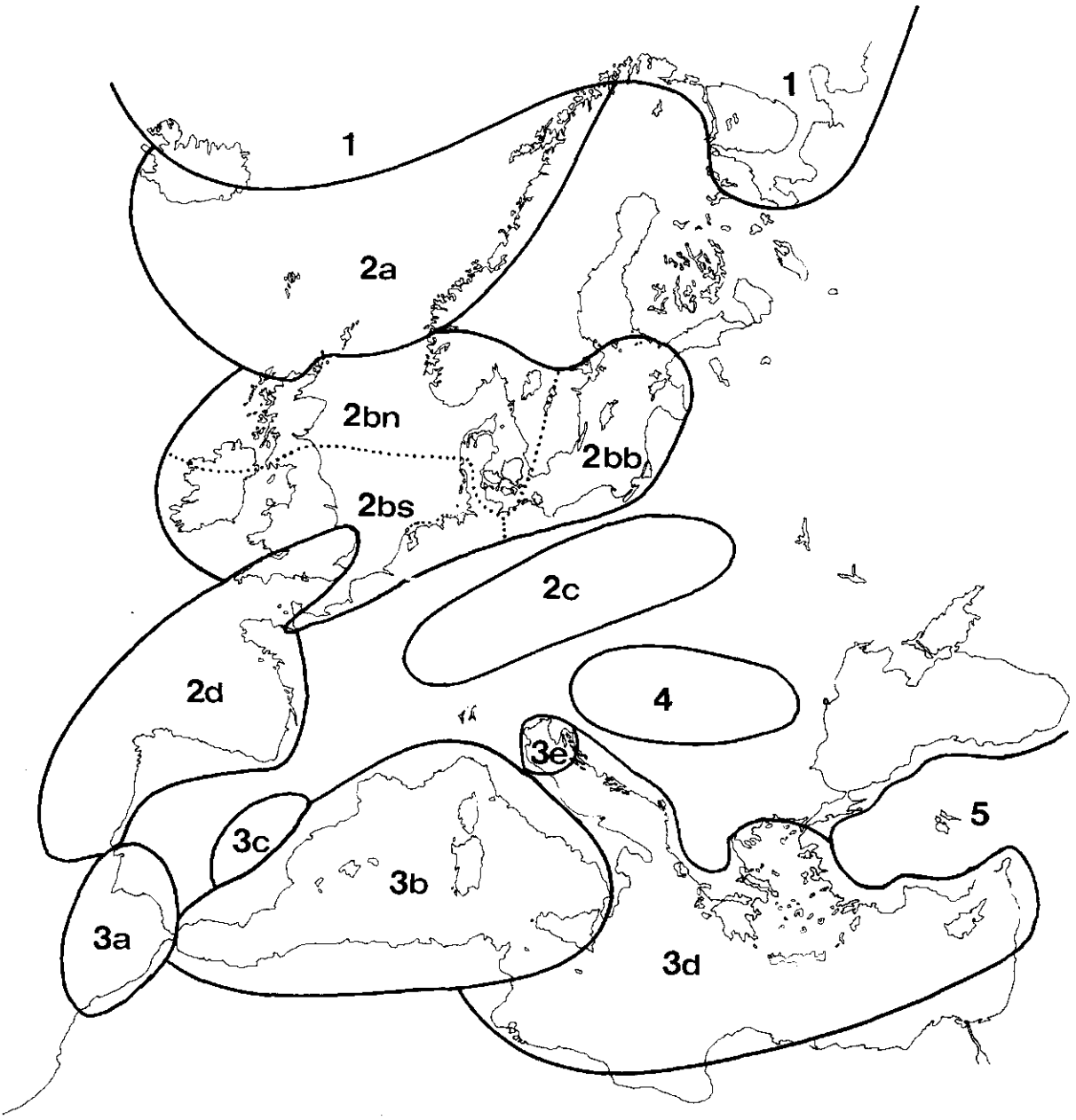

Fig. 2 Map of European biogeographical units: salt marshes. After Géhu & Rivas Martinez (1984).

1. Arctic region
2. The Euro Siberian region
   a. Boreo Atlantic sub-zone
   b. North Atlantic-Baltic sub-zone
   c. Sub-Atlantic sub-zone
   d. Cantabro-Atlantic sub-zone
3. The Mediterranean region
   a. The Mediterranean-Atlantic sub-zone
   b. Mediterranean-Tyrrhenian sub-zone
   c. Inland Iberian sub-zone
   d. Eastern Mediterranean sub-zone
   e. The special zone of the Northern Adriatic
4. The Pontic region
5. The Irano-Turanian region

southwest coasts of Great Britain and Ireland, and the west and south coasts of Portugal. Meeting zones between halophytic floras and different phytogeographic regions (fig. 2) are found along the Portuguese coasts (Eurosiberian-Mediterranean), and in the Hungarian (Pannonic) and Rumanian inland salines (Euro/Siberian-Mediterranean -Irano/Turanic elements; Wendelberger 1950). All these areas need special attention when halophyte conservation is considered.

