

MedWet

The Status of Wetland Inventories in the Mediterranean Region

Edited by
Nathalie Hecker and Pere Tomás Vives



International Waterfowl and Wetlands Research Bureau (IWRB)



Instituto da Conservação da Natureza (ICN), Portugal

The MedWet action

The Mediterranean basin is rich in wetlands of great ecological, social and economic value. Yet these important natural assets have been considerably degraded or destroyed, mainly during the 20th Century. To stop and reverse this loss, and to ensure the wise use of wetlands throughout the Mediterranean, a concerted long-term collaborative action has been initiated under the name of MedWet.

A three year preparatory project was launched in late 1992 by the European Commission, the Ramsar Convention on Wetlands of International Importance, the governments of France, Italy, Spain, Greece and Portugal, the World Wide Fund for Nature, the International Waterfowl and Wetlands Research Bureau (IWRB) and the Station Biologique de la Tour du Valat.

This project focuses on that part of the Mediterranean included within the European Union, with pilot activities in other countries such as Morocco and Tunisia. Two thirds of the funds are provided by the European Union under the ACNAT programme and the remainder by the other partners.

The concept of MedWet and its importance for the wise use of Mediterranean wetlands was unanimously endorsed by the Kushiro Conference of the Contracting Parties to the Ramsar Convention in June 1993.

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International Waterfowl and Wetlands Research Bureau (IWRB)
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The presentation of material in this report and the geographical designations employed do not imply the expression of any opinion whatsoever on the part of any of the agencies involved, concerning the legal status of any country, territory or area, or concerning the delimitation of its frontiers or boundaries.

Contents

Foreword	v
Acknowledgements	vi
List of authors and contributors	vii
Introduction	1
1. Objectives of inventory of wetlands	2
2. International inventories covering the Mediterranean region	3
3. Methodologies used in international wetland inventories	12
3.1. Wetland classification system	12
3.2. Criteria for site selection	14
3.3. Criteria for wetland identification and delineation	16
3.4. Data collection and management	16
3.5. Mapping protocols	23
3.6. Conclusion	23
4. National overviews	24
4.1. Portugal	25
4.2. Spain	29
4.3. France	41
4.4. Italy	50
4.5. Malta	58
4.6. Slovenia	60
4.7. Croatia	63
4.8. Bosnia-Herzegovina	66
4.9. Yugoslavia	68
4.10. Albania	71
4.11. Greece	74
4.12. Turkey	80
4.13. Cyprus	84
4.14. Syria	86
4.15. Lebanon	88
4.16. Israel	90
4.17. Jordan	93
4.18. Egypt	95
4.19. Libya	99
4.20. Tunisia	102
4.21. Algeria	107
4.22. Morocco	110
5. Overview of the status of wetland inventories in the Mediterranean Region	114
5.1. Coverage	114
5.2. Methodology	120
6. Conclusions and recommendations	122
6.1. Conclusions	122
6.2. Recommendations for future actions	122
6.3. Final recommendations	123
7. List of references	124
8. Annexes	132

List of figures

- Table 2.1 International Wetland Inventories in the Mediterranean region
- Table 2.2 International Conventions and Programmes in the Mediterranean region
- Table 3.1 Main Parameters used to subdivide wetland categories
- Table 3.2 Criteria for site selection
- Table 3.4.a Data categories: International inventories
- Table 3.4.b Data categories: International inventories
- Table 4.1.1 Summary of the results of the preliminary National Wetland Inventory of Portugal
- Box 4.1.1 Data categories in the Preliminary Inventory of Portugal
- Table 4.2.1 General summary of results from Spanish wetland and lakes inventory
- Box 4.2.1 Fields recorded in the information sheet of Spanish wetland inventory
- Fig. 4.2.1 Design and structure of the Spanish wetland and lakes inventory
- Box 4.2.2 Tentative ecological classification of Spanish wetlands and lakes
- Table 4.3.1 Summary of the results of: *Zones humides françaises: leur vocation agricole*. (Wetlands in France: their agricultural value) (Tesson & Schricke 1987)
- Table 4.3.2 Summary of the results of: *Principales zones humides françaises métropolitaines* (Major wetland areas of France) (Bazin 1990)
- Table 4.3.3 Summary of the results of: *Identification de zones humides d'importance majeure au plan national* (Identification of wetlands of major importance on a national scale) (Lierdeman & Mermet 1992b)
- Table 4.3.4 Summary of the results of: *Inventaire national des Arrêtés préfectoraux de biotopes* (National inventory of Prefectorial orders on biotope areas) (Baron & Rozoux 1993, Dehondt 1993)
- Table 4.3.5 Summary of the results of: *Inventaire national des Zones Naturelles d'Intérêts Ecologique, Faunistique et Floristique (ZNIEFF)* (National inventory of natural areas of ecological, faunistic and floristic interest [ZNIEFF]) (Barnaud & Richard 1993a)
- Box 4.4.1 Data categories used in the National Wetland Inventory of Italy (De Maria 1992)
- Box 4.4.2 Wetland classification used in the National Wetland Inventory of Italy (De Maria 1992)
- Table 4.4.1 Summary of the results of the National Wetland Inventory of Italy (De Maria 1992)
- Table 4.7.1 Summary of the preliminary results of the National Wetland Inventory in Croatia
- Box 4.11.1 Wetland classification system of the National Wetland Inventory in Greece
- Fig 4.11.1 Wetland selection criteria
- Table 4.11.1 Summary of the results of the National Wetland Inventory in Greece
- Table 4.12.1 Summary of some wetland data in Turkey from the results of the IBA inventory
- Box 4.19.1 Information recorded in a preliminary list of wetlands in Libya
- Table 4.19.1 Summary of the results of the preliminary list of wetlands in Libya
- Box 4.20.1 The Modified Ramsar Wetland Classification (with Tunisian examples) as used by the National Wetland Inventory of Tunisia
- Box 4.20.2 Data categories of the Tunisian Wetland Inventory:
- Table 4.20.1 Summary of the results of the National Wetland Inventory of Tunisia
- Map 5.1 Coverage by National Wetland Inventories
- Table 5.1 Progress of national wetland inventories in the Mediterranean region
- Table 5.2 Wetland type classifications in national wetland inventories compared to Ramsar classification
- Table 5.3 Data categories of national inventories and Ramsar

Foreword

Early Mediterranean civilisations were based around the wetlands of the coastal zone, and depended on them for food, water, transportation, and building materials. In a similar way, the productivity of these wetlands has made them important centres for biodiversity in the Mediterranean region, harbouring many endemic and threatened species, as well as supporting enormous concentrations of wildlife, such as fish and migratory birds.

Despite the obvious benefits that wetlands provide to people and wildlife, high economic and population growth, coupled with short-sighted planning in the coastal zone, has led to a massive loss and degradation of these Mediterranean jewels. Only in the last few years has an understanding of the consequences of the conversion of these wetland areas begun to be understood, and concerted actions have now begun in many Mediterranean countries to protect and make wise use of those wetlands that remain, and to rehabilitate and restore some of those that have been lost. The MedWet initiative is playing a vital role in stimulating such activities, and in developing effective tools for achieving these objectives.

Wetland inventories, encompassing a full description of the location, extent, type, functions, values and threats of all the wetlands in an area, are a pre-requisite for any concerted wetland conservation programme. They provide a basis for determining priorities, for comparing between regions or countries, for establishing planning frameworks, and for measuring the success of conservation actions. For this reason, developing a comprehensive wetland inventory and monitoring programme has been a high priority for the MedWet initiative.

The MedWet sub-project on inventory and monitoring, being coordinated by ICN and IWRB, aims to stimulate the completion of comprehensive wetland inventories in all Mediterranean countries, by preparing, testing and making available the necessary tools, as well as reviewing what has been, and what has to be, done. This report provides a comprehensive overview of the status of wetland inventories in the Mediterranean region, including a comparison of the methodologies used. It has been compiled partly from reports prepared by national experts from most of the Mediterranean countries, and sets a baseline of knowledge from which needs can be identified and more comprehensive inventories planned.

We hope that the report will enable Mediterranean countries to give priority to developing their national wetland inventories, using the standard methods which are being developed and tested under MedWet. These will lead to comparable programmes across the region, which will provide a sound basis for wetland protection and sustainable use in the future.

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Nathalie Hecker and Pere Tomàs Vives
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This document is the result of the collaboration of many and varied contributors. Initial planning, coordination and networking was undertaken by Pere Tomàs Vives (IWRB) who also prepared chapters 1 and 6. In mid 1994 Nathalie Hecker (IWRB) took over the coordination of the report; she has carried out the analysis of the methodologies used in international (chapter 3) and national inventories (chapter 5). Updating, revision and editing of the whole text has been undertaken mainly by her, with the collaboration of Pere Tomàs Vives and Steve Ridgill. The overview of international inventories and conventions (chapter 2) has been prepared by Derek Scott, coordinator of several international regional inventories: West Europe and Northwest Africa, Neotropics, Oceania, Middle East.

The national accounts describing the inventories existing in the individual countries are based on contributions produced by experts, generally from those countries (see below). Often the contributors (from governmental and non-governmental organisations) were directly or indirectly involved in the national wetland inventory for their country. Contributors from countries without a national wetland inventory were often involved in plans for setting-up their country's inventory.

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Introduction

The first step for the development of a methodology is to undertake a review of the work already carried out on the subject of study, in this case the inventory of wetlands. The review permits to identify and analyse the existing initiatives, in order to build on them and to make the best possible use of their experience, and, at the same time, to identify gaps in the existing work. The present report has been produced with these purposes, as a precursor to the development of a standard methodology for inventories of wetlands which can be used in Mediterranean countries. Thus, this document could be considered as an *'inventory of inventories'*.

The specific objectives of this report are the following:

1. To review the present status of wetland inventories in each Mediterranean country.
2. To review the methodologies used and the coverage of existing international inventories.
3. To review the methodologies used in those countries that have carried out a national wetland inventory and the coverage of these inventories.
4. To identify needs for national wetland inventories in Mediterranean countries.
5. To disseminate knowledge on the methodologies used for wetland inventories among wetland conservationists and scientists in the Mediterranean region and to promote international cooperation.

The latter is certainly one of the most important objectives, since the preparation of this document has contributed to the development of an important and informal network throughout the Mediterranean region and outside, which enables exchange of information and experience.

The compilation of this report started in summer 1993 aiming to present the situation concerning inventories of wetlands in the Mediterranean region by that time. For several reasons the report has been delayed. However, efforts have been made to keep the information up-to-date, although this has not always been possible.

Twenty-two countries are covered, including all the countries with Mediterranean coastline, plus Portugal and Jordan, which fall, at least partly, within the area of Mediterranean climate influence. Within each country, the approach adopted is to consider the whole area of the country, since this is the scope of national inventories. Another reason for this is that, in many countries, it is very difficult clearly to establish the boundary of the Mediterranean zone. Only in the case of France, the results of the national inventories referred to the three Mediterranean administrative regions is given, complementing the information for the whole country.

This document describes most, if not all, of the existing inventories at international and national level covering wetlands in the Mediterranean region and, for some countries, regional ones are also presented. However, due to the large area covered and to the great number of regional and local initiatives, it has not been possible to cover with the same level of detail all the existing regional or local inventories. In any case, all available inventories are mentioned in the text and listed in the reference list.

The more than 160 references listed at the end of the report constitute probably the most comprehensive compilation of publications concerning the inventories of wetlands in the Mediterranean region.

The information presented in this report at both national and international levels does not imply any judgement by the editors nor by the publishers about political boundaries or names of the countries in the Mediterranean region.

Pere Tomàs Vives, *MedWet Project Coordinator, IWRB*

1. Objectives of inventory of wetlands

An inventory of wetland resources is a prerequisite for the determination of conservation and management priorities, and for the successful integration of wetland conservation interests into water and land use planning frameworks. Inventories provide a basis for the assessment of wetland resources at local, national and international levels, information on human activities and on the benefits of wetlands. Additionally, they may serve as a baseline for monitoring changes in ecological character, including changes in wetland area.

What is an inventory of wetlands?

Broadly speaking, an inventory is a list of wetland sites which contains a minimum of data such as location and size, physical and biological features present, human activities and impacts, protection status, etc. An inventory should involve the setting of objectives within a given time-period or as an ongoing project, with a final aim of publishing the information or making the data readily available in a centralised database system.

What constitutes a wetland, what determines its size, to what extent the complex of wetland habitats are classified and mapped, and whether a minimum size of wetland will be set, are all questions which must be answered before the compilation of an inventory starts. In most inventories, the sites considered meet certain predetermined selection criteria (presence of certain species or habitats, surface area, etc.) and the information is presented in a systematic way, based on pre-established criteria for identifying what is a wetland, a list of data categories and a classification system for wetlands.

Objectives of inventories of wetlands

In July 1993 the first meeting of the group of experts who provide scientific advice to this MedWet sub-project was held in Alcochete, Portugal. This group comprises specialists on wetland inventories from different countries, both from the Mediterranean region and outside. They recommended that the objectives of any wetland inventory should be:

- a) to identify where wetlands are, and which are the priority sites for conservation.
- b) to identify the functions and values of each wetland site: ecological, economic, social and cultural values.
- c) to establish a baseline for measuring future change in wetland area and in wetland functions and values.
- d) to provide a tool for planning and management, at both practical and policy levels.
- e) to permit comparisons at both international and national levels.

In the following chapters the approaches of the different inventories is presented and analyzed at both international and national level, explaining in each case the objectives, the methodology and the results attained.

2. International inventories covering the Mediterranean region

Introduction

During the 1950s, it became apparent that while extensive networks of national parks and equivalent reserves had been created around the world to secure the conservation of terrestrial habitats, wetland ecosystems had to a large extent remained without any real protection, despite the fact that they were increasingly coming under pressure from human encroachment, drainage, pollution and other forms of degradation. Out of this appreciation of the need to conserve wetland ecosystems arose the need to identify those wetland sites which, in the interests of science and posterity, should be given some form of conservation status. Clearly, there was a need for an internationally agreed list of priority sites which could provide a basis for national action in wetland conservation.

Over the next three decades, there was a rapid proliferation in inventory schemes designed to document the world's most important and vulnerable wetland ecosystems, and thereby identify priorities for action. Wetland inventories have now been completed or are in progress for almost the entire globe, with some parts of the world having been covered on several occasions (Scott 1993a). The inventories have varied greatly in scope and depth, from simple lists of only the most important sites to detailed accounts of all sites thought to be of some significance for nature conservation.

In the Mediterranean region, the countries of Southern Europe have been included in three international wetland inventories, while some of the North African countries have been included in as many as six. The countries of the Middle East had until recently received rather less attention, but are now the subject of a major international wetland inventory scheduled for completion in 1995.

In addition to these true wetland inventories, there have been several other international inventories and data-gathering exercises which have provided a great deal of information on wetlands in the Mediterranean region. Notable amongst these have been an inventory of sites of international importance for waterfowl in West Europe and Northwest Africa (Scott 1980), an inventory of important bird areas in Europe (Grimmett & Jones 1989), an inventory of important bird areas in the Middle East (Evans 1994), the CORINE database on important biotopes in the European Union, and the IWRB database on the International Waterfowl Census.

Various international conventions and programmes concerned with the natural environment provide a strong basis for international cooperation in the protection of wetlands, and in many cases involve the identification and designation of sites specially worthy of protection. Such designation usually guarantees the site in question a considerable measure of legal protection. Six international conventions (three global and three regional) are relevant to wetlands in the Mediterranean region; three of these, the Ramsar Convention, World Heritage Convention and Barcelona Convention, make provision for the designation of sites, while the African, Bern and Bonn Conventions place considerable emphasis on habitat protection. Two international programmes, Unesco's Man and the Biosphere Programme and the Council of Europe's Network of Biogenetic Reserves, also make provision for the designation of important sites for nature conservation, while the EC Wild Birds Directive places considerable obligations on Member States to identify, designate and safeguard Special Protection Areas for birds. At least five countries in the Mediterranean region now participate as Contracting Parties or Member States

in all of the conventions and programmes relevant to their territory, and all belong to at least two. Over 400 sites, many of them wetlands, have been designated under one or other of these conventions and programmes, while some sites, such as the Camargue, in France, have been designated under as many as four.

International wetland inventories

Table 2.1
International wetland
inventories in the
Mediterranean region.

The first major international inventory of wetland ecosystems was initiated in 1959, when the International Society of Limnologists (SIL) decided to draw up a list of the world's lakes and rivers "whose preservation and protection is particularly desirable". This inventory, aptly named Project

Country	1	2	3	4	5	6	7	8	9	10	11*	12
Portugal	0	4	9	-	-	-	-	5	14	-	126	125
Spain	1	10	13	-	-	-	-	13	92	-	248	1340
France	13	21	39	-	-	-	-	42	89	-	268	1206
Italy	13	7	76	-	-	-	-	49	52	-	1104	551
Malta	0	0	3	-	-	-	-	0	1	-	-	0
Slovenia	0	0	0	-	-	-	-	0	7	-	-	140
Croatia	5	1	2	-	-	-	-	2	13	-	-	81
Bosnia-Herzegovina	0	1	1	-	-	-	-	1	3	-	-	6
Yugoslavia	2	4	10	-	-	-	-	6	13	-	-	172
Albania	2	0	5	-	-	-	-	5	8	-	-	15
Greece	2	7	20	-	-	-	-	11	40	-	94	105
Turkey	0	8	49	-	-	-	-	-	59	-	-	136
Cyprus	0	-	3	-	-	-	-	-	6	-	-	15
Syria	15	-	2	-	-	-	6	-	-	12	-	14
Lebanon	0	-	2	-	-	-	5	-	-	1	-	5
Israel	7	-	6	-	-	-	7	-	-	11	-	15
Jordan	1	-	1	-	-	-	3	-	-	7	-	1
Egypt	4	-	9	15	6	-	-	-	-	-	-	23
Libya	4	-	5	7	5	39	-	-	-	-	-	10
Tunisia	0	8	15	13	9	85	-	14	-	-	-	189
Algeria	0	5	11	25	14	210	-	16	-	-	-	80
Morocco	3	7	13	17	5	181	-	13	-	-	-	167

* only those sites containing wetland habitats (codes 1, 2, 37, 44, 5 and 89)

Key to Table 2.1.

1. Project Aqua (Luther & Rzóška 1971)
2. Project Mar (Olney 1965)
3. A Directory of Western Palearctic Wetlands (Carp 1980)
4. A Directory of African Wetlands (Hughes & Hughes 1992)
5. African Wetlands and Shallow Water Bodies (Burgis & Symoens 1987)
6. Zones Humides d'Afrique septentrionale, centrale et occidentale (de Beaufort & Czajkowski 1986)
7. Wetlands of West Asia (Scott 1993b)
8. A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)
9. Important Bird Areas in Europe (Grimmett & Jones 1989)
10. Important Bird Areas in the Middle East (Evans 1994)
11. CORINE Biotopes Database (European Communities-Commission 1991a,b)*
12. International Waterfowl Census (IWRB)

Aqua, was confined to inland water bodies, and focused primarily on sites of special limnological interest. The project was developed by the International Biological Programme during the 1960s, and culminated in 1971 with the publication of a directory containing information on 600 lakes and rivers throughout the world (Luther & Rzóška 1971). More than sixty of these water bodies are in the Mediterranean region (Table 2.1).

Meanwhile, at an international conference on wetlands organized jointly by IUCN, ICBP and IWRB in the Camargue, France, in November 1962, a decision was taken to embark upon the compilation of a list of marshes, bogs and other wetlands of international importance, primarily as waterfowl habitat, in Europe and North Africa. This list, known as the Mar List and published by IUCN in 1965 (Olney 1965), was the first serious attempt at a regional inventory of wetlands the conservation of which was considered to be of international significance. The list was deliberately restricted to about 200 sites, since it was felt that governments and conservation bodies at that time would not be able to cope with many more sites. Eighty-three sites were identified in the 15 Mediterranean countries in Europe and the Maghreb.

With the development, in 1974, of an agreed set of criteria for the identification of wetlands of international importance, it became possible to compile basic lists, or "shadow lists", of all those sites which might be eligible for designation as wetlands of international importance under the Ramsar Convention. The first of these such lists was compiled by Carp (1980) for IUCN and UNEP, and covered the

Western Palearctic Region. The list was based on both the Mar and Aqua lists, and combined sites of ornithological interest with sites of limnological and botanical interest. The directory covered 44 countries in Europe, North Africa and the Middle East, and listed almost 900 sites. All countries in the Mediterranean region were included, and 294 sites were identified. However, only 95 of these were described in any detail, and for the remainder, the only information given was geographical coordinates, size, protection status and a coded reference to the criteria for inclusion.

During the 1980s, considerable attention was given to wetlands in Africa. Work on an inventory of wetlands throughout Africa began in the 1970s, when a group of limnologists started to compile information on wetlands of limnological interest for publication in handbook form. This work was taken over by UNEP and IUCN in 1983, and expanded into a comprehensive inventory of all major wetland systems in Africa. Although completed in early 1987, the manuscript of the *Directory of African Wetlands* was not published until 1992 (Hughes & Hughes 1992). The directory covers all 47 countries on the continent of Africa as well as Madagascar, and makes at least some reference to all except the most minor wetlands. Much of the information on the physical and ecological characteristics of the wetland systems and their flora and fauna is summarized at regional or national level, and only the larger and better known sites are described in detail. The wetlands of the Mediterranean countries in North Africa are described under 77 headings, but some of these relate to a number of similar but separate sites (e.g. "other montane lakes" in Morocco), and many of the smaller sites in these groupings are mentioned by name only.

Following on from a Workshop on African Limnology held under the auspices of SIL and UNEP in Nairobi in December 1979, a group of wetland scientists decided to attempt a synthesis of all available information on the shallow wetlands of Africa. This was published by ORSTOM in 1987 as a *Directory of African Wetlands and Shallow Water Bodies*, and covered the entire continent excluding Madagascar (Burgis & Symoens 1987). The directory provides detailed information on many of Africa's largest and best known wetlands, including information on hydrology and water chemistry, but there are many gaps in coverage, and no attempt is made to identify sites of special conservation value. Thirty-nine wetlands are described in the five Mediterranean countries of North Africa.

Two other inventories have covered the wetlands of Northwest Africa. Morgan and Boy carried out an ecological survey of standing water bodies in Algeria, Tunisia and Morocco, and described 62 sites – 22 in Algeria, 16 in Tunisia and 24 in Morocco (Morgan 1982a, 1982b; Morgan & Boy 1982). De Beaufort and Czajkowski (1986) attempted to compile a comprehensive inventory of wetlands in North and West Africa, east to Libya and south to the Congo. This inventory, sponsored jointly by the Conseil International de la Chasse et de la Conservation du Gibier (CIC) and the Secrétariat de la Faune et de la Flore (France), gives only the name of each site and a brief ecological description, but includes a useful index listing sites according to their ecological character. As the inventory lists all known wetlands (including rivers and coastal sites) irrespective of size and importance, it contains far more sites than other international inventories, with 515 sites listed for Morocco, Algeria, Tunisia and Libya alone.

