

INTRODUCTION

The Neotropical Realm is the richest and most diverse of the world's eight biogeographical realms. At the same time, it is one of the least disturbed by the destructive influences of modern man. Covering the whole of the South American continent, Central America, the Caribbean and a large part of Mexico, the Neotropical Realm includes almost the full spectrum of the world's major ecosystems and a diversity of fauna and flora unmatched anywhere else. Although a considerable amount of basic faunal and floral research has been conducted and great strides have been made to protect the natural environment, the region as a whole remains relatively poorly known, and is perhaps the most vulnerable to drastic modification by man in the coming decades.

The Neotropical Realm includes a great diversity of wetland ecosystems from the coastal lagoons and mangrove swamps of the Caribbean and Central America, through the great riverine and floodplain systems of the humid tropics and the lacustrine systems of the high Andes, to the fjordland and subantarctic tundra of southern Chile and Argentina. In recent years, there has been a marked increase in awareness of the widespread threats to wetlands in the Neotropics, but to date, no serious attempt has been made to develop an overall wetland conservation strategy for the region. This document aims to provide the basis for such a strategy, by presenting a synopsis of the most important wetlands and their wildlife, and by summarizing the measures which have been taken to conserve them.

The term "wetland" is here used in the same sense as defined in the text of the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention). Thus, wetlands are "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres". Coral reefs and other exclusively marine systems are however generally excluded from this definition, and have not been considered.

The greater part of the Directory is made up of a series of country reports grouped into the three major regions under consideration: South America, Central America (including the Neotropical portion of Mexico), and the Caribbean. Most country reports begin with an introduction which summarizes the institutional base for wetland conservation and research, the progress made to date, and the major threats to wetlands and their wildlife. Then follows an inventory of those wetlands which are known or thought to be of greatest importance from the point of view of nature conservation. The site descriptions include basic information on size and location, habitat types, principal vegetation, ownership, degree of protection, land use, fauna, threats, research, conservation and relevant literature.

In the discussion of fauna, special emphasis is given to the waterfowl for several reasons. The waterfowl of the Neotropical Realm are well known and well documented; in many other groups of aquatic fauna, our knowledge remains fragmentary, with many species still undescribed to science. Waterfowl are a popular group, conspicuous, readily identified, censused and studied; thus there tends to be much more information available on waterfowl than other wetland species. Many are long-distance migrants, dependent on wetlands in a number of countries during the course of their annual cycle, and thus demonstrating the need for international cooperation in conservation efforts. Many species are popular game birds for the hunter, and as such constitute a renewable natural resource of considerable economic value. Finally, waterfowl are particularly good indicators of the general condition of wetland ecosystems; they are at or near the top of most wetland food chains, and are highly susceptible to wetland contamination and disturbance.

The Ramsar Convention defines "waterfowl" as "birds ecologically dependent on wetlands". However, for the purposes of this Directory, the term has been restricted to wetland species of the following families: Gaviidae, Podicipedidae, Pelecanidae, Phalacrocoracidae, Anhingidae, Ciconiidae, Threskiornithidae, Phoenicopteridae, Anhimidae, Anatidae, Opisthocomidae, Gruidae, Aramidae, Rallidae, Heliornithidae, Eurypyidae, Jacanidae, Rostratulidae, Haematopodidae, Charadriidae, Scolopacidae, Recurvirostridae, Phalaropodidae, Laridae and Rynchopidae. Species of Pelecanidae, Phalacrocoracidae and Laridae which are confined to marine ecosystems, and other sea-birds (Spheniscidae, Procellariiformes, Phaethontidae, Sulidae, Fregatidae and Stercorariidae) are excluded.

Each country report includes an outline map showing the location of the sites described in the inventory. It was the original intention of the compilers to include detailed maps of each site, and indeed many of the contributors provided excellent maps of their country's wetlands. However, as the inventory grew in size, it became clear that this would not be possible for reasons of space and cost. The several hundred individual site maps which have been provided by contributors are on file at IWRB Headquarters in the U.K. and constitute an important reference source. It is to be hoped that many of these maps will be published in national wetland inventories.