- Halophyte vegetation, whether isolated geographically, ecologically or genetically (Stace 1980), also has a special conservation value, because of its potential genetic deviation. Examples are the coasts of the Bothnian Gulf and of the North Adriatic Sea (lagoons of Venice and surroundings), islands off the European coasts, such as Iceland, Greenland and various arctic islands, and isolated salt-marsh and rock formations on the mainland and in Great Britain and Ireland, especially if they have rare edaphic conditions.
- Special attention should also be given to the isolated salines of west, central and east Europe. These are supposed to be important as stepping stones in halophytic dispersal from the eastern salt steppes towards the south Baltic and Atlantic Ocean coasts (Wendelberger 1950). An example is the annual chenopod Halimione pedunculata. These mostly very restricted saline areas are seriously threatened by different forms of modern land use.

5. SELECTION OF SITES

Starting point for the selection was the inventory of 600 sites in Dijkema et al. (1984). With the help of ca. 40 regional experts ca. 170 sites of European importance have been selected for the European network of biogenetic reserves, taking into account the principles of chapter 4. In addition, the information from the inventory has been brought up to date and additional data collected for the descriptive card for each selected site. The results are presented in Table 1 and Appendix 2.

Some comments on the selection will be made following the principles from chapter 4:

Area and number of sites

Almost all sites larger than 5 km^2 have been selected, which means 79 (about half of the) sites in Table 1. Including 90 smaller sites ensures a good representation of all geomorphological (Fig. 1) and biogeographical (Fig. 2) types on a European scale. In order to maintain the complete range of halophytic flora and fauna and to ensure dispersal of halophytic species, all remaining salt marshes are in urgent need of protection. That is a task on national, regional or local scale, however.

Naturalness

The majority of the selected sites (Table 1) are natural or near to natural ecosystems. Some less natural systems have been included, which have high actual vegetation values or possibilities for restoration.

Characteristics

Most of the selected sites (Table 1) have a complete vegetation zonation. When not, there are important features to be included in the list such as a large area, possibilities for restoration or unique features. Unspoiled transitions to other natural ecosystems such as shingle, sand dunes, heath, bog, fen and woodland are extremely important characteristics (Appendix 2). That is one of the reasons to aim at an integrated conservation and management program for salt marshes, intertidal areas and adjacent terrestrial landscapes. Important threats may be a reason as well for inclusion in the list. This is especially true for southern Europe including France (Dijkema et al. 1985). Sites with unique features have been included as far as these characteristics are known (chapter 4, point 4c). In this respect the inland salt marshes and salt steppes of west, central and eastern Europe are important (Beeftink 1984). However, due to lack of information they have not been included into the list.

For some countries data are lacking (Greenland, Turkey) or in preparation (Iceland, Ireland, Spain east coast, Greece). In other countries very thorough inventories of salt marshes have been carried out, focussed on nature conservation purposes (e.g. Norway, Great Britain, Wadden Sea of Denmark, Germany and The Netherlands, western France). Finally it should be stressed that the proposals in this report are the responsibility of the Research Institute for Nature Management, supported by the regional experts (Appendix 1).

Table 1. Selection of salt-marsh sites for the European network of biogenetic reserves. Data on the sites are taken from "Salt marshes in Europe" (Dijkema et al. 1984, pages 42-68). The number of the site corresponds with the attached outline map in "Salt marshes in Europe". The geomorphological types are explained in Fig. 1.

Degree of naturalness:
1 = natural salt marsh, unspoiled biotope, grazed marshes included
2 = near to natural salt marsh, primary biotope changed by e.g. field drains, excavations
3 = artificially created salt marsh or salines; or biotope changed by many excavations, summer dykes, rubbish dumping, oil pollution

Vegetation:
1 = complete series of salt marsh communities (e.g. including gradual transitions to other natural landscapes or representing an estuarine gradient) or well-developed salt marshes which may adjoin artificial landward boundaries (e.g. embankments)
2 = salt-marsh communities incomplete or without transitions towards adjacent natural ecosystems
3 = potential salt-marsh communities, e.g. salt marshes disturbed by summer dykes or oil pollution

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conservation
	FINLAND					
1-1	Krunnit archipelago	0.6	Blb	1	1	reserve
1-7	Sannanlathi	8	Bla	2	1	no
1-8	Siikajoki	4	Bla	1	1	part res.
	SWEDEN					
4-3	Kage	0.2	Bla	1	1	no
5-1	Tullgarnsnäset	0.1	Bla	1	1	reserve