Until recently, the wetlands of the Middle East have received relatively little attention. A small number of sites were identified by Project Aqua (Luther & Rzóska 1971), and parts of the region were incorporated in the UNEP/IUCN *Directory of Western Palearctic Wetlands* (Carp 1980), but very little information was given for most of the listed sites. In a recent overview of the wetlands of Southwest Asia, Scott (1993b) lists 248 wetlands of international and national importance in the Middle East, including 21 in Syria, Lebanon, Israel and Jordan. Most of these sites and several additional sites are to be included in the *Directory of Important Bird Areas in the Middle East* (see below). However, in November 1993, work began on a

full-scale inventory of internationally important wetlands in the Middle East. This project, which is being co-sponsored by IUCN, WWF, the Ramsar Convention Bureau, IWRB and BirdLife International, will culminate in mid-1995 with the publication of a *Directory of Wetlands in the Middle East*.

Inventories of important sites for waterbirds

Following the adoption of a Directive on the Conservation of Wild Birds by the European Council in April 1979, the European Commission requested BirdLife International (or ICBP as it then was) and IWRB to draw up a preliminary inventory of areas of particular importance for the conservation of birds within the European Community. The ICBP EC Working Group compiled information on sites of special importance for terrestrial species, while IWRB focused on sites for waterfowl and sea-birds. The final report, submitted to the European Commission in June 1981, contained information on 692 sites (Osieck & Mörzer Bruyns 1981). As a part of this project, IWRB was requested to compile an inventory of sites of international importance for waterfowl not only within the European Community but also in neighbouring countries of Southern Europe and North Africa. This inventory covered 26 countries, and identified 544 sites as wetlands of international importance on the basis of numbers of waterfowl present (Scott 1980). Fourteen Mediterranean countries were covered by the inventory, and these held a total of 180 sites. However, because of its focus on waterfowl, the inventory includes a number of sites which, although important for waterfowl, are not strictly wetlands (e.g. offshore islands important for breeding *Sterna* spp.).

In the mid-1980s, ICBP began work on the compilation of an inventory of important bird areas (IBAs) in Europe, in collaboration with IWRB. This work built upon the earlier inventory of important bird areas in the European Community (Osieck & Morzer Bruyns 1981), but coverage was extended to include the whole of Europe as well as Cyprus and the Asian part of Turkey. The final report contained information on 2,444 sites considered to be of special importance for birds (Grimmett & Jones 1989). Of this total, 1,384 were identified as being sites of importance for waterfowl, including 439 sites within the Mediterranean countries. An annotated list of the important sites for waterfowl was subsequently published as a separate document (Langeveld & Grimmett 1990). However, as with the Scott (1980) inventory, some of these sites are not strictly wetlands. Furthermore, some of the criteria used in site selection were regional criteria developed for Europe rather than the Ramsar criteria; thus many of the sites would probably not qualify as wetlands of international importance under the Ramsar Convention.

Following on from the highly successful Important Bird Areas Project in Europe, BirdLife International has sponsored a similar project on important bird areas in the Middle East, in collaboration with IWRB and the Ornithological Society of the Middle East. This project has been recently completed and the *Directory of Important Bird Areas in the Middle East* has been published in 1994 (Evans 1994). Of the 61 IBAs identified in the four Mediterranean countries covered by the project, 31 IBAs are with wetlands.

A somewhat similar Important Bird Areas Project has recently been initiated in Africa. This project was launched at the Eighth Pan-African Ornithological Congress in Burundi in September/October 1992, and is being coordinated by BirdLife International. The project differs slightly from the European and Middle Eastern IBA Projects in that the immediate aim is to promote national inventories of important bird areas as a series of separate endeavours, to be undertaken over a period of five years. In many cases, these national efforts will include extensive field work. An international coordinator was appointed at BirdLife International in late 1993, and the criteria for site selection are still being refined (M.I. Evans, pers. comm.).

Wetlands in the CORINE Biotopes Database

In 1985, the European Commission launched an ambitious programme known as CORINE (Coordination of Information on the Environment), the principal aim of which has been to create an information system on the state of the environment throughout the European Community. A priority theme of the CORINE Programme has been to assemble comprehensive and compatible information on the location and state of important biotopes in the European Community, through the compilation of a computerized inventory of sites of major significance for nature conservation. By 1990, a database describing some 6,000 sites of Community importance for nature conservation had been created. An elaborate habitat classification system, based largely on the composition of plant communities, has been developed to permit detailed analysis of the status and distribution of specific habitat types (European Communities – Commission 1991a, 1991b). In January 1994, the CORINE database contained information on a total of 1,840 biotopes with some natural wetland habitat in the five Mediterranean countries of the European Union. These were the biotopes that contained some habitat in one or more of the following categories: coastal and halophytic communities; non-marine waters; bogs and marshes; humid grasslands and tall herb communities; alluvial and very wet forests and brush, and artificial wetlands such as canals, reservoirs and saltworks (Dorian Moss, pers. comm.)

Wetlands covered by the International Waterfowl Census

The International Waterfowl Census is an international monitoring scheme for waterfowl coordinated by IWRB. The Census seeks to provide information on the size and trends of waterfowl populations through coordinated annual mid-winter counts throughout the wintering range of the populations in question. The Census was launched in the Western Palearctic in 1967, and has subsequently been expanded to cover much of Africa, Asia, Australasia and South America. The Census was initially confined to the Anatidae (ducks, geese and swans) and Coots (*Fulica atra*), but in recent years has been broadened to cover all waterfowl groups. Most countries in the Mediterranean region joined in the Census in the late 1960s, and all except Malta, Albania, Lebanon and Libya have participated on a regular basis since the late 1970s. By the end of 1993, the IWC database at IWRB contained census data from almost 4,400 "sites" in the Mediterranean countries. However, this figure is misleading, as some "sites" appear both as individual sites and parts of larger, amalgamated sites, while other "sites" are wetland regions, containing large numbers of separate water bodies, e.g. the 15 sites listed in Table 2.1 for Israel include over 580 water bodies (Rose & Taylor 1993). Furthermore, not all sites are wetlands; rather, they are localities at which one or more species of Anatidae or coots have been recorded in mid-winter, and thus, for example, include areas of dry farmland with wintering flocks of geese. In recent years, participating countries have been requested to provide additional information on the count sites (area, habitat type, land-use, threats etc.), but by the end of 1993, such information was available for only about 100 sites in the Mediterranean region.

International conventions and programmes

Ramsar Convention

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) was signed in Ramsar, Iran, in 1971 and came into force in December 1975. This Convention provides a framework for international cooperation for the conservation of

Country	1	2*	3	4	5	6*	7*	8*	9*	10
Portugal	2	0-0	-	P	P	-	1-1	8-1	36-13	P
Spain	35	1-0	-	P	P	30-13	10-4	0-0	146-45	P
France	12	2-2	-	P	P	12-4	6-3	35-15	104-54	S
Italy	46	0-0	-	P	P	17-3	3-1	37-4	74-34	S
Malta	1	0-0	-	P	-	3-1	-	2-1	-	S
Slovenia	1	1-0	-	-	-	0-0	?	-	-	S
Croatia	4	1-1	-	-	-	1-1	1-0	-	-	S
Bosnia-Herzegovina	-	0-0	-	-	-	0-0	-	-	-	-
Yugoslavia	2	2-1	-	-	-	10-1	1-1	-	-	S
Albania	-	0-0	-	-	-	2-2	-	-	-	P
Greece	11	2-0	-	P	S	9-1	2-0	16-0	26-11	S
Turkey	5	2-0	-	P	-	12-2	-	2-0	-	S
Cyprus	-	0-0	-	P	-	3-2	-	2-0	-	S
Syria	-	0-0	-	-	-	0-0	0-0	-	-	-
Lebanon	-	0-0	-	-	-	1-0	0-0	-	-	S
Israel	5	-	-	-	P	7-0	0-0	-	-	S
Jordan	1	0-0	-	-	-	-	-	-	-	P
Egypt	2	0-0	P	-	P	4-2	1-0	-	-	S
Libya	-	0-0	S	-	-	1-0	-	-	-	-
Tunisia	1	1-1	P	-	P	3-1	4-2	-	-	P
Algeria	2	1-1	P	-	-	4-2	2-2	-	-	S
Morocco	4	0-0	P	-	P	1-0	0-0	-	-	S

* total sites designated, followed by sites containing significant wetlands.
P = Contracting Party; S = signed but not yet ratified.

Key to Table 2.2.

1. Ramsar Convention (to June 1995)
2. World Heritage Convention (to January 1991)
3. African Convention (to January 1991)
4. Bern Convention (to September 1994)
5. Bonn Convention (to May 1994)
6. Barcelona Convention Protocol on Mediterranean Specially Protected Areas (to September 1994)
7. UNESCO MAB Biosphere Reserves (to January 1991)
8. Council of Europe Network of Biogenetic Reserves (to December 1992)
9. EU Special Protection Areas under the Birds Directive (to March 1993)
10. Biodiversity Convention (to March 1994)

Table 2.2
International
Conventions and
Programmes in the
Mediterranean region.

(World Heritage Convention) was adopted by the General Conference of Unesco in Paris, France, in 1972. The aim of the Convention is to define the worldwide natural and cultural heritage, to draw up a list of sites and monuments considered to be of such exceptional interest and such universal value that their protection is the responsibility of all mankind, and to promote international cooperation in order to contribute effectively to this protection. On signing the Convention, each country pledges to conserve the sites and monuments within its territory that are recognized to be of exceptional value and have been designated as World Heritage Sites under Article 2 of the Convention. All countries in the Mediterranean region except Israel are Party States to the Convention. By January 1991, these countries had designated a total of 109 sites for the List (IUCN 1992). However, only 13 sites were designated wholly or partly because of their natural qualities, and only six of these contain significant wetland habitats.

wetland habitats; it places general obligations on Contracting Parties relating to the conservation of wetlands throughout their territory, and special obligations pertaining to those wetlands which have been designated to the "List of Wetlands of International Importance". Each Contracting Party is obliged to designate at least one site at the time of ratification, and is encouraged to list additional sites as and when appropriate. Sites are selected for designation to the List on the basis of an agreed set of criteria (the Ramsar criteria). 15 Mediterranean countries had become Contracting Parties by June 1995, and had designated a total of 129 sites (Scott Frazier, pers. comm.; Table 2.2). The Ramsar sites are described in *A Directory of Wetlands of International Importance*, which was first produced in draft form for the Second Conference of the Parties in Groningen, the Netherlands, in May 1984 (IUCN 1984), and has since appeared in revised and up-dated versions at the Conferences of the Parties in Regina, Canada, in May/June 1987 (IUCN 1987), in Montreux, Switzerland, in May 1990 (IUCN 1990), and in Kushiro, Japan, in June 1993 (Jones 1993). Because of the great increase in number of listed sites in recent years, the latest edition of the Directory has been published in four separate volumes, three of which are relevant to the Mediterranean region (Part I, Africa; Part II, Asia & Oceania; and Part III, Europe).

World Heritage Convention

The Convention Concerning the Protection of the World Cultural and Natural Heritage

African Convention

The African Convention on the Conservation of Nature and Natural Resources was adopted in Algiers in 1968 and came into force in 1969. The Convention, which was prepared under the auspices of the Organization of African Unity, seeks to promote individual and joint action for the conservation, utilization and development of soil, water, flora and faunal resources by establishing and maintaining their rational utilization for the present and future welfare of mankind. Articles 4–7 and 10 in the Convention deal with the protection and wise use of habitats, but there is no provision for compulsory control measures, and no obligation to afford special protection to particular habitats. By January 1991, Algeria, Egypt, Morocco and Tunisia were Party States to the Convention, and Libya had signed the Convention but not yet ratified (Biber-Klemm 1991, IUCN 1992).

Bern Convention

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) was opened for signature in September 1979, and came into force in June 1982. Contracting Parties are required to maintain populations of wild flora and fauna, and give particular emphasis to endangered and vulnerable species. Specifically, each Contracting Party undertakes to take appropriate and necessary legislative and administrative measures to ensure the conservation of the habitats of the wild flora and fauna species, especially those specified in the Appendices I and II to the Convention, and to ensure the conservation of endangered natural habitats. Contracting Parties further undertake to give special attention to the protection of areas that are of importance for the migratory species specified in Appendices II and III, and which are appropriately situated in relation to migration routes, as wintering, staging, feeding, breeding or moulting areas. As Appendices II and III cover virtually all migratory waterfowl in Europe, the value of this Convention in safeguarding wetlands is apparent. However, the Convention does not entail any international designation of sites. By January 1991, all European countries in the Mediterranean region except Albania, Malta and the republics of the former Yugoslavia had become parties to the Convention (IUCN 1992). The current status of the recently independent republics of the former Yugoslavia is uncertain.

Bonn Convention

The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) was opened for signature in 1979 and came into force in November 1983. This Convention has two distinct objectives. The first is to provide strict protection for migratory species which are in danger of extinction throughout all or a significant proportion of their range (listed in Appendix I of the Convention). Parties that are Range States for an endangered species are obliged, amongst other things, to endeavour to conserve and, where feasible and appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction. The second objective is to oblige Parties to endeavour to conclude agreements for the conservation and management of species listed in Appendix II of the Convention, either amongst themselves or with Range States that are not Parties. These agreements should, where appropriate and feasible, provide for the maintenance of a network of suitable habitats appropriately disposed in relation to the migration routes (Biber-Klemm 1991). One such Agreement, currently in draft form, concerns the Conservation of African-Eurasian Migratory Waterbirds and covers the whole of the Mediterranean region. The potential value of this Agreement in providing increased protection to the wetland habitats of migratory waterfowl in the Mediterranean Region is apparent. By May 1994, eight countries in the Mediterranean region were parties to the Convention.

Barcelona Convention

The Convention for the Protection of the Mediterranean Sea against Pollution (the Barcelona Convention) was adopted in Barcelona in 1976. The Contracting Parties to the Convention met in Geneva in April 1982 and adopted the Protocol Concerning Mediterranean Specially Protected Areas, which entered into force in March 1986. This Protocol contains a number of Articles that specify the action Mediterranean States are bound to undertake to identify, establish and manage marine and coastal areas requiring special protection. To aid them, a Regional Activity Centre of Specially Protected Areas was established in Tunisia, in 1985. One of the activities of the Centre is to maintain a computerized database containing information on the marine and coastal conservation activities of each Mediterranean country and on individual protected areas, either existing or planned. The 1989 edition of the Directory of Marine and Coastal Protected Areas in the Mediterranean Region (UNEP/IUCN 1989) contains a summary of information available in the database on those Mediterranean Specially Protected Areas designated by the Contracting Parties under the Geneva Protocol. By September 1994, all countries bordering the Mediterranean Sea were Parties to the Convention, and had designated a total of 122 Specially Protected Areas. While most if not all of these sites include some coastal and/or shallow marine habitats, only 35 are wholly or partly categorized as "wetlands". However, one of the Specially Protected Areas in France comprises 61 separate protected areas (acquisitions of Le Conservatoire de l'Espace Littoral et des Rivages Lacustres – CELRL). Many of these acquisitions contain wetlands.

Man and the Biosphere Programme

The Man and the Biosphere Programme of Unesco was launched in 1970, and aims, amongst other things, to develop within the natural and social services a basis for the rational use and conservation of the resources of the biosphere. Project 8 of the MAB Programme is directed at the conservation of natural areas and the genetic material they contain, through the creation of a worldwide network of reserves. These reserves, known as Biosphere Reserves, are designated not only for the protection of unique natural areas, but also for a wide range of other objectives which include research, monitoring, training and demonstration. In most cases, the human component is vital to the functioning of the reserve. Biosphere Reserves are nominated by the national MAB committee of the country concerned, and are only designated following review and acceptance by the MAB Bureau at Unesco (IUCN 1992). States which participate in the MAB Programme are not obliged to nominate any reserves, but most do so. By January 1991, all countries in the Mediterranean region except Malta, Albania, Turkey, Cyprus, Jordan and Libya were participating in the MAB Programme (IUCN 1992). Thirty-one Biosphere Reserves had been designated in the region, 14 of which contain significant wetlands.

Council of Europe Network of Biogenetic Reserves

In 1976, the Committee of Ministers of the Council of Europe adopted a Resolution on the European Network of Biogenetic Reserves, with the aim of conserving representative examples of Europe's fauna, flora and natural areas. A Biogenetic Reserve should be a protected area enjoying legal status and characterized by one or more typical, unique, endangered or rare habitats, biocoenoses or ecosystems. Member States were asked to compile an inventory of the different types of habitats, biocoenoses and ecosystems in their territory, so that the rarest and most endangered environments could be preserved and designated as a contribution to the Biogenetic Reserve Network. By the end of December 1992, 102 sites had been designated by the seven Mediterranean countries then participating in the Network (Council of Europe 1993). Of these, 21 sites contain significant wetlands.

European Council Directive on the Conservation of Wild Birds

The European Council Directive 79/409 on the Conservation of Wild Birds, which came into force in April 1981, requires the Member States of the European Community to maintain populations of naturally occurring wild birds and to preserve a sufficient diversity and area of habitats for their conservation. The Directive imposes strict legal obligations on Member States. In particular, the Directive states that the 144 species and subspecies of birds mentioned in the Annex I "shall be the subject of special conservation measures concerning their habitat", and requires Member States to classify "the most suitable territories in number and size as special protection areas for the conservation of these species". The Directive also states that Member States should "pay particular attention to the protection of wetlands and particularly to wetlands of international importance". In a Resolution of April 1979, the European Council called upon Member States to notify the Commission within 24 months following the adoption of the Directive of "the special protection areas designated for Annex I species" and "to take similar measures for regularly occurring migratory species not listed in Annex I". By August 1994, the five EU Member States in the Mediterranean region had designated a total of 386 Special Protection Areas or SPAs (European Commission 1994) of which 157 contain significant wetlands. These totals include several SPAs for Portugal which are in Madeira and in the Azores Islands, several SPAs for Spain which are in the Canary Islands and the totals for the whole of France.

3. Methodologies used in international wetland inventories

The methodologies used in the main international wetland inventories are diverse. Five of the main components which characterised their development are presented here: wetland classification system, criteria for site selection, criteria for wetland delineation, data (collection, storage, management system, update), mapping protocols.

3.1. Wetland classification system

Project Mar (Olney 1965)

There are eight ecological categories which include "every kind of shallow, marine, coastal or inland wetland between a depth of about 6 m and just wet ground without permanent surface water, not truly waterlogged fens and bogs". Each category is divided into more detailed types according to the permanence or the salinity of the water or the acidity for peatlands (see annex 3.1.a).

Project Aqua (Luther & Rzóška 1971)

Wetland types are divided into seven broad classes: standing waters (five types), standing waters of peculiar importance (four types), running waters (five types), wetlands, coastal waters (seven types), ground waters (two types) and underground waters (see annex 3.1.b). This is one of the few inventories which considers underground waters as a wetland type.

A Directory of Western Palearctic Wetlands (Carp 1980)

The classification is based on the main wetland types distinguished by Isakov (1966), as subsequently tested and refined by Eber (1969). The main categories are coastal areas (four sub-categories and 11 types), river valleys (two sub-categories and five types) and other areas (four sub-categories and nine types) (see annex 3.1.c). Marshes and other palustrine wetland types were not well represented in this system.

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

This inventory uses a list of 25 categories; amongst them 20 are wetlands and five are terrestrial habitats (see annex 3.1.d). There is no hierarchical subdivision of the types.

Zones Humides d'Afrique septentrionale, centrale et occidentale (de Beaufort & Czajkowski 1986)

The typology includes 49 types grouped as wetlands and terrestrial areas. Wetlands are divided into four categories: standing waters (26 types), flowing waters (one type), marine wetlands (two types) and coastal wetlands (six types) (see annex 3.1.e). This system is mainly focused on standing waters.

African Wetlands and Shallow Water Bodies (Burgis & Symoens 1987)

This directory does not use any classification though, it describes diverse wetland types such as shallow lakes, swamps, floodplains, coastal lagoons, permanent or temporary pans, etc. The

following have been excluded: estuarine and mangrove areas; artificial system such as man-made lakes and rice paddies and the deep, great lakes of the Rift Valley.

Important Bird Areas in Europe (Grimmett & Jones 1989)

This study does not cover only wetlands but any kind of habitat and there is no classification of habitat types. The sites and their habitats are shortly described in the text.

A Directory of African Wetlands (Hughes & Hughes 1992)

The directory considers wetlands as "all areas of land that are permanently or periodically inundated, i.e. lakes, ponds, swamps, marshes, bogs, riverine and palustrine floodplains, pans and wadis, coastal salt-marshes and mangrove swamps". Artificial impoundments are also included. The authors did not attempt to classify wetlands according to an artificial system and they preferred a short description.

CORINE biotopes project

The typology describes "the recognizable communities formed by interactions between flora, fauna and the abiotic environment" (European Communities Commission 1991a). Habitat categories are divided with up to seven levels of precision. Wetlands are included in each of the first level divisions: Coastal and halophytic communities; non-marine waters; scrub and grassland; forests; bogs and marshes; inland rocks, screes and sands; agricultural land and artificial landscapes. The 2nd level describes habitats in general terms and according to their floristic composition (see annex 3.1.f.). The 3rd level and those following are based on their phytosociological characteristics.

Ramsar (1990)

The Ramsar classification agreed in 1990 by the Conference of the Contracting Parties in Montreux, Switzerland covers wetland types of the whole world. It is based on the wetland classification developed in the United States (Cowardin 1979). It is divided into three main classes: Marine and coastal wetlands (11 types), Inland wetlands (16 types), Man made wetlands (eight types). This typology takes into account five aquatic systems (marine/estuarine/lacustrine/palustrine/riverine), the hydric regime (permanent/seasonal/intermittent), the salinity (fresh/brackish/saline) and some characteristics of the vegetation and/or the substrate (see annex 3.1.g).

Some inventories do not use any classification system but site descriptions including wetland types (Burgis & Symoens 1987, Hughes & Hughes 1992, Grimmett & Jones 1989). All the other inventories (except CORINE biotopes) use simple wetland classifications, their aim is to define broad wetland types. CORINE biotopes typology is a classification of habitats which aims to describe in detail each habitat in a site.

Most of these classifications are hierarchical; several levels of divisions have been established according to various parameters. The table 3.1. presents the main division parameters used in several classifications. At the first level of division, all the inventories make a distinction between coastal and inland wetlands, most of them separate flowing and standing water, and only Ramsar and CORINE

Table 3.1
Main parameters used to subdivide wetland categories.

Parameters	Olney 1965	Luther et al. 1971	Scott* 1980	Carp 1980	de Beaufort et al. 1986	Ramsar	CORINE biotopes
Coastal / inland	1	1	+	1	1	1	1
Flowing/standing	1	1	+	2 & 3	1	2	2
Natural/artificial				2		1	1
Salinity	1 & 2	2	+	3	2	3	2
Permanence of water	2			2		3	
Vegetation types					2	3	3

* this classification does not have any level of division; nevertheless it uses some wetland characteristic to separate categories.