The bibliography includes not only the references cited in the text, but also a number of other important publications and reports listed by the various contributors. Emphasis has been given to recent works with direct relevance to conservation issues; much of the older literature and many publications of academic rather than conservation interest have been omitted. The extensive literature on Nearctic avian migrants wintering in the Neotropics has recently been summarized by Rappole *et al* (1983); their annotated bibliography should be used in conjunction with the present bibliography.

Following the bibliography, there is a directory of contributors. This gives the names and addresses of the many individuals who have cooperated in the preparation of this work. The majority are listed according to the country for which they have provided information, but a number of individuals who have provided information for several countries or for the region as a whole are listed in a "General" section at the end.

The Directory concludes with an annotated checklist of the waterfowl of the Neotropical Realm. This gives a brief review of the distribution and abundance of all waterfowl occurring in the region, with emphasis on those species known or thought to be vulnerable or endangered and therefore in need of special attention. The checklist incorporates a large amount of new information provided by contributors, either on the waterfowl occurring at individual sites, or as status reports on waterfowl occurring in the country concerned. A number of contributors provided very detailed status reports complete with distribution maps. For reasons of space, it has not been possible to include all this material here. Along with individual site maps, the species status reports are on file at IWRB Headquarters and, subject to consent being given by the contributors, are available upon request.

Methodology

The compilation of the Directory has involved the collection of data through three main channels:

- a) a series of national networks of contacts, each with a "national coordinator" who was responsible for the compilation of all data from that country, and for the preparation of a general introduction for the country report;
- b) direct contact with expatriate individuals or institutions with expertise on particular sites or species in the region;
- c) a review of the recent literature.

In many cases, effective national networks were established and a comprehensive national report submitted. However, in several countries it proved impossible to coordinate the collection of information through a single person or institution, and material was received from several independent sources. In a few cases, no local contact could be established, and the material summarized in the Directory is based entirely on expatriate sources and the literature. Emphasis was given throughout to obtaining first hand and up to date information from individuals currently working on wetlands and their fauna, and little attention was given to the older literature.

Site Descriptions

Contributors were requested to submit their information on wetlands on standard data sheets of a type used in similar wetland inventories in the Palearctic Realm. The information has been reproduced in this Directory in a slightly modified form, and in many cases with additional information from other sources. Each site description contains the following data categories:

Title: The name of the wetland with a reference number for the accompanying map.

Location: The geographical coordinates (Greenwich), and general location of the site. The coordinates have been taken from the Operational Navigation Charts (1:1,000,000) of the Defense Mapping Agency, Missouri, U.S.A.

Area: The area of the wetland habitat in hectares. In the case of some rivers and coastal zones, only the approximate length of the site is known.

Altitude: The altitude of the wetland in metres above sea level.

Province and type: The biogeographical province in which the wetland is situated, following Udvardy (1975) "A Classification of the Biogeographical Provinces of the World"; and a reference to the types of wetland habitat present, on the basis of the following numerical code:

- 01: shallow sea bays and straits
- 02: estuaries, deltas
- 03: small offshore islands, islets
- 04: rocky sea coasts, sea cliffs
- 05: sea beaches (sand, pebbles)
- 06: intertidal mudflats, sand flats
- 07: coastal brackish and saline lagoons and marshes, salt pans
- 08: mangrove swamps, mangrove forest
- 09: slow-flowing rivers, streams (lower perennial)
- 10: fast-flowing rivers, streams (upper perennial)
- 11: riverine lakes (including oxbows), riverine marshes
- 12: freshwater lakes and associated marshes (lacustrine)
- 13: freshwater ponds (under 8 ha), marshes, swamps (palustrine)
- 14: salt lakes, salars (inland systems)
- 15: reservoirs, dams
- 16: seasonally flooded grassland, savanna, palm savanna
- 17: rice paddies, flooded arable land, irrigated land
- 18: swamp forest, temporarily flooded forest
- 19: peat bogs, wet Andean meadows (bofedales), snow melt bogs

Although more sophisticated wetland classification systems are available, the information was seldom adequate to permit a more detailed breakdown, and in any case for many of the enormous wetlands described in the Directory, a detailed classification of habitat types would be extremely cumbersome.