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conserv.
6-2	Foteviken	6	A2c	2	1	part res.
7-3	Valda Sandö	0.3	B1b	1	1	reserve
	ICELAND					
9-1	Faxaflði		A2?	1	1	no
9-?	_____	?	A1b	?	?	?
9-?	_____	?	A2d	?	?	?
	NORWAY					
12-3	Neiden-Munkelv	1.5	A1b	1	1	in prep.
12-6	Tana estuary	2.0	A2d	1	1	in prep.
12-12	Stabbursnes area	2	A1b+B1a	1	1	reserve
13-1	Reisaosen	1.3	A1b+A2d	1	1	in prep.
13-4	Sørlenangsbotn	1.0	A1b	1	1	in prep.
14-1	Risøysund	1.5	B1a+B1b	1	1	in prep.
14-2	Strengelvag-Gisløya	2.0	B1a	1	1	in prep.
14-8	Seines	0.5	B1a	2	1	in prep.
14-21	Beiarosen	1.0	A1b	1	1	in prep.
15-9	Skeineset-Leknesøyene	3.3	B1b?	1	1	reserve
15-10	Kjønsøyhopen	0.3	B1b?	1	1	reserve
15-4	Rinnleiret	1.2	A1b+A2d	2	1	reserve
15-11	Vaeret	5.0	B1b?	2	1	landsc. res.
15-1	Gaulosen	0.4	A1b+A2d	1	1	reserve
15-12	Sandblastvagen/ Gaustadvagen	1.5	B1a	1	1	in prep.
15-13	Hensøran	0.1	A1b+A2d	1	1	in prep.
16-6	Ulvikpollen, Ulvik	0.1	A1b	2	1	in prep.
16-7	Leira, Huglo	0.3	B1b	1	2	in prep.
16-8	Børaunen, Randaberg	1.5	B1b	1	2	landsc. res.
16-9	Haga, Sola	0.4	B1b	2	1	no
16-10	Brusanden, Ha	2.5	A2d	1	2	landsc. res.

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conserv.
18-1	Bokerøya, Svelvik	0.3	A1b	1	1	reserve
	DENMARK					
19-2	Nyord	8	A2?	1	1	reserve
19-6	Saltholm	(16)	A2?	1	1	reserve
20-11 ?	Stavns Fjord	(15)	A2?	1	1	reserve
21-2	Rønnerne, Laesö	(15)	B1a	1	1	reserve
23-2	Tipperne	(35)	A2b	2	1	reserve
25-1+2	Skallingen+Langli	21.8	A2a	1	1	reserve
25-7	Rømø Stranden	15	A2a	1	1	no
25-10+11	Darum - Astrup	14	A2c	1+2	2	no
	FEDERAL REPUBLIC OF GERMANY					
24-2	Graswarder	0.7	A2a+B1c	1	1	reserve
26-3	Föhr North	0.6	A2c	1	1	reserve
26-7	Halligen Gröde	2.8	A2c	1+3	1	landscape res.
26-8	Hallig Nordstrandischmoor	1.8	A2c	2	1	landscape res.
26-14+15	Hamburger Hallig +Sonke Nissen- + Cecilienkoog	7.5	A2c	2+3	2	national park
26-10	Hallig Südfall	0.6	A2c	1	1	national park
26-18 } 26-19 }	Westerheversand Tumlauer Bucht	6.0	A2c	2+3	1	national park + reserve
26-20	St. Peter	4.9	A2a	1	1	part nat.park
26-22	Dieksand-Neufeld	10.3	A2c+d	2+3	1	part nat.park
28-2	Spieka-Arensch	14.5	A2c	1+2+3	2+3	national park
28-6	Jadebusen	18.0	A2c	2	1+2	national park
28-7	Mellum	6.7	A2a	1	1	national park
28-8	Wangerooge	2.0	A2a	1	1	national park
28-9	Spiekeroog	5.0	A2a	1	1	national park
28-13	Norderney East	4.0	A2a	1+2	1	national park

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conserv.
28-18	Elisabethaussengr.	5.0	A2c	2	1	national park
28-22	Leybucht	8.0	A2c	3	2	national park
28-24	Dollard	4.9	A2d	2+3	1	?
	THE NETHERLANDS					
29-1+2	Dollard+Punt v.Reide	9.8	A2d	2	1	reserve
29-3	Julianapolder	2.5	A2c	3	1	reserve
29-5	Het Bildt	3.5	A2c	3	2	reserve
29-9	Schiermonnikoog East	5.5	A2a	1	1	reserve
29-12+13	Terschelling East	16.0	A2a	1	1	reserve
29-14	Texel Schorren	0.6	A2c	1	2	reserve
29-15	Texel Slufter	3.0	A2a	1	1	reserve
30-1	Kwade Hoek	1.7	A2a	1	1	reserve
30-all sites	Oosterschelde	6.0	A2c	1+2	2	in prep.
30-7	Saeftinge	23.0	A2d	1	1	reserve
30-11	Zwin	0.6	A2a	1	1	reserve
	BELGIUM					
31-1	Het Zwin	1.3	A2a	2	1	reserve
	GREAT BRITAIN					
32-2	Wash	44.6	A2c	1	2	part res.
32-4	North Norfolk	20.2	A2a+c	1	1	reserve
32-7	Hamford Water	8.6	A2c	1	2	part res.
32-8	Blackwater flats [and marshes	11.0	A2c(+a)	1	2	part res., SSSI*
32-9	Foulness	5.9	A2a+c	1	1	SSSI
32-12	Medway Estuary	7.5	A2c	1	2	SSSI
32-13	Swale Estuary	4.1	A2c	2	2	part res., SSSI