Key: 1: at first level of division 2: at 2nd level of division 3: after the 2nd level of division

biotopes separate artificial wetlands from natural ones. Salinity is usually considered at the 2nd level or below. Permanence of water and broad vegetation types are also important criteria for sub-division.

None of these classifications is specific to the Mediterranean region. However a classification such as the Ramsar one is broad enough to include Mediterranean habitats under a more general wetland type. The CORINE biotopes classification has been extended to the whole Palearctic, and Mediterranean habitats including North Africa and the Middle East are, to a different degree, considered.

3.2. Criteria for site selection

Project Mar (Olney 1965)

The list was primarily based on ornithological data. The basic criterion was: sites which are of the highest importance for the conservation of European wetland bird populations. The list of sites for each country has been divided into A and B categories: A sites are those which are considered to be of major importance for the conservation of European wetland bird populations, and B sites are those of still vital importance for migratory birds and requiring conservation, although they do not usually harbour such huge concentrations or such rare species of birds as A sites.

A Directory of Western Palearctic Wetlands (Carp 1980) and A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

In these two inventories, wetlands were selected on the basis of their importance as habitat for waterfowl species. The quantitative criteria are based on criteria 1(i) to 1(iii) of the "Recommendations for Criteria to be used in identifying Wetlands of International Importance" adopted by the International Conference on the Conservation of Wetlands and Waterfowl at Heiligenhafen, Germany in December 1974. These state that a wetland should be considered internationally important if it:

- i) regularly supports 1% (being at least 100 individuals) of the flyway or biogeographical population of one species of waterfowl, or
- ii) regularly supports either 10,000 ducks, geese and swans; or 10,000 coots; or 20,000 waders, or,
- iii) supports an appreciable number of an endangered species of plant or animal (only applied to waterfowl).

Zones Humides d'Afrique septentrionale, centrale et occidentale (de Beaufort & Czajkowski 1986)

Sites were selected according to their size: all wetlands of more than 5 hectares are included. Small sites can also be included if they have a particular interest (rare species, migration stop-over, important breeding colonies, etc.).

Important Bird Areas in Europe (Grimmett & Jones 1989)

Sites are divided in four categories according to their importance for birds:

- Cat. 1: Sites for migratory species which congregate (either when breeding, or on passage, or in winter) in important numbers,
- Cat. 2: Sites for globally threatened species,
- Cat. 3: Sites for species and sub-species which are threatened throughout all or a large part of their range in Europe (but are not globally threatened)

Cat. 4: Sites for species which have relatively small total world ranges with important populations in Europe.

For each category, several detailed criteria are used according to the number of birds (percentage of the world or European or biogeographical population) present at a site or according to the importance of the site in Europe. Furthermore the site should:

1. be different in character or habitat or ornithological importance from the surrounding land; and
2. exist as an actual or potential protected area, with or without buffer zones, or be an area which can be managed in some way for nature conservation;
3. alone or with other sites, be a self-sufficient area which provides all requirements of birds (that it is important for) which use it during the time they are present.

A Directory of African Wetlands (Hughes & Hughes 1992)

No criteria were established. The authors stated that: "All wetlands, large or small, are of some importance, and their importance varies depending upon the criteria applied"; therefore, all known wetlands have been included.

Ramsar

A wetland is identified as being of international importance if it meets at least one of the 11 criteria established during the Montreux conference in 1990 (Ramsar 1990). These criteria are divided into three categories: (see annex 3.2.a)

- Criteria for representative or unique wetlands
- General criteria based on plants or animals
- Specific criteria based on waterfowl

CORINE biotopes project

The following definition was used in identification of a site: "An area of land or a water body which forms an ecological unit of (European) Community significance for nature conservation, regardless of whether this area is formally protected by legislation". "Community significance" is indicated by one or more criteria for site selection.

The selection criteria are concerned with the following characteristics:

- the presence of threatened species of plants or animals;
- the presence of sensitive habitat types;
- the richness of a site for a taxonomic group of species;
- the richness of a site for a collection of habitat types.

Luther & Rzóska (1971) and Burgis & Symoens (1987) did not give any information about the criteria used.

The importance of the site for birds is the main criterion used in most of these inventories.

The importance of the site for other fauna and flora is also considered. The importance of habitats was used by Carp (1980), Ramsar and CORINE biotopes. Table 3.2 presents the principal criteria used for site selection in these inventories.

Table 3.2
Criteria for site selection.

Criteria	Olney 1965	Scott 1980	Carp 1980	de Beaufort et al. 1986	Grimmett et al. 1989	Ramsar	CORINE biotopes
Birds	★	waterfowl	★		★	★	★
Other fauna			★			★	★
Flora			★			★	★
Habitats						★	★
Size				★			

3.3. Criteria for wetland identification and delineation

Project Mar (Olney 1965)

Wetland delineation was recognized to be difficult. The surface area given encompasses a very large area and detailed studies were recommended to show the limits which have to be given for the establishment of reserves.

A Directory of Western Palearctic Wetlands (Carp 1980)

As there was no rigid definition of a wetland site, site boundaries were often dependant on the available information. It was recognized by the author that "further work is required to ascertain the precise limits of the most important habitats".

Important Bird Areas in Europe (Grimmett & Jones 1989)

There are no specific guidelines to delineate a wetland site partly because there was no possibility to produce maps. In many cases, the areas given are those of national or local protected areas. The contributors included areas on the basis of the limits of their special ornithological interest, rather than on the extent of wetland habitats.

A Directory of African Wetlands (Hughes & Hughes 1992)

The areas and dimensions given for individual wetlands and water bodies were calculated by the authors from the latest maps available and in some cases from satellites images. The criteria for such delineation are not given in the publication.

Ramsar

Delineation of Ramsar sites is entirely the responsibility of the Contracting Party. There are no rules or guidelines. The exception is that the Convention text says that coastal Ramsar sites may contain areas of marine water up to a depth of 6 meters. In practice, the boundaries of most Ramsar sites coincide with those of national protected areas – e.g. national parks, nature reserves, etc.

Luther & Rzóška (1971), Carp (1980), de Beaufort & Czajkowski (1986), Burgis & Symoens (1987) and CORINE biotopes project did not mention any criteria in their publications.

Wetland delineation is a crucial issue which is often overlooked because of its complexity. It is closely related to the definition of a site which varies according to the authors. The purpose of the inventory and the criteria for site selection also influence the delineation (e.g. IBA). The ecological delineation of the wetland itself would be ideally possible if fixed criteria are considered for habitat delineation (e.g. hydrophytic vegetation, hydric soil, presence of water, etc.). In practice it is difficult to apply because of the importance of other non-ecological parameters such as legal designations, ownership, land-uses, etc.

3.4. Data collection and management

Data categories recorded in these inventories are presented in tables 3.4.a and b. For some inventories these data categories are the input data (from the initial questionnaires) and for some others the output data (from the final publication) depending on the available information in each case. These categories are compared to those used for the description of Ramsar sites, which are used worldwide. Although the data categories requested or presented look standardized, their level of detail varies a lot within an inventory from one country to another, or within a country

from one site to another. The level of information is according to the present knowledge or the availability of data.

Project Mar (Olney 1965) (see table 3.4.a)

Data were collected at national level in the different countries. The inventory also includes the major results of expeditions in Portugal, Morocco, Greece and former Yugoslavia. The information collected for this inventory was updated by Luther and Rzóška in 1971 for the Aqua list and then by Carp in 1980 for the Directory of Western Palearctic Wetlands.

Project Aqua (Luther & Rzóška 1971) (see table 3.4.a)

Some countries were much less studied than others. The lack of some headings for some sites shows the lack of information. Project Mar data were updated and new information was provided by limnologists of various countries and the National Committees of the International Biological Programme (IBP). This inventory has not been updated but the information was used for the Directory of Western Palearctic Wetlands.

A Directory of Western Palearctic Wetlands (Carp 1980) (see table 3.4.a)

This directory was planned as a successor of the Mar List incorporating also the relevant data from the Aqua list. Questionnaires were circulated through IUCN and IWRB contacts in most of the countries concerned. Information from papers contributed to international conferences on wetland conservation was included. Some expeditions were organised to collect data in the less known countries. Data categories were quite detailed (see table 3.4.a.). This was the first major inventory published. No procedure for updating the information has been planned.

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980) (see table 3.4.b)

A special data sheet was developed by the Secrétariat Faune Flore at the Paris Museum of Natural History in relation to Special Protection Areas in the (at that time) EEC, and a slightly modified version of this was used for the EEC sites. Published literature and unpublished reports were also used. No data sheets were completed for the sites outside the EEC. A complete set of data sheets is on file at IWRB headquarters. Updating was planned but has not followed.

Zones Humides d'Afrique septentrionale, centrale et occidentale (de Beaufort & Czajkowski 1986)

This inventory is a list of sites and their habitats. The information mainly comes from a compilation of literature and reports. A new methodology for wetland inventories is proposed at the end of the publication with recommendations for carrying out further and comprehensive inventories. The proposed methodology includes the collection of more detailed data. Five sheets have to be filled in for each site:

1. Site sheet: Site code, name of the compiler, date, site name, administrative region, site map, area, ecological features (codes) human activities, protection measures.
2. Census of species present at a site: name of compiler, country, date, site code, species, abundance (breeding, non-breeding, migrants).
3. Annual presence of species: name of compiler, country, site code, date, species, number during the breeding season (min., max.), number outside the breeding season (min., max.).
4. Annual hunting-bags per site: name of compiler, country, site code, date, species, number killed (min., max.), estimated percentage of the animals killed.
5. Bibliography: Name of the compiler, detailed references of each publication, geographical references, codes of the sites concerned, key-words.

Table 3.4.a
Data categories:
International inventories.

Data categories	Ramsar (input)	Projet Mar (Olney 1965) (output)	Projet Aqua (Luther & Rzoska 1971) (output)	Wetland directory (Carp 1980) (output)	Preliminary inventory (Scott 1980) (output)
Country	1.	+ (in the chapter title)	+ (in the chapter title)	+ (in the chapter title)	+ (in the chapter title)
Date	2.				
Reference	3.				
Name/address of compiler	4.				
Name of wetland	5.	Name	1. Name	Name	i. Name of site
Date of Ramsar designation	6.				v. Protection status, Ramsar designation or other designations
Geographical coordinates	7.	Geographical coordinates	3. Latitude /longitude	Geographical location	iii. Geographical coordinates
General Location	8.		2. Situation		ii. County, province, region
Complex/others wetlands in the area			15. Other information	Ecology	
Area	9.	Area	5. Area	Area	iv. Area
Wetland Type	10.	Habitat type, General statement	1. Name	Ecology	vii. Major habitat types
Altitude	11.		4. Altitude	Altitude	
Overview	12.	General statement	6. Depth	Ecology	
Physical features	13.		7. Origin	Water depth	
Ecological features	14.		8. Status in limnological classification	Ecology	
Land tenure/ownership	15.		9. Special scientific interest	Ecology	
Legal designation	16.	General statement	11. Conservation status, ownership	Tenure	
Conservation measures taken			11. Conservation status	Legal status	v. Protection status, Ramsar designation or other designations
Conservation measures officially proposed	17.		12. National recognition		
Naturalness & Conservation			15. Other information		
			14. Threats from possible or proposed developments		

3. Methodologies used in international wetland inventories

Data categories	Ramsar (input)	Projet Mar (Olney 1965) (output)	Projet Aqua (Luther & Rzoska 1971) (output)	Wetland directory (Carp 1980) (output)	Preliminary inventory (Scott 1980) (output)
Current land use	18.	General statement	13. Present usage	Management practices	vi. Threat to wetland habitat
Disturbances and threats	19.		13. Present usage 14. Threats from possible or proposed developments 15. Other information	Threats	
Hydrological and biophysical values	20.		8. Status in limnological classification 9. Special scientific interest 15. Other information	Ecology	
Information about surroundings/catchment	13, 15.b, 18.b, 19.b.				
Social and cultural values	21.		13. Present usage		
Fauna list		Ornithological interest			viii. Breeding and (ix.) Passage or wintering waterfowl which the site is internationally important x. Other species of waterfowl
Noteworthy fauna	22.		9. Special scientific interest 10. Degree of scientific research 15. Other information	Ecology	
Flora list					
Noteworthy flora	23.	General statement	9. Special scientific interest	Ecology	
Current scientific research/facilities	24.		10. Degree of scientific research 13. Present usage	Scientific research	
Current conservation education	25.		13. Present usage 15. Other information		
Current recreation/tourism	26.				
Management authority	27.		11. Conservation status 15. Other information	Management practices	vi. Threat to the wetland habitat
Jurisdiction	28.				
History & site record					
References	29.		10. Degree of scientific research 15. Other information	Principal reference material	
Reasons for inclusion	30.			Criteria for inclusion	
Outline map of site	31.				

Table 3.4.a
Data categories:
International
inventories. (cont.)

Table 3.4.b
Data categories:
International
inventories.

Data categories	Ramsar (input)	African wetlands & Shallow water bodies (output) (Burgis & Symoens 1987)	IBA in Europe (input) (Grimmett & Jones 1989)	CORINE biotopes project (output) (EEC 1991)	Directory of African wetlands (output) (Hughes & Hughes 1992)
Country	1. Country	Country	1. Country	11. (in site code)	Country
Date	2.		2. Date	12. Date	
Reference	3.		3. Reference	11. Site code 14. Complex code 18. Sub-site code	
Name/address of compiler	4.	Name	4. Name and address of the compiler	15. Respondent	
Name of wetland	5.	Name of wetland	5. Name of wetland	16. Site name	Name of wetland
Date of Ramsar designation	6.				
Geographical coordinates	7.	Location	6. Geographical coordinates	25. Longitude / latitude	Location
General location	8.		7. Location 10. Biogeographical province	21. Region 22. District 23. Region code	Nearest towns
Complex/other wetlands in the area				14. Complex code 17. Site complex 19. Design areas	General
Area	9.	Area	8. Area	24. Surface area	Area
Wetland Type	10.	(in introduction)	11. Wetland type	31. Habitat code 51. Site character	General
Altitude	11.		9. Altitude	26. Site altitude	Altitude
Overview	12.	Landscapes, morphology	12. Description of site	51. Site character	General
Physical features	13.	Geology/climate/ hydrography/hydrology/ Physico-chemical characteristics of the water			
Ecological features	14.		13. Principal vegetation	31. Habitat codes 32. Habitat cover 51. Site character	
Land tenure/ownership	15.		14. Land tenure	55. Ownership	
Legal designation Conservation measures taken	16.	Legislation / designation	15. Conservation measures taken	33. Site designation code 54. Site designation	Conservation status
Conservation measures officially proposed Naturalness & Conservation	17.		16. Conservation measures proposed	52. Quality	

3. Methodologies used in international wetland inventories

Data categories	Ramsar (input)	African wetlands & Shallow water bodies (output) (Burgis & Symoens 1987)	IBA in Europe (input) (Grimmett & Jones 1989)	CORINE biotopes project (output) (EEC 1991)	Directory of African wetlands (output) (Hughes & Hughes 1992)
Current land use	18.	Human activities & management	17. Current land-use	35. Human activities	Human impact & utilisation
Disturbances and threats	19.		19. Disturbances & threats 18. Possible changes in land use	53. Vulnerability 35. Human activities	
Hydrological and biophysical values	20.	Hydrography & hydrology		52. in Quality	Hydrology & water quality
Information about surroundings/catchment	13. 15.b. 18.b. 19.b.	Human activities & management	13.b. Plants 14.b. Land tenure 17.b. Land use 18.b. Changes in land use		General
Social and cultural values	21.		20.a. Economic and social value	35. Human activities	Human impact & utilisation
Fauna list					Flora & fauna
Noteworthy fauna	22.	Invertebrates Fishes Others vertebrates	20.b. Conservation values: wildlife	41/45 Mammals/birds/amphibians/reptiles/ fishes/invertebrates 52. Quality	
Flora list		Macrophytes Phytoplankton			
Noteworthy flora	23.		20.c. Special flora values	46. Plants 52. Quality	
Current scientific research/facilities	24.		21. Research & facilities		
Current conservation education	25.			35. Human activities	Conservation status
Current recreation/tourism	26.				
Management authority	27.				
Jurisdiction	28.				
History & site record				57. History	General
References	29.	Ref. included in the text	22. References	56. Documentation	Ref. included in the text
Reasons for inclusion	30.		24. Criteria for inclusion	31. Habitat code 34. Motivation 41-46 Species	
Outline map of site	31.	Map	23. Outline map of the site	61. Map	(Map of the country)

Table 3.4.b
Data categories:
International
inventories. (cont.)

Each site has a code which appears on each information sheet; therefore the number of sheets is not limited, more information could be added to the site file to enable the updating of the information.

African Wetlands and Shallow Water Bodies (Burgis & Symoens 1987)

(see table 3.4.b)

This is a synthesis of the available knowledge through a compilation of the majority of references concerning these wetland systems. There is no systematic method. There is no procedure to update the information.

Important Bird Areas in Europe (Grimmett & Jones 1989) (see table 3.4.b)

Collection of data was carried out at national level through datasheets sent to the ICBP and IWRB networks. During the follow up of the project a database of IBAs was established by BirdLife International. Compilation of new information on existing and new sites is continuing, including additional field surveys at national level.

A Directory of African Wetlands (Hughes & Hughes 1992) (see table 3.4.b)

The authors did not use an identical format throughout the directory, since they considered that it was difficult or impossible to describe each site with the same techniques. The information for this directory came very largely from maps, survey reports and literature. Up to date data were also requested from individuals and authorities in every African country and outside of Africa as well. There is no information about the data storage and management system used. Updating is considered.

Ramsar (see table 3.4.b)

Data are provided through the information sheet on Ramsar wetlands by the government of each Contracting Party. If they come from a non-governmental body, they must be validated by the government. Data are stored since 1990 in the Ramsar sites data base managed by IWRB. It is a single database file with 49 fields. It is now being divided into a group of interrelated specialised databases. It will then become a relational database (in Fox-Pro) which is more flexible and manageable (S. Frazier pers. comm.). The information is updated as new data are available and validated by the government of the Contracting Party concerned.

CORINE biotopes project (see table 3.4.b)

The collection was done in different ways depending on the country and data availability. In some cases, data were extracted from existing national data holdings; in others, new national data holdings were set up, whilst in others, data had to be extracted from a number of existing regional sources. The project had requirements to store and validate the data and to provide facilities to allow retrieval and analysis. Data are entered on dBase III/IV and then transfer to a VAX Biotopes Database System where they can be compiled, validated, updated, retrieved, analysed, etc.

Some authors (Burgis & Symoens 1987, Hughes & Hughes 1992) chose not to use a very strict method because the information availability varies a lot. Most of the other inventories collected a very similar set of data categories (see table 3.4.a and b). Depending on their main objectives some authors developed some fields: ornithological data in Grimmett & Jones (1989) and especially waterfowl in Scott (1980); fauna and hunting in the proposed inventory of de Beaufort (1986); habitat information and ecological features in CORINE biotopes; uses and values in Ramsar; conservation issues for Grimmett & Jones (1989) and Ramsar.

Most of these inventories (except CORINE biotopes) have been published in the format of a directory. A set of data sheets has been kept and the information update was planned. Unfortunately, in many cases the follow up has never started and the update process has never been carried out. Data of some of the most recent inventories are stored in databases and they are regularly updated (e.g. IBA inventory, Ramsar).

3.5. Mapping protocols

None of these inventories has proper procedures for detailed mapping. Although some of them (de Beaufort & Czajkowski 1986, Burgis & Symoens 1987, Ramsar) requested a map of the site with the original questionnaire, these maps are not included in any of the published directories. Some include sketch maps of the countries showing the location of the sites (Luther & Rzóska 1971, Carp 1980, Grimmett & Jones 1989, Hughes & Hughes 1992).

The Ramsar database has no mapping procedures at the moment but it is planned for the future. For a proportion of sites, existing maps showing the boundaries of Ramsar sites are deposited with UNESCO or the Ramsar Convention Bureau or IWRB.

In the CORINE biotopes project, ARC/INFO and the Mapinfo desktop mapping system were used for data analysis and mapping, both of biotopes data alone and in association with data of other CORINE projects, as part of the single CORINE integrated GIS (European Communities Commission 1991a).

No mapping procedure specific to wetlands has yet been developed.

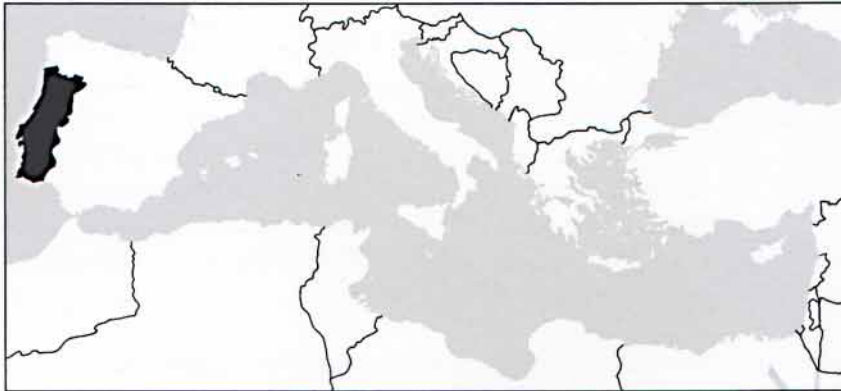
3.6. Conclusion

To date, international wetland inventories have not used common definitions and systems compatible at international level especially for wetland typology, data categories collected, selection criteria, etc. There is no standardisation yet. Some fields of the inventory methodology still need to be widely developed, such as delineation of wetland, procedure to update data and generate comparisons which will allow some general monitoring.

This analysis shows that, up to now, new inventory initiatives were not built on the methodological bases of previous experiences. The main reasons were probably the practical and technical difficulties. The development of new technologies is changing the approach towards inventories. Data storage, updating of data and mapping procedures become common and easy procedures, and this will facilitate the exchange of data.

4. National overviews

This survey on the status of national wetland inventories in each Mediterranean country is based almost entirely on the contributions of experts from those individual countries. Often those same contributors were directly connected with the actual National Wetland Inventory for their country or were closely-linked to it. Where a national wetland inventory did not already exist, the contributors were often directly involved (through their governmental or non-governmental organisation) in plans for the setting-up of their country's inventory. In all, 22 countries have been considered for this report, including all countries with boundaries on the Mediterranean coast plus Portugal and Jordan. The contributions have assessed the situation for the whole country, whether or not the whole country should be strictly considered as part of the Mediterranean region. A major exception has been the national account of France where, although national inventories have been considered for France as a whole, the Mediterranean region of France (involving the administrative regions of Languedoc-Rousillon, Provence-Alpes-Côte d'Azur, and Corsica) has been emphasised in the report.



4.1 Portugal

Contributors: Luis T. Costa, J.C. Farinha, Renato Neves, Rui Rufino, António Teixeira and Anabela Trindade

Portugal has an Atlantic coastline, with a length of *ca.* 900 km. The total area is 92,390 km² with a population of 10,285,000 (1990). The area to the north of the central river Tejo is generally mountainous, while to the south the country is more undulating and farmed more extensively. Along the coast are stretches of cliff and rocky off-shore islands, but much of the coast is low-lying and sandy, with large areas of sand dunes and marshes. A number of major estuaries also exist.

The development of agriculture has led to threats to natural ecosystems including the draining of meadows and afforestation of marginal land. The use of marginal land for agriculture, and other poor agricultural practices, has led to some serious cases of soil erosion, increased water run-off and irregularity of river discharge; in some cases this has led to desertification (Cutrera 1987).

Coverage by international inventories

Project Mar (Olney 1965)

This widely known early inventory lists only four sites: two estuaries of category A and two other category B sites. However, it is mentioned that the list is not complete and that other nationally important sites could also be included.

A Directory of Western Palearctic Wetlands (Carp 1980)

Carp (1980) lists nine wetland complexes.

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

Scott (1980) lists five wetland complexes.

These two inventories, Carp (1980) and Scott (1980), only provide incomplete coverage of the country. The information provided was surprisingly poor considering the state of knowledge at the time, probably because they were compiled without the full participation of the national experts. Furthermore, these reports cover only the four major estuarine areas in Portugal and the Boquilobo marshes.

Important Bird Areas in Europe (Grimmett & Jones 1989)

For the ICBP/IWRB report *Important Bird Areas in Europe*, the participation of Portuguese ornithologists from CEMPA/ICN was determinant to achieve a comprehensive coverage of all wetlands which can be considered as internationally important. A total of 14 wetland sites out of the total of 36 named areas were included. The information provided for each of these areas was the most up-to-date then available and was comprised of data on relevant wintering, migrating and breeding bird populations, supplemented by information on other bird species that depend upon wetlands, including passerines and raptors. All sites were described with the necessary detail, including information on legal protection status and habitat types.

CORINE Biotopes Database (European Communities – Commission 1991a,b)

The *CORINE Biotopes Project* covers 126 sites which include at least some wetland habitats.

International Waterfowl Census (IWRB)

As a result of the long-term participation of CEMPA in the *International Waterfowl Census* since 1975, the IWC database covers a large number of Portuguese wetlands. Fifteen sites are currently included in the national priority site list but information on all the other sites counted every year is still supplied regularly to the IWRB (in all, 125 sites have been counted in the past).

A Directory of Wetlands of International Importance, Part Three: Europe (Jones 1993)

Portugal, as a signatory to the Ramsar Convention, has designated two important coastal wetland sites, the Tejo Estuary and the Ria Formosa, with a total area of 30,563 ha.

National wetland inventories

A first attempt to achieve an inventory of wetlands in Portugal was carried out by Margarida Borges de Carvalho at the Ministry of Social Equipment and Environment in 1975, the IWRB International Year of Wetlands. This first inventory was based on questionnaires sent by post to all the administrative districts in the country. Unfortunately, the total number of answers received was quite low and the data obtained could not be properly processed. But quite a number of sites reported were visited and a very brief characterization of their avifauna was obtained for most of them. Unfortunately, this early information was never published. However, it was used for planning the current mid-winter waterfowl counts now performed regularly in Portugal.

In 1976, CEMPA, in close association with IWRB, started to perform mid-winter counts of waterfowl species in a number of selected sites, some of them already recognized as the most important wetland sites for birds in this country, partly based also on previous visits by IWRB ornithologists. The full importance of the sites holding significant populations of waterfowl species was assessed later (Rufino 1978, Teles and Guedes 1982). Some preliminary results of this work were presented at the IWRB Symposium held in Huelva in 1982. The number of Portuguese sites covered by mid-winter counts has increased since, providing useful information for all sites thought to reach international, national and regional importance.

Yet, although the basic knowledge did already exist, a proper inventory of the Portuguese wetlands was never published. Presently, a preliminary inventory compiling and updating all the existing data has just been published (Farinha and Trindade 1994). This certainly is a most relevant preparatory step to a comprehensive National Wetland Inventory.

Box 4.1.1
Data categories in the preliminary Wetland Inventory in Portugal.

Description	
A. SITE	The name which identifies the wetland site.
B. ADMINISTRATIVE AREA	Name of the region and districts involved.
C. COORDINATES	Latitude and longitude of a central point.
D. MAP	Delineating the wetland boundaries and the border limits of the relevant areas with the different status of legal protection recognized at the site.
E. PROTECTION STATUS	
F. AREA	The total surface area of the site in hectares.
G. DESCRIPTION	General description of the site and its main biotopes.
H. CAUSES OF DISTURBANCE	The nature and evaluation of the major threats identified for the site and other causes of disturbance.
I. FAUNA	Description of the faunistic importance of the site, given by the occurrence of mammal, bird, reptile and amphibian species, and also fish, both freshwater and migratory. <ol style="list-style-type: none"> 1. Birds <ol style="list-style-type: none"> a. species included in Annex I of EC Wild Birds Directive b. species included in the Portuguese Red Data Book c. other species, with additional information 2. Other Vertebrates <ol style="list-style-type: none"> a. species included in the Portuguese Red Data Book b. species included in Annex II of the Bern Convention and the EC Habitats Directive (92/43)
J. ADDITIONAL INFORMATION	Other data of interest
K. SOURCES OF INFORMATION	Details on the origin of all data included in this survey.

Methodology

This preliminary inventory is basically a compilation of available information from all sources (international inventories, studies on wetland sites, monitoring data on flora and fauna). The wetland sites identified include those listed by Ramsar Bureau, the wetlands that were designated as Special Protection Areas under the EC Birds Directive (79/409), Nature Parks and Reserves, Biogenetic Reserves, the Biosphere Reserves of UNESCO, wetland sites included in the CORINE Biotopes inventory, and the relevant Important Bird Areas of Europe in Grimmett and Jones (1989). All sites match the Ramsar definition of wetlands and the classification system used also follows the Ramsar typology.

A data sheet was completed for every site with all the available information, as shown in Box 4.1.1. This data sheet includes a general site description and information on physical characteristics, the main biotopes in the area, their current protection status and threats.

Available information on flora and fauna was also included. As the baseline information on waterfowl species collected by CEMPA/ICN over the last decade was considerably more detailed (Rufino and Neves 1986, Rufino 1988, 1989, 1990, 1991, 1992, 1993) it could be used to compare and assess the relative importance of wetlands, both in terms of species richness and their abundance, and considering the conservation status of species in the Red Book of Vertebrates in Portugal (SNPRCN 1990).

The sites were associated by catchment areas and the report was organized in chapters with introductory data and a sketch map on all catchment areas. The wetland sites within each catchment area were subsequently included with all the basic information already collected and a boundary map.

Results

The preliminary inventory includes 49 wetland sites of well-recognized ornithological importance and 22 other sites that will require more attention in the future, with no specific protection status and only very scarce information presently available. The number of sites

Type of wetland		No. of sites	% No. sites	Area (ha)	% Area
marine and coastal	estuarine	8	16	125,858	57
	lacustrine/palustrine	12	25	3,851	2
inland	riverine	12	25	47,249	22
	palustrine	7	14	3,170	1.5
man-made	agricultural	3	6	3,295	1.5
	industrial/urban	7	14	35,342	16
Total		49	100	218,765	100

Table 4.1.1
Summary of results from the preliminary National Wetland Inventory of Portugal.

population of selected bird species from the regular counts carried out there from 1988 to 1992. Three groups of waterfowl were used: Anatidae, waders and Coot. Following this method, the most important wetlands identified were the Tejo estuary, Ria Formosa, the Sado estuary, Ria de Aveiro and the Castro Marim marshes, all of them of Mediterranean type.

included in each of these categories is shown in Table 4.1.1.

The total area of all wetland sites listed in the inventory is 218,765 ha, which represents ca. 2.5% of the overall Portuguese mainland territory. However, the information so far available for all sites is not uniform, with some areas remaining almost unknown while others already benefit from a reasonable degree of knowledge.

The comparative importance of the wetlands was assessed by an evaluation of the mean

Conclusions and recommendations

The data available for all sites considered in this preliminary inventory of wetlands in Portugal is still quite heterogeneous. Some areas are comparatively well-known and were target sites for important conservation actions and detailed biological studies, other areas have almost no data available and are still known mostly according to traditional, empiric ways.

Following the preliminary inventory a comprehensive wetland inventory is now being undertaken, as part of the MedWet subproject on Inventories and Monitoring of Mediterranean Wetlands and this is expected to fill some of the present gaps in our knowledge. There is also an urgent need for detailed studies on flora and fauna (other than birds) associated with wetlands, because these biological aspects have been very often neglected.

It is also necessary to build up a database, including the mapping of wetlands, in order to allow future monitoring of ecological changes already occurring or which may happen in the near future.

Finally, recognizing that wetland loss and degradation in Portugal results mainly from conflicts between development processes and environmental policies, we recommend that studies on cost-benefit aspects of the destruction/degradation of wetlands are undertaken and their results made widely available to decision-makers.



4.2 Spain

Contributors: Carlos Montes and Magdalena Bernués

Spain has an area of 504,780 km² and a population of 39,085,000 (1992). Most of the country is dominated by an interior area of high ground, the meseta, partially dissected but with an average height of 600 m. Several mountain ranges exist in different parts of the country. In the south, close to the Mediterranean Sea, the Sierra Nevada rises to almost 3500 m.

Overview of national coverage by international inventories

Project Mar (Olney 1965)

10 wetland areas are listed in this publication. Some of them encompass a number of sites.

Project Aqua (Luther & Rzóska 1971)

This inventory gives a detailed description of one site: Albufera de Valencia.

A Directory of Western Palearctic Wetlands (Carp 1980)

13 wetland areas are listed in this directory as wetlands of international importance.

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

This list includes 13 wetland areas.

Important Bird Areas in Europe (Grimmett & Jones 1989)

92 of the 288 Spanish IBA are wetlands or include one part which can be considered as a wetland.

CORINE biotopes Database (European Communities – Commission 1991a,b)

248 sites of this database include a wetland or are a wetland.

International Waterfowl Census (IWRB)

1340 wetland areas have been part of the network of sites where the waterfowl census is carried out in winter.

Directory of Marine and Coastal Protected Areas in the Mediterranean Region. Part 1. Sites of Biological and Ecological Value (UNEP/IUCN 1989)

13 of the 30 Mediterranean Specially Protected Areas designated under the Barcelona Convention are classified as wetlands.

A Directory of Wetlands of International Importance, Part Three: Europe (Jones 1993)

When this directory was published, 17 wetland areas had been designated as Wetlands of International Importance under the Ramsar Convention. Since then, 12 new sites have been designated (31/08/94).

Most of these international inventories cover a small number of sites. Wetland conservation strategies proposed by governmental and non-governmental international organisations generally comprise the two following, often complementary, points of view (Bernaldez and Montes 1989a):

- a. the necessity to preserve wetlands as habitats for particularly threatened animal or plant species (most often waterfowl),
- b. the necessity to preserve wetlands as examples of particular habitat types with special characteristics (spectacular scenery, size).

This attitude explains, to a large extent, the fact that existing wetland inventories are devoted to the protection of large wetlands of a certain ecological type, or wetlands with environmental characteristics especially suitable for the conservation of waterfowl (Scott and Jones 1992, Scott 1993). This kind of methodological approach does not allow the characterization of the natural wealth and value of wetlands located in a typically Mediterranean climate. This is particularly true of periodically flooded areas in Spain, since most of their ecological types are not included in the established standards of conservation values. The ornithological criteria used to select sites for most of the international inventories (Scott and Jones 1992, Scott 1993a, Prentice and Tomàs-Vives 1993a) meant that, in the case of Spain, a group of very important wetlands have not been included. Examples of these are the hypersaline and soda lakes, endo- and exorheic steppe lakes, dune complexes, etc.

All these factors explain why Spain has often been shown as a country that, due to its climate (more than 75% of its territory has a mean annual rainfall of less than 800 mm), is poor in natural wetlands and rich in artificial reservoirs (Scott 1980, Carp 1980, Grimmert and Jones 1989). This erroneous image is portrayed even in some national inventories of Spain (SEO 1989, Fernandez-Cruz *et al.* 1988) reflecting the capacity of the continental and coastal waters to maintain populations of waterfowl rather than the ecological identity of a rich and varied wetland heritage. This approach leads to the selection of large complexes of natural wetlands and reservoirs in order to respect the high mobility of the waterfowl. Although the inventory of this type of unit (wetland complex) is important for the creation of protected natural spaces at a regional scale, it has a limited value if they have not been previously analysed in detail. At least, each wetland should be analysed together with its catchment.

National wetland inventories

The first national inventory of Spanish wetlands, carried out by Luis Pardo in 1948, had a conservationist character. The relatively small surface area of most Spanish wetlands did not make them attractive for the development of expensive land-reclamation plans. Pardo was professionally related to the Ministry of Agriculture (*Instituto Forestal de Investigaciones y Experiencias*) and started in the 1930s an inventory of the Spanish non-flowing bodies of water (wetlands and lakes) both, natural and artificial. This was

done using the literature base of geographical, limnological, and biological data, together with information concerning use of the water bodies found on the 1:50,000 maps of the *Instituto Geográfico y Catastral*. In addition, this inventory compiled the existing information, most of it from travellers guides. In 1945, a preliminary list appeared (Pardo 1945) as an introduction to the Spanish Catalogue of Lakes, *Catálogo de los lagos de España* (Pardo 1948) in which more than 2000 natural and artificial wetlands and lakes were registered from the entire Peninsula and the Balearic and Canary Islands. Pardo's inventory became one of the first comprehensive National Inventory of Wetlands produced by a country with a view towards conservation and integrated management.

In the 1970s Francisco Velez Soto, in the newly created Instituto Nacional para la Conservación de la Naturaleza (ICONA, National Institute for Nature Conservation), started a new inventory of Spanish wetlands with the objective of updating that of Pardo (Velez 1984). He used the same methodology and even the same cartographic base, together with agricultural-crop and land-use maps and the information obtained from questionnaires received from the regional delegations of ICONA. This inventory, that included all wetlands greater than 0.2 ha, was never published in its entirety, but included a list of the 205 largest or most important wetlands for waterfowl (Velez 1979). Neither the inventories of Pardo nor of Velez were verified by field work.

During the 1980s the Sociedad Española de Ornitología (SEO, Spanish Ornithological Society), financed by ICONA, put together an inventory of Spanish wetlands of international, national and regional importance for waterfowl: *Clasificación de las Zonas Húmedas Españolas en Función de las Aves Acuáticas* (SEO 1989). The governmental funding of this project was focused on the promotion and development of the Ramsar Convention in Spain (Spain ratified the Convention in 1982). Also during this period, the SEO compiled the information from Spain for the project on Important Bird Areas in Europe (Grimmett and Jones 1989, de Juana 1990) in which the information concerning wetlands was based on the previous inventories.

The Spanish National Wetland Inventory

Institutional framework

In Spain, the development of strategies for the elaboration of wetland inventories was included into the legal system with the Water Law in 1985 *Ley de Aguas* (Ley 29/1985) and the Rules for Public Watershed Uses, *Reglamento del Dominio Público Hidráulico* (848/1986). Therefore, the development of such strategies depended on the regional Water Authority (Confederaciones Hidrográficas) of each catchment. These administrative units are included within the Ministry for Civil Works, Transportation and Environment, Ministerio de Obras Públicas, Transporte y Medio Ambiente (MOPTMA), whose responsibility is the management of water resources of the main Spanish watersheds. In 1988 the Hydrological Public Works Authority, Dirección General de Obras Hidráulicas (MOPTMA) financed, with about one million dollars, a two-year project to make an extensive National Inventory of the natural wetlands of continental Spain (Montes 1991). The information from this inventory must be used as a base for the development of protection programmes included within the National Water Management Strategy, Plan Hidrológico Nacional or the new hydrological policy now being developed in Spain.

On the other hand, the new law for the Conservation of Natural Sites, Plant and Animal Wildlife (Ley 4/1989, de 27 de Marzo) established that the Ministry of Agriculture, Fishing and Food would carry out, with information obtained from the regional governments, a National Wetland Inventory. This inventory would have to be updated in order to follow the evolution of the wetlands and, if necessary, to indicate the protection measures that should be included as a part of the Watershed Planning Programmes, Planes Hidrológicos de Cuenca. In complying with this legal requirement, a considerable number of extensive regional inventories have been carried

out in recent years. In this way, some of the 17 regional communities of Spain have financed projects for inventorying their wetlands e.g., País Vasco, Baleares (Amengual 1991) and Murcia.

Scope and goals

From the beginning, this National Wetland Inventory was intended to be much more than a simple list of areas of shallow water in Spain. It tries to create the base for a system, both in the short and long-term, that facilitates the development of dynamic and predictive models of planning and management.

In this way, a structured Inventory System was designed in the following series of development programmes of which only the first two have already been developed:

1. Creation of an extensive list of non-flowing water bodies of Spain, including general information about their natural and human environment.
2. Development of an ecological classification or characterisation of the wetland functional types covering the environmental variability of the geographical regions of Spain.
3. Calculation of the rates of wetland loss for each defined functional type, with the objective of characterising the historical and present causes that explain their degradation in a socio-economic and political context.
4. Characterisation and quantification of the functions and values of the defined wetland functional types.
5. Elaboration of an integrated system of criteria for the ecological evaluation of wetlands according to their characterised functional type (functional assessment).
6. Development of scientific and practical basis for the delineation of wetlands included in each one of the functional types defined.

The inventory and ecological classification (points 1 & 2) constitute one of the first methodological phases undertaken to date. Both activities have permitted a knowledge of the abundance, distribution, size, quality of resources, variety and present conservation status of the Spanish mainland wetlands. This information is basic for the design of any rational Resource Management Policy and the establishment of research priorities and conservation.

Inventory planning and procedures

Given the structural and functional complexity of wetlands as ecological systems, their study needs to be multidisciplinary. From this perspective, a working group was created comprising 20 scientists from the various specialities: Geology/Geomorphology, Surface and Ground Water Hydrology, Aquatic Botany, Plankton/Mesobenthos, Ichthyofauna, Waterfowl and Limnology. This latter mentioned team was also responsible for the coordination of the project.

To accomplish the proposed objectives, a work plan of three years duration (1988–1990) was designed and structured in three phases as shown in Figure 4.2.1.

The first stage, of one year duration, was basically a period of desk studies consisting of regular meetings of all members of the multidisciplinary teams in order to identify and develop the sources, materials, categories and methodology of the inventory. The starting point was that a great part of the scientific success and the optimisation of time and funds available would be due to solid and coherent planning.

This first phase had as key elements:

- a. the definition of clear and realistic objectives in terms of time, funds, material and personnel available
- b. the definition and delimitation of the units to be inventoried
- c. the identification of the actual and potential users of the inventory
- d. the documentation to produce

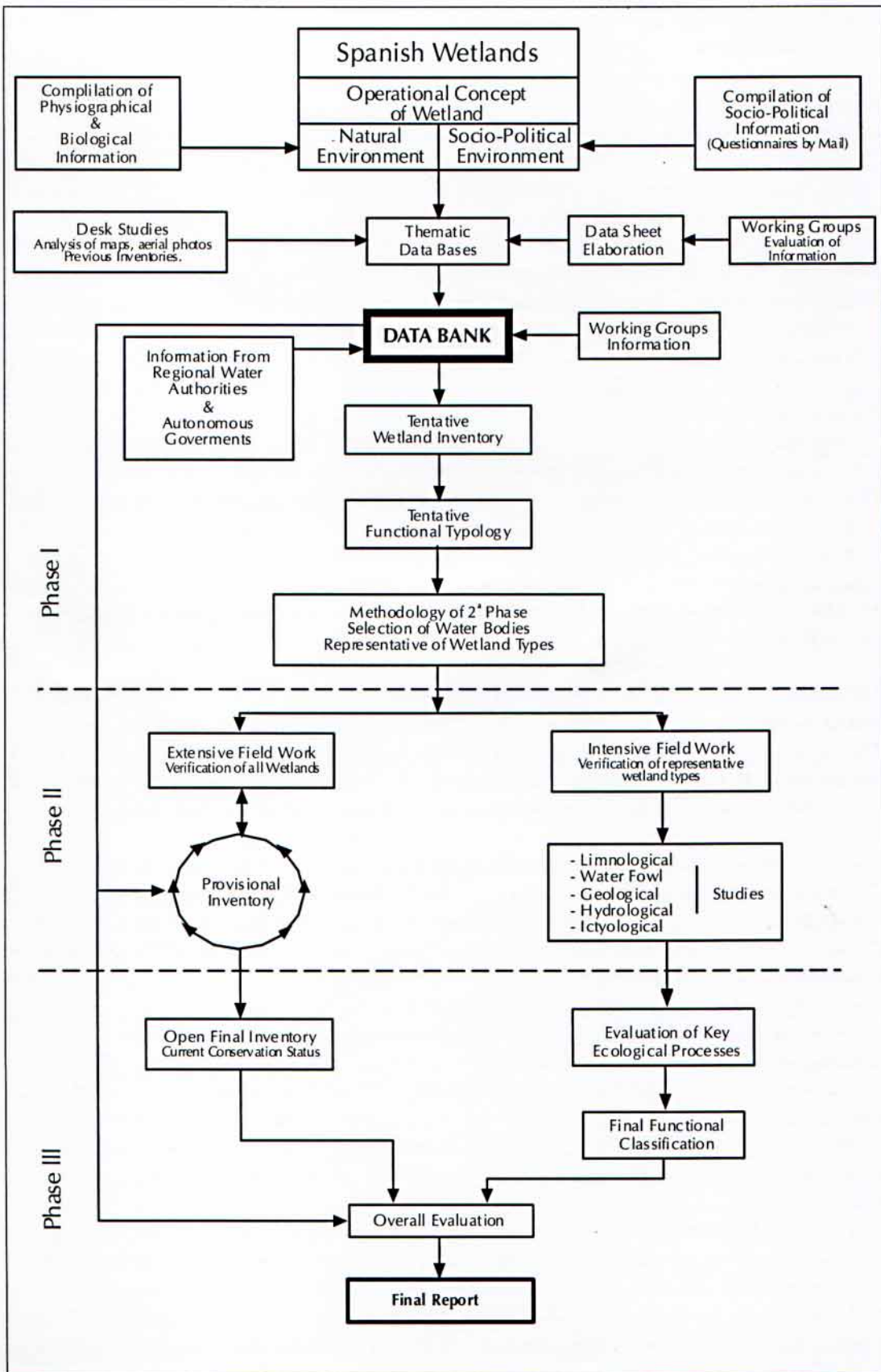


Fig 4.2.1
General planning for
the Spanish
inventory.