* SSSI = Sites of Special Scientific Interest

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conserv.
32-14	Chichester Harbour	10.8	A2b	1	2	part res., SSSI
32-17	North Solent	11.7	A2d	1	1	part res., SSSI
33-1	Poole Harbour	7.0	A2b	2	2	SSSI
33-5	Fal-Ruan Estuaries	0.9	A1a	1	1	SSSI
33-7	Bridgewater Bay	4.9	A2a	1	2	reserve
33-8	Severn Estuary	8.9	A2c	1	2	proposed SSSI
34-1	Bury Inlet	21.2	A2c	1	1	part res., SSSI
34-2	Tywyn Gwendraeth	5.8	A2a	1	1	SSSI
34-5	Traeth Bach	3.5	A2c	1	1	part res.
34-7	Dee Estuary	21.1	A2d	1	2	part res., part SSSI
34-9	Ribble Estuary	19.1	A2c	1	2	part res., SSSI
34-10	Morecambe Bay	17.5	A2c	1	2	part res., SSSI
34-11	Walney Island	2.9	A2a	1	1	part SSSI
34-14	Inner Solway (incl. Southerness Pt to Noricamb)	42.1	A2c	1	1	part res., SSSI
36-2	Ruel Estuary	6.6	A1b	1	1	SSSI
36-3	Moine Mhor	0.5	A2c	1	1	SSSI
36-5	Loch Gruinart + Loch Indaal	0.9	A1b	1	1	SSSI
36-7	Loch Nevis	0.5	A1b	1	1	no
36-9	Loch Carron	0.7	A1b	1	1	no
36-12	Baleshare	0.9	A2a	1	1	SSSI
36-13	Northton	0.4	A2c	1	1	SSSI
36-16	Morrich More	2.5	A2a	1	1	SSSI
36-21	Culbin Sands	3.0	A2a+d	1	1	part res.
36-24	Tay Estuary	8.0	A2d	2	2	SSSI
36-26	Buddo Ness	0.1	A1c	1	1	SSSI
	IRELAND					
37-?	_____	?	?	?	?	?
38-1	Lady's Island Lake	?	?	?	?	?

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conserv.
39-5	Tralee Bay	(9.5)	A2a+d	1	1	no
39-9	Fergus Estuary	(6.5)	A2c+d	2	1	no
39-16	Dooughtry area	?	?	?	?	?
39-21	Ballysadare Bay	(15.0)	A2c	1	2	part res.
39-32	Lough Swilly	?	?	1	2	no
	FRANCE					
40-2	Le Fort Vert	1	A2a	3	2	in prep.
40-4	Estuaire de la Canche	2.0	A2a+d	1+3	1	in prep.
40-5	Baie d'Authie	2.5	A2c+a	1+3	1	no
40-6	Baie de la Somme	8.5	A2c+a	1+3	1	no
40-8	Le Grand Vey	10	A2c(+a)	2	2	no
40-14	Havre de St-German	6	A2a	1	1	no
40-17	Havre de Regneville	6	A2a+d	1	1	no
40-18	Havre de Bréhal	2.5	A2a	1	1	no
40-20+21	Baie du Mt.St.Michel	33	A2c	1	1	no
41-4	Estuaire l'Islet	0.5	A2a+d	1	1	no
41-7	Anse de Lanneros	1	A1c	1	1	in prep.
41-10	Anse de Kernic	2	A2a	1	1	no
41-13	Vervian +					
14	Anse de Pontfort +					
15	Kerzanton +	10	A1a	2	1	no
16	Le Faou +					
17	Pont de Buis					
41-19	Ile Chevalier	3	A1a	2	1	no
41-21	Rivière d'Etel	4	A1a	1+3	1	no
41-23	Golfe du Morbihan	3	A1a+A2e	2	1	no
41-27	Pointe d'Arcay	2	A2a	1	1	reserve
41-32	Lège-Arès		A2c	1	2	
33	Le Claovey		A2a	2	1	
34	Ile aux Oiseaux	7	A2a	1	1	no
35	Gujan-Mestras		A2c	2	2	