- e. the methodology to apply to the inventory
- f. the information to be obtained
- g. the development of a system of ecological classification both flexible and applicable to all inventoried units
- h. the design of systems of evaluation and control.

The methodological approach was designed to provide valuable information to managers, planners, and scientists from different organizations (regional, national, European and international), through a network of computer databases. This information would be an essential tool for the elaboration of programmes of sustainable development, protection, environmental evaluation, research, characterisation and analysis of environmental impacts, priority areas, information gaps, management of resources, land purchase, ecological restoration, monitoring, etc., related to wetlands.

Wetland definition

One of the first tasks undertaken by the multidisciplinary team was to adopt a conceptual and operational definition of a wetland applicable to all the palustrine areas of Spain. The definition used by the Ramsar Convention was considered too general and ambiguous to be used in the kind of wetlands common in Spain. To do this, the definition should match the level of accuracy with which that criteria will be applied. The definitions of the United States Fish & Wildlife Service for the US Wetlands Inventory (Cowardin *et al.* 1979) and that of Bernaldez and Montes (1989b) for Spanish wetlands, were used as a starting point. The definition adopted was:

“Wetlands, from an ecological perspective, are landscape functional units that are found within an environmental gradient, at one extreme of which are the typical terrestrial environments and at the other are deep-water aquatic environments (lakes and seas) and flowing waters (rivers). Conceptually speaking, they constitute the ecological borders or ecotones between the terrestrial and aquatic ecosystems, and are actually found on the borders of lakes, rivers and seas.

In addition, they are units of the landscape that are neither a river nor a lake or marine environment, but constitute a positive hydrological anomaly in both space-and-time with respect to their drier surroundings. The excess in humidity must be sufficiently important so as to affect the physical, chemical and biological processes of such areas. The excess of humidity will be reflected in:

- a. the presence, in a permanent, seasonal, or intermittent form, of a shallow film of water and/or a water table close to, at the same level, or above the ground surface
- b. the presence of hydromorphic soils
- c. the presence of hydrophytic vegetation.

A certain area constitutes a wetland if all three of these basic elements or only one of them occurs, but the hydrological state of the first element has to be always satisfied.”

Under this ecological definition of a wetland, a range of areas are included, from “hidden seepage” areas or areas of evapo-transpiration of groundwater where only the roots of phreatophyte plants are in contact with the saturated zone (wet meadows, sedge meadows, riparian woodlands, etc) to the palustrine formations of non-flowing, shallow bodies of water (ponds, bogs, sloughs, marshes, lagoons, floodplains, deltas, salinas, playa lakes, etc). Anyway, in most cases wetland landscapes are a space-time mosaic of both kinds of formations.

Within this ecological concept, lakes are not included. These are regarded as bodies of water of sufficient depth so as to maintain an organisational and functional stability on a light-gravity axis, and during the summer period the water column is stratified into layers of different density (epilimnion, thermocline, hypolimnion). In general, for the Spanish peninsula, a depth between 12–15 m defines the limit between lakes and wetlands.

Geographical units inventoried

The next step concentrated on the definition of the geographical units to be inventoried. The time and logistical constraints meant that the descriptive analysis was centred on a spatial scale, or inventoriable unit, centred in the water body itself and its basin (the physiognomic concept; a wetland unit is e.g. a saline lake, a fluvial marsh, an inland delta, etc). It was not possible, in this first phase, to carry out the National Inventory at a habitat scale (the area concept) as it was in the case of the United States Wetland Inventory (in which a wetland unit is e.g. a tidal flat, a rock bottom, an aquatic bed, an emergent wetland, etc).

The lack of time available also meant that it was not possible to include the areas of hidden seepage, or areas in which during most of the annual and inter-annual hydrological cycles only the root-zone of vegetation is moistened by the upper limit of the saturated layer. For this reason, it was not possible to include the riparian forests or large wet meadows.

In contrast, the lakes that are not considered as wetlands in a limnological sense, have been included in the inventory to optimize and standardize management criteria. On the other hand, these ecological systems include important areas of wetlands on their shores and basins that would have been excluded otherwise, since the habitat scale was not used. In this way, this Spanish Wetland Inventory becomes a characterization of the most important standing waters (wetlands and lakes) of marine and continental origin of the entire country.

Although this Spanish Wetland Inventory was originally thought of as an analysis of natural water bodies, older artificial wetlands were also included. These artificial wetlands, whose hydrological functioning had become to a large extent natural and independent of the fluctuations imposed by humans, have a remarkable interest as natural habitats for animal and plant species and/or communities of particularly interesting organisms. Examples of these historic wetlands include the coastal and interior salt pans both abandoned and currently in use. Rice fields were considered as a transformed part of old natural wetlands.

Reservoirs and gravel pits were not included, although they might have been important for certain populations of waterfowl. These kind of artificial systems have already been recognised by the Ornithological Society of Spain in an inventory of bodies of water especially important as habitats for waterfowl (SEO 1989).

Spain is not a territory of great lakes and wetlands, but it does have a rich heritage of abundant small bodies of water (more than 25,000). Given the impossibility of producing an inventory of all bodies of water on a national scale, size was used as a basic criterion, but not exclusively. In this way, a surface area equal to or greater than 0.5 ha was used as the initial criterion for inclusion of a water body in the inventory, although some wetlands of a smaller size, but of well-known environmental value, were also included.

The project was limited to mainland Spain, because the Balearic and Canary islands have their own specific water regulation laws. In a future phase of the inventory, which has already started, it is hoped to extend the area covered to include these islands.

Sources and analysis of information

In the preparation of the draft National Inventory for subsequent field verification, many complementary sources of information were used. Almost all available publications concerning Spanish wetlands were consulted, together with unpublished work from regional governments.

The Status of Wetland Inventories in the Mediterranean Region

Box 4.2.1
Fields recorded in the
information sheet of
Spanish wetland
inventory
MOPU – Dirección
General de Obras
Hidráulicas.

A. GEOGRAPHICAL AND ADMINISTRATIVE REFERENCE	code: name: place-name on the map: other names:	municipality: nearest town: province: autonomous region:	catchment area: sub-catchment area: altitude: map: utm coordinates: observations:
B. INVENTORY DATA	recording date: updating date:		
C. MORPHOMETRY	* OF THE WETLAND IN THE PRESENT CONDITION area: max. width: * OF THE WETLAND IN NATURAL CONDITION area: max. width: observations: bathymetric section profile nº:	perimeter: max. depth: perimeter: max. depth:	max. length: mean depth: max. length: mean depth:
D. CLIMATE	meteorological station no: relevance: name: period (years):	dominant wind direction: wind intensity: average rainfall: average temp:	average maximum temp: average minimum temp: absolute maximum temp: absolute minimum temp: type of climate:
E. GEOLOGY	lithology of the catchment: lithology of the basin:	genetic processes: observations:	
F. HYDROLOGY	persistence: hydrology: observations:		
G. HYDROGEOLOGY	aquifer classification: aquifer type:	permeability: permeability type:	
H. HYDROCHEMISTRY	date: colour: secchi disc: conductivity: pH: * CATIONS sodium: potassium: calcium: magnesium: dominant ionic composition:	total alkalinity: salinity: suspended solids: turbidity: dissolved oxygen: * ANIONS chloride: sulphate: carbonate: bicarbonate: ionic concentration:	* NUTRIENTS nitrates: ammonium: nitrites: phosphates: observations:
I. MICROORGANISMS	protists communities:	pigments primary production:	
J. FLORA AND AQUATIC VEGETATION	submerged aquatic plants floating aquatic plants	perennial marginal plants communities	*catena nº:
K. ZOOPLANKTON			
L. BENTHOS			
M. FISH	species	communities	
N. BIRDS	species conservation status	past status status variation	
O. HUMAN ENVIRONMENT	naturalness: conservation status: * LEGAL AND ADMINISTRATIVE ASPECTS land tenure: administration: * USES grazing coastal/littoral vegetation watering place water supply hydroelectric *IMPACTS drainage refilling totally cultivated partially cultivated surrounded by crops water extraction aquifer over-exploitation urbanization urban sewage	protection status: plans for protection: salt extraction hunting fishing educational recreational industrial sewage solid waste pesticides recreational pressure livestock alteration of vegetation stone extractions dredging	observations: medicinal baths others observation intensive aquaculture introduced species hydric regulation dams excavation reservoir on an ancient wetland others observations
P. SYNTHESIS AND ENVIRONMENTAL TYPES	wetland type environmental evaluation	environmental evaluation justification	recommendations observations
Q. BIBLIOGRAPHY			

All the documentation was included in a computerised database that contained references concerning the natural environment of each wetland. In this way, it was possible to obtain regional lists and information concerning the many aspects of the physical environment and biological communities, as well as the administrative and conservation status of many of the wetlands.

However, most of the information came from an exhaustive analysis of the 1:50,000 scale maps made by the Instituto Geográfico del Ejército and the Instituto Geográfico Nacional together with black-and-white aerial photographs scale 1:18,000 (vertical panchromatic). At these scales, it was easy to identify the 0.5 ha minimal unit. Aerial photographs from several different flights were used, but all were between 1978 and 1988.

Although at first it was intended to experiment with different types of remote sensing, in the end it was decided to use only high altitude stereoscopic aerial photography. At present, the technology of satellite imagery is not sufficiently developed to be used for identification, characterisation and classification of small wetlands with the required level of precision.

In order to evaluate the designed methodological scheme, and before applying it to the whole of Spain, a pilot study was carried out in two well-known wetland areas: the Wetlands of the Madrid Aquifer (Bernáldez and Montes 1989b) and the lagoons of the Upper Guadiana Basin (Florín *et al.* 1994). The pilot study demonstrated that the methods employed based on map and aerial photograph analysis produced very acceptable results, with very high levels of confidence, with respect to the number of wetlands registered, and lower levels of confidence depending on the morphometric variables considered (surface area, maximum length and width, perimeter, etc.).

An Information Sheet (see fields in Box 4.2.1), was designed in order to standardise, computerise and process all the data. Several computerised databases (still being developed) were used in a collective Databank.

Information contained in the Databank, together with that obtained from map and aerial photograph analysis was used to produce a preliminary inventory of Spanish wetlands and a tentative ecological classification.

Field methodology

The second phase of the project started with the collection of field data following two lines of research (Figure 4.2.1).

A team of field workers made an extensive survey throughout Spain, visiting the majority of the wetlands inventoried. In this way, the validity of the inventoried units was tested in terms of their acceptability within the defined wetland concept, and within the restrictions for their inclusion in the national inventory. This extensive survey also provided an updated overview of the conservation status of Spanish wetlands.

The second line of research was an intensive survey in greater detail of a series of wetlands, which were considered potentially representative of each one of the classes of wetlands within the provisional wetland classification. The multidisciplinary analysis of these wetlands allowed, on one hand, the testing of consistency within the defined classes and, on the other hand, the generation of some very general criteria of environmental evaluation towards their conservation.

Wetland classification

The objective of the third phase was to integrate all the information compiled in order to make an open National Inventory which had been checked in the field, through the modification and enlargement of the database wherever necessary. In this way, the basis for a functional classification of the Spanish lakes and wetlands was set. The final goal of this phase was to make an initial approximation of these water bodies to their environmental value.

Box 4.2.2

Tentative ecological classification of Spanish wetlands and lakes. Each type is defined by one or more key ecological processes explaining the structure and dynamics of Spanish wetlands.

A. INLAND			
1. High mountain	a. Lakes	1. Glaciokarst	
		2. Glacial	1. Circus 2. Valley
	b. Wetlands	1. Lagoons and pools	1. Glaciokarst 2. Glacial
		2. Peatlands	
2. Mid-elevation mountain	a. Lakes	1. Karstic	
	b. Wetlands	1. Karstic	
		2. Structural	
3. Sedimentation basins (Mediterranean)	a. Lakes	1. Tectonic	
	b. Wetlands	1. Plains in areas of river sedimentation (endoreic)	1. "Raña" type
			2. Saline steppe wetlands
			3. Dune complexes
			4. Steppe wetlands
			5. Regional underground flow discharge system
2. River valley in eroded areas (exoreic)	1. Floodplains		
	2. Oxbows, depressions in river valleys		
	3. Temporary watercourses and gully complexes		
4. Artificial		1. Inland saltworks	
		2. Farm ponds	
		3. Rice fields	
B. COASTAL			
1. Atlantic	a. Exposed coast	1. Lagoons and depressions	
		2. Lagoons associated to beach barrier-lagoon complexes	
	b. Sheltered coast	1. Open estuaries	
		2. Estuaries with barrier	
3. Tidal flats			
		4. Atlantic marshes	
2. Mediterranean	1. Deltas		
	2. Coastal lagoons		
	3. Coastal salt pans		

Regarding the classification system used in this National Inventory, it was necessary to develop a new typology, given that it was not possible, as explained previously, to use the one from the US Wetlands Inventory (Cowardin *et al.* 1979), since they use the concept of area and not the physiognomic concept (Cowardin 1982), and neither was the inventory model by the Ramsar Convention (Scott 1989) used, because it was too general.

An attempt was made to generate the basis for a functional classification. That is, to develop a system which organises information about the ecological processes that define the identity of the Spanish lakes and wetlands and which differentiates classes with common similarities from those in other classes. Each class or ecological type is homogeneous for a combination of environmental factors or ecological processes that characterise their organisation, functioning and dynamics.

In this kind of classification, the wetlands are understood as functional units of the landscape, very complex products of, generally, asymmetric interactions of morpho-topographical, structural,

climatological, lithological, tectonic, sedimentary, and hydrological factors. The descriptors that explain the ecological factors or their combination generated from their interaction and that define the functioning of the wetlands (mineralization of the waters, turbidity, ionic composition, nutrients, biological communities), can be characterised through knowledge of some mechanisms. These mechanisms explain the origin or genesis of the basins, and the way these systems obtain their water. For these reasons, the classification is referred to as genetic-functional, and the wetlands are considered as geographic-functional units. Given the Mediterranean character of the majority of Spain, the hydrological regime, with a pattern of unpredictable annual and inter-annual fluctuations, is the major organizing force of most of Spanish wetlands.

A general scheme of the provisional classification of the Spanish standing waters (wetlands and lakes) is presented in Box 4.2.2 but the final version is still being modified (Bernaldez & Montes, in press).

Preliminary results

Table 4.2.1 shows a summary of the general results obtained in the first stage of this national inventory. As the functional classification is not yet finalized, the inventoried units are grouped into seven large classes.

More than 90% of the recorded units are inland wetlands and lakes, most of them with Mediterranean character. The coastal wetlands in numerical terms are a far less important group. On the other hand, in terms of surface area, the inland wetlands comprise only 20% of the total wetland surface area whereas some of the coastal wetlands are very extensive. Six of the coastal wetlands together comprise 75% of the total wetland surface area (Marismas del Guadalquivir, Aiguamolls de l'Emporda, Bahía de Cadiz, Delta del Ebro, Mar Menor and Albufera de Valencia).

Due to the fact that the Spanish coastal wetlands, like those in the rest of the Mediterranean basin, maintain the greater percentage of waterfowl communities of the region (Dolz Garcia & Gomez Lopez 1988), they have been generally considered as more important than those of the interior, despite the fact that these interior wetlands perform important geomorphological, hydrological, bio-geochemical and ecological functions (Montes and Martino 1987).

Conclusions and recommendations

In the above, it has been attempted to show that Spanish wetlands are characterised by their abundance and by the variety and singularity of many of their ecological types. For this reason, wetlands have not only been considered here as functional landscape units (ecological systems), or only as habitats of species or communities of noteworthy organisms. We have thus found it necessary to develop a new classification criteria, data sheet system, and inventory scheme, different to those proposed by the Ramsar Convention and those suggested as guides for European inventories (Hughes in press, Scott and Jones 1992).

In the first stage of the working programme for this national inventory, which has now been finished, a true and up-to-date image of the abundance, ecological variety and conservation status of Spanish wetlands has been revealed. A preliminary databank of extensive information has also been created which provides an excellent tool for the development of research and management.

Type of wetland and lake	No. of sites	% No.sites	Area (ha)	% Area
Inland	1,275	92.9	16,421	13.6
High mountain	444	32.1	2,386	1.9
Karstics	81	5.8	784	0.6
Freshwater stepparians	637	46.2	4,805	3.9
Saline stepparians	99	7.2	5,212	4.3
Floodplains	14	1.1	3,234	2.6
Coastal	104	7.1	104,116	86.3
Mediterranean coast	54	3.9	32,944	27.3
Atlantic coast	50	3.6	71,172	59.5
Total		1,379		120,537

Table 4.2.1
General summary of results from the Spanish wetland and lake inventory.

Since the inventory is an open system, the work continues on several lines of research within two new projects financed by the Dirección General de Obras Hidráulicas (MOPTMA) and included within the programmes of the Plan Hidrológico Nacional (National Hydrological Policy).

In the first place it is intended to carry out an updating strategy (so as to include the wetlands of the Balearic and Canary Islands) as well as the coordination of the National Inventory with other similar programmes that are developed at different spatial and political levels (Autonomous Communities, ICONA-*Ministerio de Agricultura*, European Union, etc.). Although it is necessary to modify some aspects of the methodology, the planning scheme and the methods employed are easily exportable for coordination with other inventory projects.

The development of new technology in satellite imagery encourages the exploration of new possibilities and re-evaluation of the data obtained using maps and aerial photographs. In addition, efforts are made to bring a large-scale automated cartographic system to perfection, incorporating GIS, to be used as a tool to develop programmes on delineation and changes in land-use.

On the other hand, a multi-disciplinary team is starting to work on the elaboration of the basis for future manuals for identifying and delineating wetlands, as well as a manual for functional wetland assessment.

Finally, it is evident that policies for the conservation of Spanish wetlands need to include environmental education programmes, at several different levels, in order to create a greater public awareness of the value of these ecosystems and, thereby, encourage a positive attitude towards the necessity to preserve them for future generations. At the same time, it is important for the scientific community and land-managers to learn about our efforts to preserve these functional units which are such a unique part of our landscape. In this context, another series of sub-projects have been developed with the purpose of producing educational material such as hand-outs, pamphlets, information booklets and videos, and furthermore, to organise a forum, or international conference, devoted to wetland conservation and management.



4.3 France

Contributors: Geneviève Barnaud and Dominique Richard

France, one of the largest countries of Western Europe, occupies an area of 551,600 km² and has a population of 57,372,000 (1992). The country has extensive coastline to the north and the Atlantic to the west, with extensive shallow bays and estuaries which are important for migrating and wintering waterfowl. The Mediterranean coastline includes the large island of Corsica. The large river, the Rhône, runs between the Alps and the Massif Central into the Mediterranean, where the Camargue is another important wetland area for breeding, migrating and wintering waterfowl. Inland, the most important wetland sites include the Rhine valley and the shores of Lake Geneva.

Information on the Mediterranean region in France refers to the following administrative regions: Corsica (CS), Provence-Alpes-Côte d'Azur (PACA), and Languedoc-Roussillon (LR). The wetland type *étang* has been retained in French because it refers to various wetland types such as coastal lagoon, lake, pond which cannot always be distinguished further.

Coverage by international inventories

The Mediterranean region of France is covered in a number of international inventories, but only the major wetland areas are invariably included.

Project Mar (Olney 1965)

A total of 21 sites were chosen under this project as mainly important for waterfowl, three of which lie in the Mediterranean region: Camargue (1,425 km²), Etangs of the Languedoc region (275 km²), and Etang de Biguglia (15 km²).

Project Aqua (Luther & Rzóska 1971)

A total of 13 sites are listed for their limnological interest. The three sites in the Mediterranean region lie in the Rhone delta (Camargue).

A Directory of Western Palearctic Wetlands (Carp 1980)

A total of 39 sites, of which the Camargue (1,425 km²) and the Etangs of the Languedoc region (229 km²) lie in the Mediterranean region, are described, mainly for their ornithological interest.

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

A total of 42 sites are listed of which seven are situated in the Mediterranean region:

1. Etangs and salt-pans of the Roussillon region (150 km²);
2. Etangs and salt-pans of the Languedoc region (200 km²);
3. Salins d'Aigues-Mortes (320 km²);
4. Camargue (1,425 km²);
5. Etang et salins de Berre, Salins du Caban, Etangs de Lavalduc and Golfe de Fos (200 km²);
6. Salins d'Hyères et des Pesquiers (10 km²);
7. Etang de Biguglia and surrounding wetlands (16 km²).

Important Bird Areas in Europe (Grimmett & Jones 1989)

A total of 153 sites were included, of which 89 sites lie in wetland areas, 16 IBAs are islands or bays, and 18 IBAs are valleys surrounded by mountains. In the Mediterranean region 35 IBAs were identified, of which seven were islands or bays, six were gorges and valleys, and 12 can be considered as wetland sites in the strictest sense.

CORINE biotopes Database (European Communities – Commission 1991a,b)

A total of 976 sites of major importance for nature conservation in the European Community are listed in this database but not all sites are wetlands. 268 are wetland sites of which 38 are in the Mediterranean region, 19 in LR, 12 in PACA and 7 in CS.

International Waterfowl Census (IWRB)

Extracts from the International Waterfowl Counts in France, (Ligue de Protection des Oiseaux, pers. comm.) give a total of more than 700 sites. Of these, there are 18 sites comprised of a total of 59 sub-units in the Mediterranean region: seven sites in LR, comprised of 33 sub-units; eight sites in PACA, comprised of 13 sub-units; and three sites in CS. According to the IWRB database, 1206 sites have been covered, although some may not be regularly counted.

Directory of Marine and Coastal Protected Areas in the Mediterranean Region. Part 1. Sites of Biological and Ecological Value (UNEP/IUCN 1989)

Of the 12 areas in France in the Barcelona Convention as Mediterranean Specially Protected Areas, 4 are wetlands. There are Etang du Bagnas, the Camargue, Etang de l'Estagnol and Mas Lariou.

A Directory of Wetlands of International Importance, Part Three: Europe (Jones 1993)

A total of eight sites, two of which are in the Mediterranean region, Camargue (850 km²) and Etang de Biguglia (14.5 km²) are listed as Ramsar sites in this directory. Since then four new sites have been designated, none of these are in the Mediterranean region.

Analytical Work by the Council of Europe on Halophytic Vegetation (Dijkema et al. 1984)

Nineteen sites were identified in the Mediterranean region (13 sites in LR, two in PACA, four in CS).

Coastal wetlands of the European Community (Ménanteau 1991)

A total of 10 sites, among them the Etangs of the Bas-Languedoc region (300 km²) and the Camargue (1,400 km² of which 780 km² in the Grande Camargue) are included in this directory.

National wetland inventories

Several national wetland inventories have been compiled in France since the 1970s. The following inventories appear to be the most complementary in terms of their objectives.

Lacs, étangs, retenues (Lakes, ponds, dams) (Anon. 1971)

This inventory, organised by the Ministry of Environment (Water Services), used the replies from a survey by questionnaire and an analysis of academic research work. The results of the inventory included a map showing the following three main wetland types: lakes, ponds (marshes, swamps, extraction pits), dams (barrages, reservoirs), further divided into three categories according to surface areas (10–99 ha, 100–499 ha, 500 ha and above); a list of sites by surface area; and, a list by wetland type and by administrative region (*département*). In all, a total of more than 3,000 water bodies are classified and listed.

In the Mediterranean region: for LR, 32 coastal lagoons (265.6 km²) and 19 inland lakes and/or reservoirs (15.4 km²) were listed; for PACA, there were listed 34 coastal lagoons (267.5 km²) and 10 inland lakes and/or reservoirs (47.8 km²); and for CS there were 13 coastal lagoons (30.9 km²) and six inland lakes and/or reservoirs (2.8 km²). The inventory was used as a national inventory on water quality and for general information purposes.

Zones humides d'importance internationale et autres zones humides (Wetlands of international importance and other wetlands) (Le Duc 1979)

This inventory was part of the Project Mar (IUCN), organised nationally by the National Museum of Natural History. The methods employed were bibliographic studies and an adaptation of the MAR (IUCN) classification system. The resulting products were a map and a list of sites but without any indication of wetland type or surface area. A total of 72 sites, 28 of which are of international importance, and 44 other important wetlands are listed. No surface areas are supplied. More specifically, in the Mediterranean region, three sites of international importance (Étang de Biguglia, Etangs of the Languedoc-Roussillon regions, Camargue), and two other important wetlands (Étang de l'Estagnol, Etangs and marshes of Casabianda) are given. The main use of the inventory was to identify priority sites for conservation purposes.

Atlas des réserves d'avifaune aquatique (Atlas of waterbird reserves) (Derenne 1979)

Under the Ministry of Environment, this inventory was organised by the Directorate for Nature Conservation – Ministry of Environment. The various methods employed included the use of the descriptions of the administrative aspects of sites (legal status, map, management practices), a bibliographic study, and an information enquiry of nature conservation agencies and hunting federations. There is no classification of wetland types, but a classification by legal status of the reserves (*maritime, fluviale, approuvée, naturelle, libre*, ornithological park, and others) was made. The results showed that France as a whole has a total of 434 reserves covering 3,120 km² and 1,395 km of continental coastline. In the Mediterranean region, there are 90 reserves, covering 968 km² and 280 km of continental coastline, 27 km of island coastline and 17 km of riverine coastline. The purpose of the inventory was mainly to assess current knowledge.

Inventaire des tourbières de France (Inventory of peat-bogs in France) (Géhu et al. 1981)

Organised by the European Institute of Ecology of Metz, Ministry of Environment – Directorate for Nature Conservation, the methods used were a bibliographic study and information enquiry.

The results showed a total of 893 peat-bogs, of which 68 peat-bogs were considered to be of prime importance. In the Mediterranean region there were 46 peat-bogs listed, 30 in LR, 12 in PACA and four in CS. Four peat-bogs were considered of prime importance, one in Languedoc-Roussillon, and three in Corsica. The inventory was used for general knowledge and for proposals of conservation measures.

Inventaire préliminaire des zones de protection spéciale pour la conservation des oiseaux et des zones dans le cadre de la "Directive Oiseaux" (Preliminary inventory of special protection areas for the conservation of birds and of areas listed under the framework of the "Birds Directive" (Marion 1982)

Conducted by the National Museum of Natural History for the European Community, this inventory employed a bibliographic study and consulted with ornithological and conservation NGOs. The application of the criteria applied under the Birds Directive and those under Ramsar, and the distinction between sites of Type 1 (wetlands and coastal areas in France to be strictly protected) and sites of Type 2 (large wetlands and coastal areas in France where all activities have to be subjected to an environmental impact assessment) was made. The results showed a total of 123 sites, including 23 sites of terrestrial habitat, and 59 wetland sites of Type 2 within which there are 82 areas of Type 1 identified, plus a further 14 individual sites purely of Type 1. Surface areas are not supplied. A total of 14 sites lie in the Mediterranean region: five of Type 2, five strictly of Type 1, eight of Type 2 and Type 1, and one site of Type 1. The inventory was mainly for information purposes and to help proposals for conservation measures.

Zones humides d'importance majeure pour les anatidés (Wetlands of major importance for Anatidae) (Yésou 1983)

This inventory was conducted by the *Office National de la Chasse* (National Hunting Organisation) on behalf of the Inter-Ministerial Commission on Natural Heritage. It was compiled from existing inventories and through a bibliographic study, and used a simple classification of 10 categories presented in an overview by site, including maps. A total of 26 sites were classified. There are three sites in the Mediterranean region, covering the Etangs of the Languedoc-Roussillon regions (296 km²), the Camargue (1,400 km² of which 140 km² are *sansouïre* – Mediterranean temporary saltmarsh, 254 km² are agricultural land, and 240 km² are salt-pans), and the Etang de Biguglia and surrounding wetlands (16 km²). The use of the inventory was to help with proposals for conservation measures and for information purposes. The details described include: the natural environment, the general ornithological value (migration, wintering and breeding), the migration and wintering of Anatidae, the existing reserves, proposals for the maintenance and the improvement of the natural values and maps.

Fichier national des zones humides (National wetland database) (Mustin 1984)

This was conducted by various consultancies for the Ministry of Environment – Research Service. Methods used were that of a bibliographic study and enquiries from regional environment agencies (DIREN), while the analysis used existing classification systems. As regards results, no overall evaluation was made, but 16 sites were identified in the Mediterranean region: 11 in LR and five in PACA. The surface areas were not always indicated and Corsica was not included.

The inventory was a feasibility study for a national wetland database aimed at the regular evaluation of the impact of large drainage projects and of agricultural development. An interim report summarized the situation by region, but the database itself has not been completed yet.

Zones humides françaises: leur vocation agricole. (Wetlands in France: their agricultural value) (Tesson & Schricke 1987)

This is another inventory conducted by the Office National de la Chasse and which was mainly a bibliographic synthesis. The results show a total of 40 sites covering a total surface area of 16,000 km², representing 2.9% of the national territory. More specifically, in the Mediterranean region, the areas include brackish marshes of the Camargue (300 km²), four sites in the Etangs of the Languedoc-Roussillon region (300 km²), and rice-fields (120 km²). The data on other wetland types in the Mediterranean region cannot be extracted from the overall figures (Table 4.3.1). The inventory gave a knowledge of wetland areas used for agricultural purposes and of the most important sites with a salt-water, brackish or fresh-water environment, and gave proposals for the use of these sites while still favouring waterbird populations.

Type of wetland	No. of Sites	% No. of Sites	Area (ha)	% Total Area
Saline and brackish wetlands	16	40	100,000	6.3
salt meadows	4	10	10,000	0.6
brackish marshes protected by embankments (Atlantic coast)	7	17.5	30,000	1.9
brackish marshes of the Camargue	1	2.5	30,000	1.9
ponds and lakes ("étangs") du Languedoc-Roussillon	4	10	30,000	1.9
Fresh water wetlands used for agriculture	13	32.5	200,000	12.5
reedbeds	5	12.5	30,000	1.9
cultivated marshes	2	5	8,000	0.5
rice fields	1	2.5	12,000	0.7
fishponds	5	12.5	150,000	9.4
Fresh water wetlands used for any types of agriculture	11	27.5	1,300,000	81.2
wet meadows	5	12.5	1,000,000	62.5
wet heathlands	2	5	20,000	1.2
peatlands	2	5	30,000	1.9
damp woodlands	2	5	250,000	15.6
Total	40		1,600,000	

Table 4.3.1
Summary of the results of:
Zones humides françaises: leur vocation agricole.
(Tesson & Schricke 1987)

Principales zones humides françaises métropolitaines (Major wetland areas of France) (Bazin 1990)

Another inventory conducted by the Directorate for Nature Conservation – Ministry of Environment. This inventory was also a compilation of existing inventories, a bibliographic study and an information enquiry from various sources. The results gave a total wetland surface area in France estimated at ca. 15,500 km², (excluding mud-flats, marine habitats, water courses and large lakes) i.e. 3% of the national territory. In the Mediterranean region, the nine lakes and marshes considered cover 600 km²; the data regarding the other wetland types in the Mediterranean region cannot be extracted from the overall figures (Table 4.3.2). The inventory was used for the wetland conservation programme where only 4% of wetlands benefit from protective legislation.

Type of wetland	No. of Sites	Area (ha)	% Total Area
Salt meadows	?	10,000	0.6
Atlantic marshes protected by embankments	7	30,000	1.9
Mediterranean lakes/ponds ("étangs") and marshes	9	60,000	3.8
Alluvial floodplains	10	700,000	45.2
Freshwater coastal marshes	10	300,000	19.4
Ponds areas	5	150,000	9.7
Reedbeds, riparian woodlands, peatlands, wet heathlands, etc.	?	300,000	19.4
Total		1,550,000	100

Table 4.3.2
Summary of the results of:
Principales zones humides françaises métropolitaines (Bazin 1990)

Réserves naturelles (Natural Reserves) (Richard 1989, Barnaud 1990)

Organised jointly by the National Museum of Natural History and the Directorate for Nature Conservation – Ministry of Environment. The inventory was compiled from existing inventories with the addition of a bibliographic study, and incorporated use of the CORINE-Biotope classification. In all, of 98 Natural Reserves censused in 1989 nationwide, 66 were wetlands or a part of their surface area consisted of various wetland habitats. In the Mediterranean region, 24 Natural Reserves were censused, of which 14 consist totally or partially of wetland habitat, covering a total surface area of 321 km². Several CORINE-Biotope types can be encountered within the same reserve. The inventory brought together much information useful for proposing conservation measures.

Inventaire français des Zones de grand Intérêt pour la Conservation des Oiseaux sauvages (ZICO) dans la Communauté Européenne ZICO (French inventory of the areas of special interest for the conservation of wild birds [ZICO] in the European Community) (Rocamora & Thauront 1992)

This inventory also used consultancies on behalf of the Directorate for Nature and Landscapes – Ministry of Environment. The methods used were the same as for the directory “Important Bird Areas”, the compilation from existing inventories, but a very wide-ranging survey was completed. The results show a total of 285 sites (including all types of habitat), which together constitute 8% of the total surface area of France and, in addition, 98 sites which meet the Ramsar criteria.

In the Mediterranean region, a total of 60 ZICO (LR 26, PACA 28, CS 12), covering 11,951 km², and representing 22.1% of the total surface area in the LR-region, 14.1% in the PACA-region and 10.8% in CS, are listed. Amongst the ZICO which meet the Ramsar criteria there are 10 sites (673 km²) in LR, one stretching across the border between LR and PACA (210 km²), five sites (855 km²) in PACA, and two sites in CS (72 km²). Certain ZICOs should also be mentioned here as they represent a particularly interesting wetland type: six sites in PACA (206 km²); two sites in PACA (89 km²) and five sites in CS (516 km²) belonging to the category of marine and island wetlands. Since the classification is not hierarchical, it is not possible to summarize the results per habitat type. The information gathered is most useful for proposals for conservation purposes.

Identification de zones humides d'importance majeure au plan national (Identification of wetlands of major importance on a national scale) (Lierdeman & Mermet 1992b)

This inventory used a consultancy on behalf of the Directorate for Nature and Landscapes – Ministry of Environment. This very wide-ranging enquiry was compiled from existing inventories, and used a very simple classification system consisting of four types (see Table 4.3.3), the development of this work having been carried out under the framework of the Wetland Monitoring Agency, *Observatoire des zones humides*. Apart from peat-bogs and other high-altitude wetlands, 70 sites are listed, classified into four types, covering 20,800 km², of which 17,721 km² are inland wetlands and 3,000 km² are open water areas (lakes, estuaries, bays etc). To this total should be added 16 major peat-bog areas and/or other smaller wetlands.

Under the category “coastal, Mediterranean wetlands”, eight sites (2,420 km²) are listed, two in LR, three in PACA and three in CS. Uses of the inventory include general information purposes, the identification of threats, monitoring of wetland sites, and the formulation of proposals for conservation purposes.

Table 4.3.3
Summary of the results of: *Identification de zones humides d'importance majeure au plan national* (Lierdeman & Mermet 1992b)

Type of wetland	No. of Sites	% No. of Sites	Area (ha)	% Total Area
Coastal wetlands	29	41.4	912,000	43.8
Atlantic and Channel	21	30.0	670,000	32.2
Mediterranean	8	11.4	242,000	11.6
Inland wetlands	41	58.6	1,169,500	56.2
Alluvial valleys	23	32.8	464,000	22.3
Pond areas – marshes in inland plains	18	25.7	705,500	33.9
Total	70		2,081,500	

Inventaire national des Arrêtés préfectoraux de biotopes (National inventory of Prefectorial orders on biotope areas) (Baron & Rozoux 1993, Dehondt 1993)

These Prefectorial orders, which are implemented under the law of 10-7-1976 (*Protection de la Nature*), are made by the *Préfet* of the *Département* and protect the habitat of animal or plant species which are also protected at the national and international level. Undertaken by the National Museum of Natural History, on behalf of the Directorate for Nature and Landscapes – Ministry of Environment, this national inventory conducted a systematic

enquiry of the regional environment agencies, through the completion of questionnaires (covering administrative, geographical, and biological aspects). It used a simplified version of the CORINE-biotopes classification. The results in the Mediterranean region show a total of 40 prefectorial orders, covering a surface area of 265.3 km², among them 15 wetlands (51.1 km²) (see Table 4.3.4).

Type of wetland	No. of Sites	% No. of Sites	Area (ha)	% Total Area
Marshes	1	6.7	70	1.4
Lagoons	2	13.3	210	4.2
Lakes - ponds	5	33.3	3,720	74.3
Slow flowing water courses, Riparian woodlands	6	40.0	950	19.0
Islets	1	6.7	60	1.2
Total	15	100	5,010	100

Table 4.3.4

Summary of the results of: *Inventaire national des Arrêtés préfectoraux de biotopes* (Baron & Rozoux 1993, Dehondt 1993)

Inventaire national des Zones Naturelles d'Intérêts Ecologique, Faunistique et Floristique (ZNIEFF) (National inventory of natural areas of ecological, faunistic and floristic interest [ZNIEFF]) (Barnaud & Richard 1993a)

Under the National Museum of Natural History, on behalf of the Directorate for Nature and Landscapes - Ministry of Environment, this national survey of interesting areas, including wetlands among other habitat types, was conducted by scientific teams in each region and involved the collection of bibliographic data, fieldwork, validation of data, and the completion of survey questionnaires (covering administrative, geographical and biological aspects).

A simple classification system was adopted for wetlands. The system is comprised of 20 categories and distinguishes between areas of Type I (areas of generally limited surface area, characterised by the presence of rare species or habitats that are rare, outstanding or represent natural heritage on a national or regional level) and those of Type II (large natural or hardly modified landscapes or areas with important biological potential).

The following criteria were applied for the listing of a site:

- i. the presence of rare and/or endangered species and/or groups of species
- ii. the presence of ecologically or chorologically marginal communities
- iii. the presence of unique, little disturbed ecosystems
- iv. the presence of areas with a strong biodiversity.

The criteria for the delineation of wetlands were based on vegetation and on geomorphology. The data is stored in a data management system (Oracle on an IBM RS6000). The cartographic data is stored in the Geographic Data Information System, Arc-Info. The records are regularly up-dated.

In 1993, 14,000 ZNIEFF were censused in France. About 30,000 km² of wetlands, i.e. 5.6% of the total surface area of France were classified under Type I (areas of outstanding biological interest). The Mediterranean region contains a total number of 1,257 ZNIEFF. Of these, 413 areas, covering 1,268.8 km², are classified under ZNIEFF Type I, which features "wetlands" as a main category (Table 4.3.5). By region, this represents 199 sites in LR (348 km²), 123 sites in PACA (684.4 km²) and 91 sites in Corsica (236.4 km²).

Table 4.3.5

Summary of the results of: *Inventaire national des Zones Naturelles d'Intérêts Ecologique, Faunistique et Floristique (ZNIEFF)* (Barnaud & Richard 1993a)

Type of wetland	No. of Sites	% No. of Sites	Area (ha)	% Total Area
Marine and Coastal				
Open sea (near the coast)	2	0.5	1,620	1.3
Bay, strait				
Estuary, delta	14	3.4	2,070	1.6
Rocky shore	25	6.1	9,350	7.4
Cliff	16	3.9	6,500	5.1
Beach (sand, shingle)	11	2.7	1,600	1.3
Dune	17	4.1	3,810	3.0
Island, islet	22	5.3	8,210	6.5
Lagoon, lake and marsh - salt water (coastal)	42	10.2	45,580	35.9
Lake, pond and marsh - fresh water (coastal)	16	3.9	2,650	2.1
Salines (marais salants)	10	2.4	2,710	2.1
Tidal mudflats	2	0.5	1,770	1.4
Salt Meadow	9	2.2	2,020	1.6
Inland				
(Fast flowing water course)				
Slow flowing water course	62	15.0	14,170	11.2
Lake, reservoir, pond	68	16.5	12,860	10.1
Marsh, peatland	80	19.4	10,840	8.5
Wet meadow	16	3.9	1,060	0.8
Salt basin (Bassin salé)	1	0.2	10	0.01
Total	413	100	126,880	100

The many uses of the inventory include the identification of potential and current threats, monitoring of valuable conservation sites, and the use of information in conservation proposals and as a planning tool, as well as for general information purposes.

Regional inventories

It is noteworthy that thematic or regional inventories exist which have not been summarised here under the general category of national inventories but which are highly valuable additional sources of information. These deal, for example, with wetlands on the eastern coast in Corsica (Frisoni 1978), with southern wetlands (Roux 1989), with high-altitude lakes (Gauthier *et al.* 1984) or in the Languedoc-Roussillon region with the analysis of lacustrine environments (AQUASCOP 1979, Frisoni 1990), and in the Provence with the evaluation of land-use in the Camargue (Tamisier 1990, A.R.P.E. 1992).

Conclusions and recommendations

Data is still collected either for the publication of various national atlases or for the development of the Natural Heritage Monitoring Agencies, *Observatoires du patrimoine naturel* (waterbirds, mammals, reptiles, amphibians, threatened areas). There is a proposal for the establishment of a Wetland Monitoring Agency, *Observatoire des Zones humides* (Lierdeman & Mermet 1992a, b, c), which would use data collected for other purposes and re-organize it in the form of regional and national assessments of the wetland situation. This project depends partly on the outcome of the programme on the evaluation of conservation, management and administration policies on wetlands, which was initiated in 1993 at the request of the Ministries for Environment and Agriculture. It included the investigation of nine sites in a survey in the Mediterranean region: the Etangs and salt-pans of the Roussillon region, from Canet to Vendres; the Etangs and salt-pans of Languedoc from Agde to la Grande Motte; the Camargue; the wetlands between the Rhone and the Crau, Fos and Etang de Berre; the wetlands of the Hyères area; the Gulf of Porto and the peninsula of Scandola and Galéria; the Etang of Urbino and associated wetlands; the Etang de Biguglia; and the Pozzines du Plateau de Coscione.

The Governmental Water Agencies, *Agences de l'Eau*, will take important wetlands into account in respect to the functioning of river-flow systems, when they establish the Water Management and Administration Schemes, *Schémas d'Aménagement et de Gestion des Eaux* (SAGE), for hydrographic units, under the Water Act of 1992.

The increased use of the GIS system in the National and Regional Parks and in certain regional government agencies might also contribute to inventories of various ecosystems. The establishment of the Regional Environmental Monitoring Agencies, *Observatoires régionaux de l'environnement*, is being investigated; these would also gather information on natural habitats and would thereby contribute to existing inventories.

On a European level, the implementation of the Habitats Directive and of the future network, Natura 2000, supports the importance of various interesting habitats, some of which are wetlands. The ZNIEFF inventory serves as the basis for this work and will therefore be updated and made complete. In particular, a method for surveying marine ZNIEFFs proposed in 1993 (Dauvin 1993), will be tested in the Mediterranean regions in 1994. At the same time the CORINE biotopes classification system is being adapted to the situation in France, which will contribute to the mutual compatibility of inventories.

The CORINE Land Cover programme, established to compile maps of ecosystems on a scale of 1:100,000, is being carried out. It also covers coastal wetlands (coastal marshes, salt marshes, salt-pans and inter-tidal areas) and inland wetlands (inland marshes, swamps, peat-bogs), using

satellite imagery, Landsat-Thematic-Mapper or SPOT (IFEN 1993). It is planned eventually to super-impose the ZNIEFF-maps and the eco-zone-maps together.

The LIFE programme includes the establishment of programmes for the conservation and management of wetland areas on a national scale. Some of the Etangs of the Languedoc-Roussillon region are included in these projects, which will also result in a summary (maps and classification of sites). At the same time, large wetland areas are taken into account in the framework of the Agro-Environmental Regulations (EEC No 2078/92), and inventories and monitoring programmes are planned.

Finally, it is also planned to develop further the list of Wetlands of International Importance (Ramsar) in France. At present, two sites in the Mediterranean region have been designated (Camargue, Etang de Biguglia), while a project for the designation of La Petite Camargue gardoise (part of the Camargue which is in the Gard *département*) and La Petite Camargue héraultaise (part of the Camargue which is in the Hérault *département*) is currently under study.

The data collected for these many national and international programmes will contribute to the knowledge of wetlands on a national level (Barnaud & Richard 1993b), and to the knowledge of wetland sites within the Mediterranean area.



4.4 Italy

Contributors: William Pratesi Urquhart and Alessandro Montemaggiore

Italy covers an area of 310,278 km² and has a population of 57,809,000 (1992). The climate varies considerably, the south having a Mediterranean character, while the north is colder and rainfall is more or less evenly spread throughout the year. Italy can be subdivided into four geographic and vegetative zones: the Alps in the north, the Po valley in the northeast, the coastal zones and the Apennines that include the rest of the country.

In Roman times, 10% of Italy (3 million ha) was covered by wetland habitats. Only 764,000 ha remained by 1865, and by 1972 this had diminished to only 190,000 ha. A Special Committee of the Senate dealing with ecological problems recommended, in 1972, that the remaining wetlands should be preserved and protected as useful and necessary for maintaining an ecological balance in the country as a whole. Some large wetland complexes still exist, particularly along the northwest shores of the Adriatic (Laguna di Marano e Grado, Laguna di Venezia, Delta del Po and the Valli in the Provinces of Ferrara and Ravenna); all of them still retain a most interesting flora and fauna, and the remnants of their former characteristic landscapes. Only a few wetland reserves exist along the Tyrrhenian coast (Bolgheri, Orbetello, Burano, Saline di Tarquina and Circeo National Park). The wetlands of Sardinia are important to migrating and wintering waterfowl, while some of the wetlands in Sicily are important staging posts for migratory waders. A number of wetlands of the mountainous regions in Northern and Central Italy, and others situated in Puglia and Sicily rate as internationally important because of their limnological interest (IUCN 1990).

Coverage by international inventories

Project Mar (Olney 1965)

There are 5 areas listed under category A and 2 sites are listed under category B. Information is provided on the location and extension of the wetland areas along with a brief description of each site and information on local waterfowl populations.