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conserv.
48-2	Etang de Canet-St. Nazaire	(15)	A2b	1	1	proposed res.
48-4	Etang de Salses-Leucate	(60)	A2b	2	1	proposed res.
48-6	Etang de Bages-Sigean	(65)	A2b	2	1	in prep.
48-10	Espiguette	(29)	A2b	1	1	classed zone
48-11 to 13	Camargue	(650)	C+A2b	1+2	1	parc + res.
50-1	Etang de Biguglia	(16)	A2b	?	?	?
	PORTUGAL					
44-5	Ria de Aveiro	20	A2a+c	2	1	no
44-7	Tejo	13	A2d+e	2	1	part res.
44-8	Sado	20	A2a+d+e	2	1	part res.
44-13	Faro	48	A2a	1	1	Natural park
44-14	Castro Marim	10	A2a+e	2	1	reserve
	SPAIN					
42-3	San Vincente de la Barqura	10	A2d	3	1	no
42-11	Rias de Santona, Treto, Limpias y Colindres	20	A1a	1+2+3	1	no
43-10	Laguna de Frouxeira	2	A2b	2	1	?
45-1	Rio Guadiana	35	A2d+a	1	1	no
45-1	Ria Carreras	10	A2d+a	2	1	no
45-2	Rio Pedras	30	A2d+a	1	1	no
45-3	Rio Odiel	50	A2d+a	1	1	parc + res.
45-4	Rio Tinto	30	A2d+a	1	1	no
45-5	Doñana	33(400)	C+A2a	1	1	parc + res.

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conserv.
45-11	Salinas de [Torrevieja	?	A2e	?	?	?
45-12	Salinas de Sa. Pola	?	A2e	?	?	?
46-1	L'Horta	?	A2b?	?	1	?
46-2	Camp de Morvedre	1	A2b	?	1	no
47-1	Formentera	40	A2b+e	1	?	no
61-2	El Salobral	1.0	B2a	1	1	reserve
61-4	Gallocanta	4	B2?	1	1	reserve
61-5	Villafafila	10	B2?	1	1	?
	ITALY					
51-5	Lagune di Orbatello	36	A2b	2	1	?
52-3	Stagnone + Mozia	10	A2b	2	2	hydrogeological
53-5	Stagni di Posada	4.4	A2b	1	2	no
53-7	Stagni di S Teodro	(5)	A2b	1	1	no
53-8	Stagni di Olbia	1.0	A2b	2	2	landsc. res.
53-11	Stagno di Cagliari	53.0	A2b	2	2	landsc. res.
53-12	Stagni di Oristano	9.0	A2b	2	2	landsc. res.
54-4	Venice Laguna Nord	35.0	A2b	1	1	hydrogeological
54-4	Venice Laguna Sud	(35)	A2b	1	2	hydrogeological
54-5	Laguna di Grado	(53)	A2b	1	2	hydrogeological
54-11	Sacca di Goro	(10)	C	1	2	hydrogeological
	GREECE					
56-1	Arta-Bight	c. 5	C	2	?	Ramsar site
56-2	Mesolongi Lagoons	?	C+A2b	?	?	Ramsar site
56-3	Gulf of Thessaloniki	c. 6	C	2	1	Ramsar site
56-4	Nestos Delta	?	C(A2b)	2	1	Ramsar site
56-5	Porto Lagos + Vistonis lake	?	C+A2b+A2d	2	1+2	Ramsar site
56-6	Evros Delta	35	C+ A2b	2	1	Ramsar site

number	site	area in km2	geom. type	natural-ness	vegeta-tion	nature conserv.
	TURKEY					
62-?	_____	?	?	?	?	?

REFERENCES

Beeftink, W.G. 1984. Geography of European halophytes. In: K.S. Dijkema (ed.) et al. Salt marshes in Europe. Council of Europe, Strasbourg. 15-33.

Beeftink, W.G. in prep. De betekenis van de faktor getij voor de schorvegetatie in zuid-west Nederland. In: Oecologie van estuariene vegetatie.

Chapman, V.J. 1960. Salt marshes and salt deserts of the world. Leonard Hill, London. 392 p.

Dankers, N., M. Binsbergen, K. Zegers, R. Laane & M. Rutgers van der Loeff 1984. Transportation of water, particulate and dissolved organic and inorganic matter between a salt marsh and the Ems-Dollard Estuary, The Netherlands. Estuarine, Coastal and Shelf Science 19: 143-165.

Dijkema, K.S. 1984. Development and classification of main salt marsh biotopes in Europe. In: K.S. Dijkema (ed.) et al. Salt marshes in Europe. Council of Europe, Strasbourg. 8-15.

Dijkema, K.S. (ed.), W.G. Beeftink, J.P. Doody, J.M. Gèhu, G. Heydemann & S. Rivas Martinez 1984. Salt marshes in Europe.Nature and environment series 30. Council of Europe. Strasbourg. 178 p.

Gèhu, J.M. & S. Rivas Martinez 1984. Classification of European salt plant communities. In: K.S. Dijkema (ed.) et al. Salt marshes in Europe. Council of Europe, Strasbourg. 34-40.

Smit, C.J.& W.J. Wolff (eds.) 1980. Birds of the Wadden Sea. Balkema, Rotterdam. 308 p.

Stace, C.A. 1980. Plant taxonomy and biosystematics. Arnold, London. 279 p.