Project Aqua (Luther & Rzóska 1971)

A total of 12 Italian sites is covered (a thirteenth, lago di Lugano, is covered as being in Switzerland).

A Directory of Western Palearctic Wetlands (Carp 1980)

In the Italian section, a table indicating the name, coordinates, size, wetland criteria and conservation status of 76 sites is given. This is followed by a more detailed description of 12 of these sites (102,007 ha are covered in this section).

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

A list of 49 important sites giving brief details about position (coordinates), size (total 302,762 ha), protected area and simple habitat codes. Maximum or mean bird presence is indicated for main breeding waterfowl species as well as migrating and wintering species.

Important Bird Areas in Europe (Grimmett & Jones 1989)

A total of 140 sites are listed (many of which comprise a number of sub-sites) covering an area of over 3,510,000 ha. 52 of these sites are wetlands areas, some of them including more than a single wetland. A large number of other sites are dry habitats including some restricted wetland areas, e.g. mountainous area with rivers and streams. These were proposed by ICBP and IWRB to be included in the Shadow List of Wetlands of International Importance (Langeveld & Grimmett 1990), covering a minimum area of 272,812 ha.

CORINE biotopes Database (European Communities – Commission 1991a,b)

The CORINE biotopes data for Italy are often out of date. However, under its Bio-Italy project, the *Ministero dell' Ambiente* (Ministry of Environment) is updating the CORINE data by means of an information sheet. This sheet includes extra data such as whether an area is a Ramsar site, etc. The data that are collected from these detailed questionnaires will form the basis of the *Ministero dell' Ambiente's* databank on wetlands.

International Waterfowl Census (IWRB)

The IWC database holds data on 551 sites, though 84 sites were counted in 1993 (Rose & Taylor 1993).

A Directory of Wetlands of International Importance, Part Three: Europe (Jones 1993)

In the volume published in 1990 (IUCN 1990), 45 wetlands of International Importance are inventoried with a varied degree of coverage. The 1993 Directory (Jones 1993), covers 46 Ramsar sites in greater detail. The new information is based on the data published in the *Inventario delle Zone Umide del Territorio Italiano* (De Maria 1992).

Directory of Marine and Coastal Protected Areas in the Mediterranean Region. Part 1. Sites of Biological and Ecological Value (UNEP/IUCN 1989)

The 1989 Directory lists ten sites as Mediterranean Specially Protected Areas under the Barcelona Convention. To date, a total of 17 sites have been designated, of which three are wetlands: Burano, Orbetello and Circeo.

National inventories***IBA Italia (Lambertini et al. 1990)***

As in the IBA-Europe, 140 sites were inventoried (of which 52 are wetlands). Another 19 sites (of which 10 are wetlands) were listed as proposed areas for inclusion in the next list of IBAs.

Documenti per una politica di gestione naturalistica del territorio italiano (Pavan 1990)

This provides a series of thematic maps followed by long tables listing protected sites for the whole country, not only wetlands, giving references about institutional decrees, size, province, etc. The 45 Italian Ramsar sites designated in 1990 are listed in a separate table. Special tables with maps cover territories by province.

Registro delle Aree Protette Italiane (Ministero dell'Ambiente 1991)

This publication lists, by region, wetlands that are protected and gives the total area protected as 53,930 ha.

Elenco delle zone umide italiane e loro suddivisione in unità di rilevamento dell'avifauna acquatica (Baccetti & Serra 1994)

This wetland inventory published recently by the Istituto Nazionale per la Fauna Selvatica (INFS) lists 2,013 different sites in Italy, to be used as single units for the International Waterfowl Censuses. For all sites the following information is given: a code, name, location (Comune, Provincia and Region). The more important regional literature is cited. A shorter list is given identifying 145 sites as those being where IWC counts should preferably be carried out, although many more sites should ideally be used. The list of 145 sites includes those holding more than 500 individual waterfowl (Anatidae and Coot only), recorded according to the data of the INFS. There is also a list of 15 small island wetlands which are very important areas for migrants. Forms for the collection of standardized additional information on each site, according to IWRB criteria, are also presented as annexes.

Official list of Protected Areas (Gazzetta Ufficiale della Repubblica Italiana 1994)

The official list of Protected Areas approved under the Frame law for Protected Areas (394/91) 21 December 1993, identifies a category of "wetlands" of international importance (as designated under the Ramsar Convention). 34 of the Italian Ramsar sites are included on this list. The remaining Ramsar sites are not included on this list as the existing protection measures for these sites do not conform with the laws/regulations outlined in Law 394/91.

Inventario delle Zone Umide del Territorio Italiano (De Maria 1992)

Aquater Spa, part of the ENI group, was commissioned to compile the inventory of wetlands in the Italian Territory on behalf of the Ministero dell'Ambiente, Servizio Conservazione della Natura.

Methodology

The aim was to produce a detailed inventory of wetlands of both international and national importance present within the Italian national territory. For reasons of homogeneity the wetlands were designated as being of importance according to a set of criteria involving both qualitative and quantitative data relating to the presence of waterfowl.

PHASE 1. Expert Group

A multidisciplinary group of experts that included Naturalists, Biologists, Foresters, Agronomists, Chemists and Geologists was set up. A specialist consultancy Hystrix (experts in environmental studies and nature research) was also consulted.

PHASE 2. Literature search

Bibliographic research was carried out in order to identify wetlands in Italy. The aim of this was to collate as much of the available information in order to gain a general picture of the national situation. To obtain the information the following were contacted:

- Public bodies: Regional, Provincial administrations.
- Research bodies: Universities, Istituto Nazionale per la Fauna Selvatica, Civic museums.
- Environmental Associations: WWF, LIPU, Lega Ambiente.
- Natural Parks and Reserves management bodies.
- Individual experts in the field.

The main problems encountered during this initial phase were due to either the incomplete nature of the material available, or to obstructive bureaucracy.

PHASE 3. Analysis of the bibliographic material

The material collected was studied, evaluated and classified and a primary list of wetlands in Italy was produced. The list comprised 597 areas; however, this list should not be considered exhaustive in that: it was difficult to obtain accurate data from some areas where little research has been carried out; the initial study was aimed at identifying wetlands that represented particular environmental emergencies; and there were gaps in the information provided from official sources.

For these 597 areas, information sheets containing some data (name, location, extension, ownership, degree of protection, ecological, hydrological and morphological aspects) have been partially completed. This list and associated information has as yet not been published.

PHASE 4. Selection criteria for wetlands of international and national importance

From the initial list of 597 Italian wetlands, 103 were designated according to the selection criteria as being of international or national importance, as based on quantifying the natural value of each area. They were subsequently subjected to a more detailed study and included in the final report. The selection criteria were chosen with the aim of presenting as homogeneous a picture as possible of the national situation.

Where data was lacking, the literature search was supplemented with field research. The bibliographic information available on the status of wetlands in the Italian territory is fragmentary, diverse and non-homogeneous, and thus did not always allow for coherent analysis. Often data either did not exist or it was difficult to obtain (lack of a central databank, data unpublished, lack of funds, etc).

The selection criteria used in this study are based on the bibliographic information available, the indications produced at the various Ramsar Convention conferences, and make use of the following wetland characteristics:

- the presence of large numbers of waterfowl;
- the presence of species or sub-species of threatened, rare or vulnerable animals;
- recognition of the particular value of an area for the presence of waterfowl at a critical stage in their biological cycle.

The sites were chosen/identified on the basis of:

- recognition of their international importance under the Ramsar Convention, and sanctioned by Ministerial decree;
- quantitative limits;
- qualitative limits;

Quantitative limits were defined as:

a. the threshold by which a wetland was deemed as being of international importance was:

- when an area regularly hosts 10,000 Anatidae, or 10,000 coots, or 20,000 waders; or
- when an area regularly hosts 1% (at least 100 individuals) of the biogeographic population of a species or sub-species of waterfowl; or

- when an area regularly hosts 1% of the nesting pairs of the biogeographic population of a species or sub-species of waterfowl.
- b. the threshold by which a wetland was deemed as being of national importance was:
 - when an area regularly hosts 5,000 ducks or 5,000 coots or 10,000 waders or
 - when it regularly hosts 10% (at least 10 individuals) of the Italian population of a species or sub-species of waterfowl; or
 - when it regularly hosts 10% of the nesting pairs of the Italian population of a species or sub-species of ducks.

Qualitative limits for an area to be recognised as being of international importance were:

- when it hosts an appreciable number of individuals of a species or sub-species of birds or mammals that are rare, vulnerable or under threat; or
- when an area is of particular value as a habitat for ducks, coots and waders at a critical stage in their life cycle.

As regards the first qualitative limit it became clear that due to the actual available information (because of a lack of homogenous data) that it was not possible to evaluate the importance of an area exclusively on the basis of the presence of vulnerable species. Vulnerable species, especially birds, were therefore considered as a whole and in strict correlation with quantitative data. As far as mammals were concerned, the only species considered was the Otter (*Lutra lutra*), which is threatened and has strong ties with the aquatic environment.

The importance, relative to the presence of waterfowl on the basis of quantitative criteria, was extrapolated principally from the winter census data and in part by census data on nesting and migratory species. This census data, used for the quantitative analysis, was supplied by the INFS (waterfowl winter-census in Italy). This data does not give a complete picture for some regions of Italy either because it was incomplete, or because it was unreliable, due to the collection methods used in some regions.

The winter censuses, compiled in January, demonstrate the richness of an area only as far as overwintering waterfowl are concerned. It is therefore possible that areas of high ornithological value, both for the nesting and resting sites for migratory birds, have been excluded. For example, in Basilicata, the overall picture could not be evaluated owing to unpublished census data; census data was also unobtainable for Sardinia. This deficiency is in part offset by data collected from research institutions, individual experts and environmental associations.

Other factors that have influenced the completion of an overall picture have been the differences between regional coordination of data collection and also, in some cases, the data have been collated by untrained individuals.

The species of waterfowl for which census data was evaluated belong to the orders: Gaviiformes, Podicipediformes, Pelecaniformes, Ciconiiformes, Anseriformes, Gruiformes, Ralliformes and Charadriiformes.

As previously stated, 103 sites were selected on the basis of the criteria outlined above.

PHASE 5

These 103 wetlands chosen have been divided into four categories (Table 4.4.1):

- A. wetlands that are recognised by Ministerial Decree as being of international importance under the Ramsar Convention.
- B. sites which on the basis of the waterfowl census, whether overwintering, migratory or nesting, can be defined as being of international importance under the criteria used in this study, but which are, as yet, not formally recognised as being of such.
- C. sites defined as being of national importance on the basis of the quantitative thresholds. The numerical value corresponding to the 10% limit of importance for the Italian population of

waterfowl species was based on the limits shown by Chelini (1979) and confirmed by Boldregghini and Rallo (1988). These limits refer to the following species: Mallard (*Anas platyrhynchos*), Teal (*Anas crecca*), Gadwall (*Anas strepera*), Wigeon (*Anas penelope*), Pintail (*Anas acuta*), Shoveler (*Anas clypeata*), Tufted Duck (*Aythya fuligula*), Pochard (*Aythya ferina*), Goldeneye (*Bucephala clangula*), Red-breasted Merganser (*Mergus serrator*) and Coot (*Fulica atra*). This list, with its relative thresholds, is obviously incomplete; however, not only was it the most useable but it was practically the only one available. It is clear that, in future, it will be necessary to have a dynamic picture relative to waterfowl censuses during different biological phases and over the whole Italian territory.

- D. wetlands defined as being of national importance under the qualitative limits. In fact these areas, recommended by researchers, public bodies and environmental associations, are to be considered as being of high natural interest both for the richness and variety of the species of waterfowl and for their importance to birds during critical stages in their biological cycle.

It should be noted, however, that of the initial 597 sites originally studied, there are sites that could be valued as being of importance under different criteria not considered in this study. In addition, some areas were not considered to have a high natural value, not because they had a low intrinsic natural value, but because they had been excessively degraded and disturbed by man.

Results

After the important sites were identified, the available data were evaluated in order to define the general situation of the areas to be considered.

For each of the 103 sites selected, two to three pages of information have been compiled and contain the following details (see box 4.4.1):

- name, location and size;
- degree of protection afforded to the site;
- administrative, management and ownership situation;
- detailed description of landscape/geological/hydrological features and of the flora and fauna;
- environmental threats and possible positive intervention measures suggested.

A list of the wetlands where otters have been recorded is also presented, though giving only details of the name and location of the site. A list of wetlands that are of international importance for the presence of heronries is also given, containing the following data: name, commune and province in which they are located and

Type of wetland	No. Sites	% No of sites	Area (ha)	% Area
A	47*	46	70,402	40
B	10	9	20,598	12
C	14	14	27,879	16
D	32	31	57,489	32
Total	103	100	176,368	100

(* One Ramsar site (Lago di Caprolace) was considered as two separate sites in the National Wetland Inventory (Lago di Caprolace and Pantani dell'Inferno).

Key to table 4.4.1.

- A. Wetlands of international importance under the Ramsar Convention, recognised by Ministerial decree.
 B. Wetlands of international importance on the basis of the waterfowl census. As yet not formally recognised as being of such.
 C. Wetlands of national importance on the basis of quantitative criteria.
 D. Wetlands of national importance under the qualitative criteria.

Table 4.4.1

Summary of the results of the National Wetland Inventory of Italy (De Maria 1992).

- | | |
|------|--|
| 1. | Code |
| 2. | Name |
| 3. | Region |
| 4. | Province |
| 5. | Commune(s) |
| 6. | Geographical Coordinates |
| 7. | Extension |
| 8. | Level of Protection |
| 9. | Ownership, Administrative and Management Aspects |
| 10. | Environmental Characteristics |
| 10.1 | Geological and Hydrological features |
| 10.2 | Flora |
| 10.3 | Fauna |
| 11. | Functions and Main Uses of the Wetland |
| 12. | Environmental Risks and Potential Intervention Proposals |
| 13. | Map Reference |
| 14. | Bibliographic Reference |

Box 4.4.1

Data categories used in the National Wetland Inventory of Italy (De Maria 1992).

Box 4.4.2
Wetland classification
used in the National
Wetland Inventory of
Italy (De Maria 1992).

A. NATURAL WETLANDS

- Inland lakes
- Mountain lakes (>750 m above sea level)
- Coastal lakes (<10km from the sea, either with or without direct contact with the sea)
- Peatlands (areas of slow and continual build up of vegetational matter, generally found in land hollows wherever water gathers)
- Rivers (banks and bed)
- Estuaries (river mouths)
- Deltas (river mouths and delta outflows)
- Seasonal marshes and bogs (stagnant water with marshy features where water is not permanent)
- Permanent marshes and ponds (stagnant water with marshy features with permanent water)
- Lagoons (areas of water, with high or medium salinity, wedged in dry land that communicate with the sea either continuously or occasionally)
- Valli da Pesca* (expanses of water near the coast with variable salinity, often bordered by artificial banks/dykes used principally for fish-culture)
- Coastal and marine waters

B. ARTIFICIAL WETLANDS

- Expansion tanks/reservoirs (basins used to temporarily collect and store water from full water courses)
- Irrigation reservoirs (basins that collect water from water courses for irrigation and other purposes)
- Flooded quarries (basins originating following excavation for sand, clay or gravel and filled by runoff water or fluvial activities)
- Canals (artificial water courses)
- Salines (salt pans/basins for the production of salt via evaporation)
- Sedimentation tanks (basins for the accumulation of soil, etc. via deposition; eg: in sewage works)

census data where available. For those sites which occur in either of the above lists but which are also important under the criteria selected in this study, much greater detail is included.

A set of thematic land use maps (scale 1:25,000) have been produced. However, these are as yet unpublished. They demarcate the area of the wetland site and its catchment area, and show current uses.

Use of the inventory

The inventory is used to disseminate information about these wetland areas, and particularly to inform the relevant Ministries and Regional administrations.

It is used to identify sites for future designation under the Ramsar Convention and also to identify sites in need of priority action. The inventory also proposes possible intervention procedures in order to avoid threats identified in each area, as well as being a useful tool for the basis of planning and management.

Main regional inventories

Le zone umide del Veneto (Rallo & Pandolfi 1988)

A total of 120 wetlands have been identified in the Veneto Region (North-east Italy). For each site, a 1:50,000 map is provided, together with an extended description, information on access, flora and fauna, conservation status. The typology of different wetlands is also well described in general.

Le zone umide della Sardegna (Massoli-Novelli & Mocchi Demartis 1989)

A relatively complete list of sites organised in sections according to habitat type: ponds and lagoons (46 sites), natural lakes (1 site), marshes and tableland wetlands (10 sites), river wetlands (10 sites), artificial lakes (43 sites). All sites are mapped while a more detailed section describes the main sites with photographs and accurate descriptions.

Riserve Naturali della Lombardia (Anon. 1987a,b)

A description of sites organised according to habitat type and a list of nature reserves of Lombardy (which includes some wetlands), with size, province, etc. Each reserve is described in detail with maps, photographs and a long textual account including site history, etc.

Aspetti naturalistici di alcune zone umide di acqua dolce della bassa Pianura Padana (Anon. 1983)

Like the previous publication but only relative to 10 freshwater sites of Emilia Romagna (total of 160 ha). Special chapters illustrate flora and fauna at a very complete level including a key to plant identification.

Aspetti naturalistici delle zone salmastre dell'Emilia Romagna (Anon. 1990)

A companion guide to the previous one, devoted to coastal wetlands of the same region. Many details are given (including details on maps) on the progression of wetland reclamation. Nine wetland groups are described and 1:25,000 scale maps are reproduced. The size of each site is not always clearly indicated. Very good chapters on flora and fauna (including identification) and a rich reference list complete the guide.

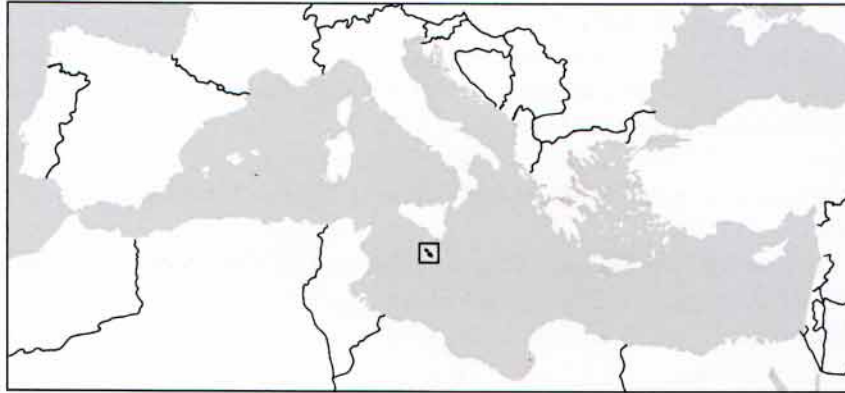
Conclusions and recommendations

The inventory data (De Maria 1992) is at present being incorporated into the Italian *Ministero dell'Ambiente's* database system under the aegis of the *Servizio Conservazione della Natura*. The Ministry also maintains a volume of maps that cover all the listed areas as well as satellite photographs for some of the areas. It is planned to publish the maps as soon as finance can be arranged. The National Ramsar Scientific Committee is charged with updating the information as well as its dissemination (despite the lack of funds).

The inventory will hopefully play an ever more important role in designating areas to be protected under Law 394/91. It is hoped that this inventory will be regularly consulted and hence become an essential part of the land-use planning process at a national and regional level.

There is a need for a central database system (the *Ministero dell'Ambiente* is currently setting one up under Bio-Italy) which is both user-friendly and readily accessible to all who require information. This database should also be well publicised and researchers, governmental and environmental associations be encouraged to provide relevant information and data (Law 241/92 obliges public administrations to make available information requested by organisations and citizens).

The initial inventory, compiled by Aquater, of the 597 areas should be updated and published.



4.5 Malta

Contributor: Joe Sultana

Malta lies in the centre of the Mediterranean Sea, consisting of two main islands, Malta (249 km²) and Gozo (70 km²), and several smaller ones. With a population of 360,000 (1992) Malta is very densely populated (average of 1059 per km²). Much of Malta is cultivated with many villages and towns. The northern and western parts of Malta and Gozo, are comprised of steep rocky ridges dividing fertile valleys. Marshy habitats are very scarce, but many valley bottoms have irrigation dams with standing water for several months.

Most natural ecosystems are under threat from human activities, of which the most important are building development, road construction, quarrying and dumping of domestic and building waste. In addition, there is excessive hunting, heavy use of sand dune ecosystems and associated sandy beaches, expansion of tourism and hotel development, and reserves and sanctuaries have problems with tourism, agricultural encroachment and poaching.

Coverage by international inventories

Ghadira nature reserve is the only significant wetland site in Malta, apart from a small one at Is-Simar which is presently being recreated. This is a six-hectare salt-marsh area with pools and ditches surrounded by halophytic vegetation and tamarisks, and is the only site which has been given some coverage by several international inventories.

A Directory of Western Palearctic Wetlands (Carp 1980)

Although Ghadira pool is the only wetland site described fully, two other sites are listed though no details besides geographic coordinates are given. The two sites, Salina creek and salt pans, and the fishponds at Marsaxlokk, are described as important potential resting sites for birds but subject to much disturbance. The details of Ghadira pool are fairly complete: geographic location, area of pool and surrounding no-shooting zone, altitude, water depth, ecological and botanical details, legal status, proposed management plans, threats, scientific research and principle reference material.

Important Bird Areas in Europe (Grimmett & Jones 1989)

This inventory provides some brief general information on Malta's ornithological importance, its conservation infrastructure and protected area-system as well as the international measures

relevant to the conservation of sites. It then covers five sites, including Ghadira wetland area. The quality of the entry on Ghadira is excellent and to the point and the information given is accurate, except for the coordinates which should be 35°58'N, 14°21'E and not 35°57'N, 14°23'E. It does not mention that the site has been designated as a Council of Europe Biogenetic Reserve and a Mediterranean Specially Protected Area under the Barcelona Convention. Ghadira Pool is also listed in the *Wetlands for the Shadow List of Ramsar Sites* (Langeveld & Grimmett 1990)

Directory of Marine and Coastal Protected Areas in the Mediterranean Region. Part 1. Sites of Biological and Ecological Value (UNEP/IUCN 1989)

This inventory includes three sites in Malta one of which is the Ghadira Wetland Area. The two other ones (Filfla Island and Fungus Rock) are not considered as wetlands but coastal areas. It gives a lot of accurate information under several different headings including information on the flora and fauna, location and physical features. The area given is 0.02 km² which should read 6 hectares. It does not give its international protection status. The reference material is incomplete.

A Directory of Wetlands of International Importance, Part Three: Europe (Jones 1993)

In the volume published in 1990 (IUCN 1990), the introduction for Malta gives some general information on the wetland situation and protected areas legislation, followed by the entry on Ghadira. The information given is accurate and sufficient and is divided under nine different headings. However it is not well presented. The information on flora and fauna (other than birds) is included under site description together with geological and weather information, while ornithological information is presented under a separate heading – International and National Importance. This inventory introduces new information on scientific research and facilities. The reference material is incomplete.

In the 1993 directory, although brief, the entry on Ghadira provides sufficient and accurate data (area should read 6 hectares not 11). For an inventory of this kind the entry is very well presented and to the point. It lacks, however, a list of reference material.

Management of Mediterranean Wetlands (Council of Europe 1992)

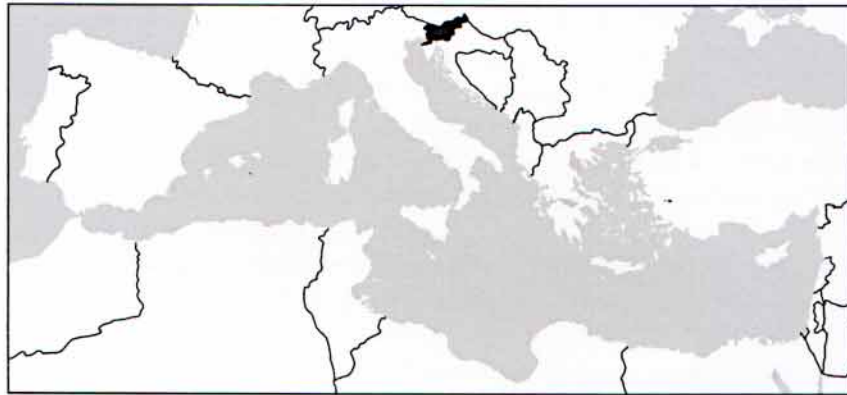
This publication carries a sort of inventory on national wetland situation of several Mediterranean countries. The method of presentation is inconsistent and is different from one country to another. Ghadira wetland reserve, Malta's entry, includes all the information from the publication by UNEP/IUCN (1989) mentioned elsewhere, but gives much more information on the cultural/historical features as well as on management and uses. It gives no reference material.

National wetland inventories

Apart from Ghadira and the newly recreated wetland at Is-Simar, there are several much smaller areas of saline marshland as well as watercourses in valleys which hold some water all the year round. So far no inventory of such sites have been compiled although data on their flora and fauna of most of the sites may be found in Schembri *et al.* (1987).

Conclusions and recommendations

As mentioned above, many smaller areas of saline marshland and valley watercourses have yet to be described in a published list. The human pressure in Malta on such sites is tremendous and a compilation of such an inventory is necessary to highlight their importance and their threats.



4.6 Slovenia

Contributor: Rober Bolješič

Slovenia occupies an area of 20,250 km² and has a population of 1,988,307 (1994). Slovenia represents the meeting point of four biogeographic regions: Dinaric, Alpine, Mediterranean and Pannonian. For this reason Slovenia has a very rich and varied flora and fauna with over 50,000 species determined so far. More than 50% of Slovenia is covered with woodland. Many of these forests are ancient and relatively undisturbed.

In spite of its shortness (46 km), the Slovenian coast includes some wetlands of wide importance (e.g. in the bays of Kopei and Piran). Like elsewhere in the Mediterranean basin, the Slovenian shore was a victim of degradation, particularly during the 20th century. The entire Slovenian coast is of outstanding ornithological importance as one of the northernmost littoral stations for migratory birds in the Mediterranean region. Large wetlands such as Sečovlje Salt pans and Škocjanski Zatok are used by birds as key points on their flight over the arid and semi-arid areas.

At the same time, these wetlands represent unique examples of brackish, halophyte and maritime biotopes in Slovenia. They have been of great importance for the people of the area for centuries and are used for salt, fish and other resources. They are also important for many other activities such as research, culture, recreation, education, etc. Altogether, there is thus an obligation to protect these unique habitats.

Coverage by international inventories

Important Bird Areas in Europe (Grimmett & Jones 1989)

This inventory is limited to ornithological aspects, but it covers the most important wetlands in Slovenia. The coverage of inland wetlands is very good. The inventory covers all of the most important inland wetlands in Slovenia as: Krakovski Forest, North-East Slovenia, River Drava from Verželj to Gobina, Black Grove, Lake Cerknica and Ljubljana moor. On the other hand, the coverage of coastal wetlands is poor. The inventory deals with only one coastal wetland: Sečovlje Salt pans. In the *Wetlands for the Shadow List of Ramsar Sites* (Langeveld & Grimmett 1990) five IBAs are listed, all of which are considered to qualify as potential or actual Ramsar sites.

International Waterfowl Census (IWRB)

Slovenia started in 1986 as part of the International Waterfowl Census, and in that time

a total of 140 counted sites has been listed. However, the most recent report gives a map showing a consolidated list of 49 sites of which 18 were counted in 1993 (Rose & Taylor 1993).

Directory of Marine and Coastal Protected Areas in the Mediterranean Region. Part 1. Sites of Biological and Ecological Value (UNEP/IUCN 1989)

Slovenia is party to the Barcelona Convention but there are no sites designated as Mediterranean Specially Protected Areas. However, the Strunian Natural Reserve has been recently included in the Mediterranean Protected Areas Network (MEDPAN).

A Directory of Wetlands of International Importance, Part Three: Europe (Jones 1993)

The inventory gives information of geographical data (coordinates and surface area) for Ramsar sites. Sečovlje Saltpans is the only wetland in Slovenia included in the list of the Ramsar Convention.

National wetland inventories

At the State Institute for Conservation of Natural and Cultural Heritage great work has already been done on the *Inventory of the Most Important Natural Heritage*. Unfortunately, the inventory is not yet complete. Its aim is to pay attention to the Natural Heritage which is recognised as the most important within the territory of the Republic of Slovenia. It should be used as the basis for active nature conservation in the following ways:

- to establish adequate legislation (on a local and state level)
- for planning (the inventory should be used as the base for planning documentation)
- physical planning
- to give directions for further research work
- to give directions for further conservation measures
- public awareness campaigns

Methodology

Since 1980, the Institute for Conservation of Natural and Cultural Heritage has been doing systematic work on the collection of data on the Natural Heritage of Slovenia. The basis for this work was the old inventory from 1976 which was complemented with new data.

Two basic elements form the selection criteria for inclusion in the Inventory:

- a description which shows the reason why one locality is included in the evidence, and
- location which is determined by Gauus-Kruder coordinates.

Every object is then drawn into the Atlas of Natural Heritage (1:25,000). Each locality is characterised by their national and international conservation categories. The conservation categories used in the inventory are listed in Annex 4.6.1.

Results

Parts for Eastern and Central Slovenia have already been done, but the part for western Slovenia, which includes our coastal and some inland wetlands still needs to be done.

The list of wetlands submitted with this report (but not including the enclosed details forwarded with each site) is presented in Annex 4.6.2.

Conclusions and recommendations

Greater efforts should be made to include some new sites in the list of the Ramsar Convention, particularly Ljubljana marshes, Lake Cerknica and the Drava River. When the *Inventory of the Most Important Natural Heritage* is finished it will be useful as a good base for preparing the wetland inventory for Slovenia. Unfortunately at this moment the work has been stopped.

It is very important that this inventory will continue and fully classify and describe the present status of all wetlands in Slovenia. In particular the complete inventory of western Slovenia where all the important coastal wetland areas and some inland wetlands should be undertaken as soon as circumstances allow.



4.7 Croatia

Contributor: Jasmina Mužinić

Croatia is a country with an area of 56,536 km² and a population of 4,685,000 (1991). Croatia possesses a great diversity of habitats being under the influence of Mediterranean and the lowland Pannonian climates of central Europe. The total area of wetland ecosystems covers around 15% of Croatia and they are mainly situated along the rivers Mura, Drava, Dunav, Kupa and Sava. The Croatian coast consists of an off-shore string of more than 365 islands and cliff sites. Coastal deltas are represented by the rivers of Mirna and Neretva but there are also coastal and island wetlands. Deciduous oaks (*Quercus* spp.) cover the karst lands and lowlands of the Pannonian Plains. Along the coastal strip maquis is a widespread habitat.

Coverage by international inventories

With reference to coverage by international inventories, in the period from 1965 to 1980, a total of 8 wetland sites on the territory of Croatia (Kopacki Rit, the Neretva Delta, Lonjsko polje, Lake Vrana on Cres, the Plitvice Lakes, Podsused, the Mirna delta, Lake Vrana near Biograd) were mentioned in various international projects and symposia relating to the gathering of information on wetland ecosystems.

Project Mar (Olney 1965)

The first of these was the *Project Mar* inventory, in which one site in Croatia, Kopacki Rit, is mentioned as an important breeding area for rare birds as well as an area visited by tens of thousands of birds.

Project Aqua (Luther & Rzóska 1971)

This inventory includes 5 sites in Croatia (Kopacki Rit, the Neretva Delta, the alluvial areas along the Danube and the Drava, Lake Vrana on Cres and the Plitvice Lakes).

A Directory of Western Palearctic Wetlands (Carp 1980)

In this directory, two sites are listed: Kopacki Rit and Neretva Delta. Kopacki Rit is described as an area of international importance for limnological and zoological reasons. The author did not have precise data as to the location of the other areas mentioned (Rakita, Krapje Dol and Podsused), so that it is not clear from the Directory that Rakita and Krapje Dol are sites in Lonjsko Polje, and that Podsused is a site not far from Zagreb.

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

In this preliminary inventory of internationally important wetlands, Kopacki Rit, where the passage of 30,000 waterfowl is mentioned, and the Neretva Delta, are described as important passage and wintering areas for migrant waterfowl.

Important Bird Areas in Europe (Grimmett & Jones 1989)

It was only in the ICBP/IWRB project (Grimmett & Jones 1989) that 13 wetland habitats in Croatia were described, 5 of them (Sv. Eufemija, Turopolje, the Koncanica fishponds, Jelas Polje and Bokanjacko Blato with the Nin salt-plains) for the first time. Within the scope of Important Bird Areas in Croatia, 3 new wetland areas – fishponds (Donji Miholjac, Grudnjak and Nasicka Breznica) were accepted in 1993. Thus the total number of wetlands has increased to 16 sites.

International Waterfowl Census (IWRB)

A list of 81 sites have been counted in the past, though it is possible that some sites counted were part of larger wetland complexes. In 1993, there were a total of 40 wetland sites counted (Rose & Taylor 1993).

Directory of Marine and Coastal Protected Areas in the Mediterranean Region. Part 1. Sites of Biological and Ecological Value (UNEP/IUCN 1989)

Of the 10 areas on Croatian territory listed in the Barcelona Convention as Mediterranean Specially Protected Areas, only one is a wetland area. This is the Neretva Delta. Due to its unique natural and historical characteristics, the Pantan wetland (in the Bay of Kastela) will be proposed for inclusion in the Mediterranean Specially Protected Area list (Cvitanic and Muzinic, manuscript).

A Directory of Wetlands of International Importance, Part Three: Europe (Jones 1993)

In 1993, four sites with a total surface area of 80,455 ha were included in the Ramsar Convention (Crna Mlaka, Kopacki Rit, the Neretva Delta, Lonjsko and Mokro Polje).

National wetland inventories

Previous listings of Croatian wetlands

At the *Second European Meeting on Wildfowl Conservation*, 6 wetland sites in Croatia were described (Rucner 1967) with reference to endangered and rare bird species and to the number of birds.

The, then, Yugoslav National Section for Bird Preservation (1972) listed seven wetland biotopes in Croatia on the basis of some qualitative and quantitative ornithological data. With regard to updating the data relating to protected wetland areas, it has been determined that four sites with a total surface area of 21,375 ha (Vasic 1974) were registered in Croatia up to 1970.

The Ornithofauna of Wetlands in Croatia

The inventory of wetlands in Croatia is an ongoing one under the project *The Ornithofauna of Wetlands in Croatia* which is under way at the Institute for Ornithology of the Croatian Academy of Arts and Sciences. In addition to 16 sites, 14 new wetlands have been listed under this national project. The data gathered include, apart from ornithological data, other data relating to the fauna and flora of each wetland.

Methodology

The wetland classification system used is the one described by Scott (1980) in annex 3.1.d: Key to habitat types referred to in site descriptions for EEC countries but adding "fishpond". Habitats as salt-plains and accumulations are not included in the preliminary inventory. The data on flora and fauna in the wetlands are stored in a PC in a CORINE biotopes data base programme. Some sites were selected according to ornithological evaluation taking into consideration endangered and rare birds and according to numerical criteria.

Results

There are 30 wetlands in Croatia covering a total surface area of 116,422 ha (Table 4.7.1) under the rough classification of 10 types. With regard to protection status, the inventory consists of four sites under the Ramsar Convention of which one is also under the Barcelona Convention, 14 sites of IBA, and six under national protection as ornithological reserves, protected landscapes or protected drinking water springs.

Use of inventory

Since the national inventory is a preliminary one, further data on the flora and fauna, on threats, etc., are required. The inventory could not therefore be used for the planning and management of sites or for dissemination of knowledge. For the same reason the inventory has not been published yet.

Type of wetland	No sites	% No sites	Area (ha)	Area (%)
Inland freshwater lake, wet meadow, forest	1	3	17,700	15
Wet meadows, forest	2	7	70,560	61
Flood meadows	3	10	1,650	1.5
Fish ponds	6	20	8,365	7
Coastal freshwater lake	8	27	2,717	2
Coastal saltwater lake	1	3	3,000	3
Coastal mudflats	1	3	20	0
Delta, estuary	4	13	11,885	10
Saltings	2	7	420	0.5
Inland freshwater lake, reservoir	2	7	105	0
Total	30	100	116,422	100

Table 4.7.1
Summary of the preliminary results of the National Wetland Inventory in Croatia.

Conclusions and recommendations

In Croatia there are 30 sites listed in a preliminary inventory of wetlands. Their national and international value should be established on the basis of wildlife evaluation according to Habitats and Bird Directives as well as the Ramsar and Barcelona Conventions.

A unified criterion for the gathering of data and the evaluation of wetlands, and a database are needed to carry out a comprehensive inventory in Croatia.



4.8 Bosnia-Herzegovina

Contributor/Editor: Steve Ridgill

Bosnia-Herzegovina occupies an area of 51,130 km² and has a population of 4,481,000 (1991). The country is mostly forested and coniferous forest is dominant, especially in the central mountains, with riverine forests of *Alnus* sp., *Salix* sp., and *Fraxinus* sp. at lower levels. There are two national parks and two nature parks but only 0.5% of the total territory is protected. Some of the major threats to protected areas include water and air pollution and much forest is said to be affected by acid rain.

Overview of national coverage by international inventories

Project Mar (Olney 1965)

One site is listed, Donjeneretvljanska blatja, accorded category B status for its importance for waterfowl. The very brief description of ponds, marshes, peatland, sandbanks, submerged plains and forests in the lower Neretva valley notes the advanced state of reclamation schemes.

A Directory of Western Palaearctic Wetlands (Carp 1980)

One site, Hutova Blato in the Neretva valley, is included for Bosnia-Herzegovina, but no details of the site are given. This is a smaller part of the larger area named by *Project Mar*.

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

The same single site as above where it is noted that the complex of freshwater ponds and marshes is the last remnant (360 ha) of the larger (16,300 ha) site in the *Project Mar* list.

Important Bird Areas in Europe (Grimmett & Jones 1989)

Three wetland sites are briefly described, all of which are considered to qualify for the Shadow List of Wetlands of International Importance or potential Ramsar sites (Langeveld & Grimmett 1990).

International Waterfowl Census (IWRB)

A total of six sites have been counted in the past but no count was possible in 1993 (Rose & Taylor 1993).

***Directory of Marine and Coastal Protected Areas in the Mediterranean Region.
Part 1. Sites of Biological and Ecological Value (UNEP/IUCN 1989).***

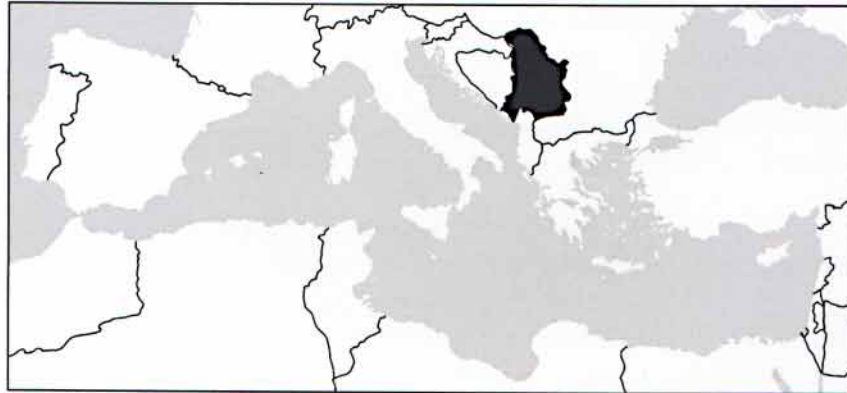
Despite the list of ten sites listed for the former Yugoslavia, no site is listed corresponding to Bosnia-Herzegovina, although the Neretva Delta National Park, which is listed, borders on the important site of Hutovo Blato but it is not clear whether this extends into Bosnia-Herzegovina.

National wetland inventories

No information of any nationally organised wetland inventory is presently available.

Conclusions and recommendations

It is clearly important that an update on the position of wetlands in Bosnia-Herzegovina is urgently required.



4.9 Yugoslavia

Contributor: Radomir Mandić

Yugoslavia occupies an area of 102,173 km², about 20% of which is covered by ponds, marsh, peat bogs and flooded areas. The majority of these wetland areas are situated in the northern part of Yugoslavia, along the great rivers of Sava, Danube, Tisa and Morava in the south. There are also some significant wetlands in the littoral region, as well as the great Skadar lake, which partly belongs to Albania.

In the northern lowland region of Yugoslavia, flooded willow and poplar forests still occur, as well as remnants of the once widespread lowland forests of pedunculate oak (*Quercus robur*). The continued existence of these forests is through the influences of a continental climate along with a high groundwater level, as shown by the marked areas liable to flooding. Forest communities in humid and flooded valleys of great rivers are connected linearly, so one can talk of considerable areas with constantly high humidity and wetland vegetation, from smaller ponds overgrown with reed and surrounded by marginal willow and poplar forest up to the occasional true wetland complexes covering more than 1000 ha. Lowland flooded forest and wetlands in the north of Yugoslavia are of invaluable significance for the survival of wetland birds on a European scale. Lakes, salt/brackish marshes and ponds, and fish ponds provide significant feeding habitat for many waterbirds and breeding sites for many important bird species. Yugoslavian wetlands are also significant for migration and overwintering of birds, while wetlands in the littoral region are very significant for many bird species during extreme cold weather in the continental part of Europe.

Great regions and complexes of freshwater lakes and wetlands, some of them of specific natural value of national and international importance (Obedaska Bara, Ludaš lake, Carska Bara and Skadar lake), are very sensitive, and their significance in protecting biodiversity as well as avifauna are irreplaceable.

Salt lakes and marshes in Vojvodina are important habitats, and they are under threat from water regulation work which will fundamentally change their state. In the Montenegro littoral area, there are similar brackish ecosystems concentrated around the mouth of several smaller and greater rivers flowing to the sea, particularly along the Bojana river in the furthest south (Zogajsko Blato and Štoj). These sites are endangered by water deficit, direct and indirect pollution, eutrophication and degradation and/or drainage of water habitat for increasing arable use.

Overview of national coverage by international inventories

Project Mar (Olney 1965)

There are 3 category A sites and one category B site (now a Ramsar site). Details of sites are very

brief and confined to listed wetland types, geographical position and area, and importance for waterfowl.

Project Aqua (Luther & Rzóška 1971)

Brief though comprehensive descriptions are given of two sites.

A Directory of Western Palearctic Wetlands (Carp 1980)

This gives a list of 10 wetland sites.

A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa (Scott 1980)

Only six sites are listed.

Important Bird Areas in Europe (Grimmett & Jones 1989)

A total of 13 wetland sites are described out of a total of 17 listed important bird areas. This list includes the two Ramsar sites, two World Heritage Sites and some National Parks, Special Reserves, Regional Parks. All 13 wetland sites qualify as Wetlands of International Importance in the *Wetlands for the Shadow List of Ramsar Sites* (Langeveld & Grimmett 1990), where no further details, except for the name and area of each site, are given.

International Waterfowl Census (IWRB)

Over preceding years, 172 sites are listed as having been counted. More recently little information has been available over counted sites (Rose & Taylor 1993).

A Directory of Marine and Coastal Protected Areas in the Mediterranean Region. Part 1, sites of Biological and Ecological value (UNEP/IUCN 1989)

Of the 10 areas on Yugoslavian territory listed in the Barcelona Convention as Mediterranean Special Protected Areas, one is a wetland.

A Directory of Wetlands of International Importance, Part Three: Europe (Jones 1993)

Two sites (Obedska Bara and Ludaš Lake) were designated as Ramsar sites in March 1977.

National wetland inventories

The principle investigations in these wetland areas are done by the Institutes for Nature Protection of Serbia and Montenegro, in order to protect them through Strict Nature Reserves, Regional and National Parks. On the basis of the Environment Protection Law, these Institutes protect all significant habitats colonized by national rarities of flora and fauna.

The only details of a National Wetland Inventory are through the list of major Reserves and National Parks which are either with or without protection, as provided by the Director Zavoda, Zavod za Zaštitu Prirode Sribje of Beograd. This list comprises 13 wetland sites, mostly complex wetlands covering large areas of flooded forest (see Annex 4.9.1).

Conclusions and recommendations

Wetland habitats are not investigated in Yugoslavia in sufficient detail and urgency, except for those which due to their exceptional value and international importance, are registered in the List

of Wetlands of International Importance (Ramsar Convention) or in the Register of European and North African aquatic habitats (IUCN). Such wetland habitats which have sufficient data are Obedska bara, Ludoška jezero (Ramsar site) and Carska bara (IUCN). Data exist for other sites, but are insufficient to establish their significance as habitats and to enable the investigation of the causes of their degradation, as well as to ascertain the proper methods for their protection and restoration.

The causes of wetland degradation globally could only be explained by human activity (stream regulation, drainage of marshy terrain, exploitation of protected forests in littoral parts, eutrophication, non-rational use of chemicals in agriculture, etc.). Connections between underground and surface waters are insufficiently known and investigated, along with the inflow and retention of water in depressions, which together prevent the establishment of causes of wetland disappearance in Yugoslavia.

Without the complete study of the situation of wetland complexes in Yugoslavia, it is only possible to give generalized recommendations:

- establish criteria for the protection of wetland complexes, which represent living communities with high biodiversity
- define limits, characteristics and methodology for monitoring the situation in wetland ecosystems throughout the territory of the whole country
- develop scientific criteria for the selection and protection of particularly valuable wetland ecosystems
- control the use of chemical products in agriculture and forestry which disrupt the stability of the aquatic ecosystems
- protect the world's natural inheritance by the establishment of a policy for the conservation of biodiversity and sustainable exploitation of biological resources.