Wendelberger, G. 1950. Zur Soziologie der KontinentalenHalophyten-vegetation Mitteleuropas. Dankschr. österr. Akad. Wissensch. Math.-Naturw. Kl. 108(5). 180 p.

APPENDIX 1; LIST OF REGIONAL EXPERTS

COASTAL SALT MARSHES

Finland

(N. part Bothnian Bay)

Terttu Vartiainen Ph.D.
Munkkiniemen puistotie 1B
SF-00330 Helsingfors 33

(Oulu area)

Apud. Prof. Jouko Siira
University of Joensuu
Dept. of Biology
Box 111
SF-80101 Joensuu 10

(Jakobstad area)

Mrs. Brita Schwanck
Unionsg. 45A 16
SF-00170 Helsingfors

(Aaland isles)

Carl-Adam Haeggström
University of Helsingfors
Dept. of Botany
Unionsgat. 44
SF-00170 Helsingsfors

Sweden

Torsten Larsson
The National Swedish Environment
Protection Board (SNV)
Box 1302
S-171 25 Solna

Norway

Directorate for
Nature Management
Tungasletta 2
N-7000 Trondheim

(North)

Reidar Elven
University of Tromsø
Inst. of Biology and Geology
PO Box 790
N-9001 Tromsø

(Central)

Jarle Inge Holten
UNIT, Museet
V/Økoforsk
Erling Skakkes gt. 47 a
N-7000 Trondheim

(South and west)

Anders Lundberg
Geografisk Institut
Helleveien 30
N-5000 Bergen

(South)

Odd Vevle
Telemark distriktshøgskole
N-3800 BØ i Telemark

Iceland

Náttúruverndarráo
Hverfisgötu 26
IS-101 Reykjavík

Náttúrufraeoistofun Islands
Hverfisgötu 116
IS-105 Reykjavík

APPENDIX 1; LIST OF REGIONAL EXPERTS

Denmark

National Agency for the Protection
of Nature, Monuments and Sites
Mr. Claus Helweg Ovesen
Fredningsstyrelsen
Amaliegade 13
DK-1256 København K

Dr. Peter Vestergaard
University of Copenhagen
Inst. of Plant Ecology
Øster Farimagsgade 2D
DK-1353 København K

The Netherlands

Drs. K.S. Dijkema
Research Inst. for Nature Management
Box 59
NL-1790 AB Den Burg/Texel

Dr. W.G. Beeftink
Delta Inst. v. Hydrobiol. Onderzoek
Vierstraat 28
NL-4401 EA Yerseke

BRD

Prof. Dr. B. Heydemann
Universität Kiel
Zoologisches Institut
Ulshausenstr. 40-60
D-2300 Kiel

Peter Prokosch
Norbert Kempf
WWF-Wattenmeerstelle
Schleswig-Holstein
Norderstrasse 22
D-2250 Husum

Jochen Lamp
WWF, Ökologiestation
Am Guthpol 9
D-2820 Bremen 70

Belgium

Prof. A. Noirfalise
Faculté des Sciences agronomiques
de l'Etat
B-5800 Gembloux

Ireland

Dept. of Tourism, Fisheries and
Forestry, Conservation Section
Leeson Lane
-Dublin 2

Great Britain

Dr. J.P. Doody
Nature Conservancy Council
Northminster House
Peterborough PE1 1UA
United Kingdom

France

(West)

Prof. Dr. J.M. Géhu
Université de Paris
Station de Phytosociologie
Fondamentale et Appliquée
Hameau de Hendries
F-59270 Bailleul

(Mediterranean)

Dr. J.J. Corre
Université de Montpellier
163 Rue A. Broussonet
F-34000 Montpellier

APPENDIX 1; LIST OF REGIONAL EXPERTS

Spain

(General)

Prof. Dr. S. Rivas Martinez
Universidad Complutense
Facultad Farmacia
Departemento Botanica
E-Madrid 3

(Cantabria)

Dr. Enrique Loriente
Facultad Ciencias
Departemento Botanica
E-Santander

(Galicia)

Prof. Jesus Izco
Universidad Santiago
Facultad Farmacia
Departemento Botanica
E-Santiago de Compostele

(Andalucia)

Dr. F. Garcia Novo
Universidad de Sevilla
Departemento de Ecologia
Apartado 1095
E-Sevilla

Dr. Enrique Figueroa Clemente
Universidad de Sevilla
Departemento de Ecologia
Apartado 1095
E-Sevilla

(Southeast)

Prof. M. Costa
Universidad Valencia
Facultad Farmacia
Dept. Botanica
E-Valencia

(Doñana)

Dr. Javier Castroviejo
Estacion Biologica de Doñana
Paraguay 1-2
E-Sevilla (12)

(Cataluña)

Prof. Jaume Terradas
Universidad Antonoma
Belcaterra
Facultad Ciencias
Departemento Botanica
E-Barcelona

Portugal

Profa. Dra. M. Amélia Martins Loucão
Departemento de Biologia Vegetal
Faculdade de Ciencias
58, R. da Escola Politécnica
P-1294 Lisboa Cedex

Italy

Prof. Dr. S. Pignatti
Dipartimento di Biologia Vegetale
Universita di Roma, La Sapienza
Citta Universitaria
I-00185 Roma

Greece

Dr. D. Babalonas
Aristoteles University Thessaloniki
Dept. of Syst. Botany &
Phytogeography
-54006 Thessaloniki

Turkey

Dr. Turhan Uslu
Gazi Universitesi Fen-Edebiyat
Fakultesi Biyoloji Bölümü
Besevler
T-Ankara

APPENDIX 1; LIST OF REGIONAL EXPERTS

Cyprus

Nature Conservation Service
c/o Ministry of Agriculture
& Nature Resources
CY-Nicosia

Malta

Joe Sultana
Environment Off./Conservation Dept.
of Health and Environment
15 Merchants Street
M-Valletta

INLAND SALT MARSHES AND SALT STEPPES

BRD

Bundesanstalt für Naturschutz und
Landschaftsökologie
Heerstr. 110
D-5300 Bonn Bad Godesberg 1

Austria

Prof. Dr. G. Wendelberger
Universität Wien
Lehrkanzel für Pflanzensoz. und
Vegetationskunde
Box 285
A-1091 Wien

Spain

Dr. Carlos Arnaiz
Dept. Botanica
Facultad Farmacia
Universidad Complutense
E-Madrid 3

Turkey

Dr. Turhan Uslu
Gazi Universitesi Fen-Edebiyat
Fakultesi Biyoloji Bõlümü
Beselver
T-Ankara

APPENDIX 2: EXAMPLE OF A DESCRIPTIVE CARD FOR THE EUROPEAN NETWORK OF BIOGENETIC RESERVES

(complete sets of descriptive cards for all sites are available at the Council of Europe, Strasbourg and the Research Institute for Nature Management, Texel).

COUNCIL OF EUROPE — SALT MARSHES IN EUROPE

selection of sites for the european network of biogenetic reserves

---

Expert	.....
(name + adress)	.....
	.....
10 Name of the site/area	.....
11 Country	.....
12 Region	.....
13 Map reference	.....
14 Geographical position	.....°N .....°East/West

---

16 Size of area	.....ha
17 Owner	.....
(name + adress)	.....
	.....
18 Managing authority	.....
(name + adress)	.....
	.....
19 Present protection status	.....
	.....
	.....
20 Year status granted	.....

---

15 Geomorphological type	.....
22 Characteristics:	
- naturalness	natural/near to natural/artificial created
- salt marsh vegetation (incl. brackish transition)	almost complete zonation/incompl. /potential salt marsh (e.g. summer polder)
- transition(s) to (an)other natural ecosystem(s)	shingle/sand dunes/heath/bog/fen /woodland/.....
29 Threats:	
- use with adverse effects	.....
- pollution	waste water/toxic pollutants/oil
- diminishing the area	dumping/excavation/reclamation /urbanisation/industry/harbour construction
21 Motives for designition (e.g. large natural area; typical, unique or rare features; threats)	.....

Please send back to: Research Institute for Nature Management,
P.O. Box 59, 1790 AB Den Burg, Texel,The Netherlands

De volgende RIN-rapporten kunnen besteld worden door overschrijving van het verschuldigde bedrag op giro 516 06 48 van het RIN te Leersum onder vermelding van het rapportnummer. Uw giro-overschrijving geldt als bestelformulier. Toezending geschiedt franco.

85/1 P.Opdam & S. Woldhek, De invloed van roofvogels en uilen op hun prooidieren; een literatuuronderzoek. 33 p. f 6,50
85/2 G.M.Dirkse, Sphagnum sect. Subsecunda in Nederland. 28 p. f 5,40
85/4 F.Niewold, Hondsdolheid in het Nederlandse grensgebied. I. De periode tot 1980. 29 p. f 5,20
85/7 A.W.M.Mol, Hydrobiologische districten in Nederland. 50 p. f 7,30
85/8 L.H.H.van Vliet, Mogelijke gevolgen van anorganische en organische stoffen in baggerspeciedepots voor daar aanwezige of zich ontwikkelende bodem- en zoöfauna. 152 p. f 19,45
85/9 H.P.M.Hillegers, De stinzenflora van Zuid-Limburg. 53 p. f 7,60
85/10 H.Eijsackers, Onderzoek naar zware metalen en zure regen in Zweden. 41 p. f 6,40
85/11 M.Aerts, De effectiviteit van angstkreten bij verjaging van roeken Corvus frugilegus L. in de landbouw. 98 p. f 14,-
85/12 S.Broekhuizen & H.Vink, De dassen van Utrecht en het Gooi; een populatie in de schaduw van het uitsterven. 19 p. f 4,20
85/13 K.S.Dijkema e.a., Cumulatie van ecologische effecten in de Waddenzee. 105 p. f 14,75
85/15 A.J.de Bakker & H.F.van Dobben, Inventarisatie van epifytische lichenen in Midden-Nederland en de Meijepolder. 37 p. f 6,-
85/16 L.M.J. van den Bergh, Ganzenpleisterplaatsen in Nederland. 58 p. + bijlagen. f 14,50
85/17 W.Ma & W.H.Diemont, Het kweken van regenwormen in heidecompost en vermicompostering. 43 p. f 6,60
85/18 N.Dankers & K.Zegers, Maatregelen ter voorkoming van verdrinking van zeehonden en hun effecten op de visvangst in harderfuiken. 10 p. f 2,60
85/19 P.J.H.Reijnders, Verdrinking van zeehonden in fuiken. 10 p. f 2,60
85/20 H.M.Beije & G.J.Baaijens, Effecten van ingrepen in de waterhuishouding op de vegetatie in het Beerzedal. 20 p. f 4,50
85/21 A.W.M.Mol, De literatuur over Nederlandse aquatische macrofauna tot 1983. 176 p. f 22,-
85/22 W.J.Wolff, Het effect van natuur- en milieubeschermende maatregelen op de levensgemeenschappen van de Waddenzee. 18 p. f 3,40
85/23 M.A.Binsbergen & W.J.Wolff, Verslag van een oriënterend onderzoek naar de bodemfauna van de Haaksgronden nabij Texel. 28 p. f 5,-
85/24 J.B.M.Thissen & M.J.S.M.Reijnen, Effect van verkeer op broedvogels in populierenbossen en grienden. 90 p. f 13,25

86/2 N.Dankers e.a., De effecten van het stoppen van de stroming op een mosselbank. 24 p. f 5,50
86/4 A.W.M.Mol, Overzicht van de hydrobiologische literatuur in Noord-Brabant. 356 p. f 43,-
86/5 J.G.de Molenaar, Een literatuurstudie naar vogelsterfte door het opnemen van hagelkorrels. 16 p. f 4,-
86/6 H.M. Beije, Onderzoek de effecten van militaire oefeningen op bodem, vegetatie en fauna. Rapport 16. Samenvattend rapport. 94 p. f 10,-
86/7 M.Nooren, Inventarisatie van de houtwallen in het Nationale Park De Hoge Veluwe. 49 p. f 8,-
86/8 M.Nooren, Over het verleden van de Hoge Veluwe. 89 p. f 13,50

86/9 K.Stoker, De verspreiding van rode bosmieren op de Hoge Veluwe. 110 p. f 15,60
86/10 W.Denneman e.a., Zware metalen en hun effecten op natuurwaarden; een case study over de Brabantse Kempen. 76 p. f 12,-
86/11 H.N.Leys, Geologische en vegetatiekundige aspecten van de holwortel (Corydalis cava). 132 p. f 19,-
86/12 J.A.Sinkeldam, Het plankton van de zandwinplas 'de Kuilen' in het Kuinderbos van 1981-1983. 77 p. f 12,-
86/13 M.Platteeuw, Effecten van geluidhinder door militaire activiteiten op gedrag en ecologie van wadvogels. 50 p. f 7,50
86/14 N.Dankers, Onderzoek naar de rol van de mossel en de mosselcultuur in de Waddenzee. 36 p. f 6,-
86/16 G.Hanekamp & H.M.Beije, Natuurwetenschappelijke aspecten van het machinaal plaggen van heide. 36 p. f 6,-
86/17 G.Visser, Verstoringen en reacties van overtijende vogels op de Noordvaarder (Terschelling) in samenhang met de omgeving. 221 p. f 27,50
86/18 C.J.Smit, Oriënterend onderzoek naar veranderingen in gedrag en aantallen van wadvogels onder invloed van schietoefeningen. 44 p. f 7,-
86/19 B.van Noorden, Dynamiek en dichtheid van bosvogels in geïsoleerde loofbosfragmenten. 60 p. f 8,50

87/5 K.Kersting, Zuurstofhuishouding van twee poldersloten in de polder Demmerik. 63 p. f 11,-
87/6 G.F.Willemsen, Bijzondere plantesoorten in het nationale park de Hoge Veluwe; voorkomen en veranderingen. 92 p. f 13,50
87/7 M.J.Nooren, Het verleden van de houtwallen in het nationale park de Hoge Veluwe. 23 p. f 4,-
87/8 G.Groot Bruinderink, D.Kloeg & J.Wolkers, Het beheer van de wilde zwijnen in het Meinweggebied (Limburg). 100 p. f 14,50
87/9 K.S.Dijkema, Selection of salt-marsh sites for the European network of biogenetic reserves. 30 p. f 5,50
87/10 P.Doelman, M.Fredrix & H.Schmiermann, Microbiologische afbraakprocessen als saneringsmethode van met bestrijdingsmiddelen verontreinigde gronden. 225 p. f 27,50