Site description: A general description of the site.

Principal vegetation: A description of the principal aquatic vegetation, if known; in many cases, information was available only on the major terrestrial communities of the region.

Land tenure: The status of land ownership.

Protection: The extent, if any, to which the wetland habitat and its fauna are protected.

Land use: A description of the principal land use activities at the wetland and in the surrounding areas.

Waterfowl: A brief account of the importance of the site for waterfowl. The scientific nomenclature and taxonomic sequence follow Blake (1977), except in the case of some Laridae.

Other fauna: Information on other fauna dependent on the wetland habitat. In many cases, this includes bird species not normally regarded as waterfowl, such as birds of prey and some passerines. In some cases, noteworthy terrestrial species of surrounding areas are included, particularly when listed in the WWF Red Data Book. For mammals, the scientific nomenclature follows Ewer (1973) and Walker (1975).

Threats: An account of the existing and potential threats to the wetland.

Research and conservation: A review of major research activities, completed and ongoing; management plans; proposals concerning future conservation and management; and in some cases general comments on the importance of the area and need for further study.

References: Published literature and unpublished reports relevant to the site. In most cases, the literature cited has been utilized in the compilation of the data sheet.

Source: Names of individuals and institutions providing information on the site. In many cases, information from two or more sources has been combined.

Criteria for inclusion: A reference to the criterion or criteria which justify the inclusion of the site in the Directory. The criteria used in the selection process are those developed for the identification of wetlands of international importance within the context of the Ramsar Convention, and adopted by the Conference of the Parties to that Convention at Cagliari in November 1980 (Atkinson-Willes *et al*, 1982). According to these criteria, a wetland should be considered internationally important if it

- 1a: regularly supports either 10,000 ducks, geese and swans (Anatidae); or 10,000 coots (*Fulica* spp); or 20,000 waders (shorebirds);
- 1b: regularly supports 1% of the individuals (being at least 100) in a biogeographical population of one species or subspecies of waterfowl;
- 1c: regularly supports 1% of the breeding pairs in a biogeographical population of one species or subspecies of waterfowl;
- 2a: supports an appreciable number of a rare, vulnerable or endangered species or subspecies of plant or animal;
- 2b: is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its fauna and flora;
- 2c: is of special value as the habitat of plants and animals at a critical stage of their biological cycles;
- 3a: is a particularly good example of a specific type of wetland community characteristic of the climatic zone in which it lies;
- 3b: exemplifies an extreme stage in a hydromorphological process.

In the present inventory, the reference "123" is applied to large and important wetlands which qualify for inclusion on the basis of criteria in all three categories.

For proper application of the Ramsar criteria, it is essential that a considerable body of information be available on the site in question. For many wetlands in the Neotropical Realm, the information is so scanty that no objective evaluation of the importance of the site can be made. If all such sites were to be ignored, the Directory would become little more than an inventory of wetlands which have been well studied and well documented, and would lose its value as a basis for the identification of priorities in future wetland surveys and research. Furthermore, for application of criteria 1b and 1c, it is essential that some estimate be available for the total size of the waterfowl populations. Such estimates are available for only a handful of species in the Neotropical Realm. Thus, even when detailed censuses have been made at a site, it is seldom possible to determine if the numbers of birds present are internationally important on the basis of the Cagliari criteria. It has therefore been necessary to rely to a considerable extent on the subjective judgement of contributors in the selection of sites for inclusion in the Directory. Sites selected on this basis, *i.e.* sites which are thought to be of considerable importance but which clearly merit further investigation, are given the reference "0".

Comprehensiveness

The Directory includes entries for all forty-five countries in the Neotropical Realm. For all but two countries (Guyana and the Turks & Caicos Islands), it has been possible to provide at least a preliminary inventory of important wetlands on the basis of information received from contributors and the literature. In the case of a few countries (all of which are small Caribbean states), no local contacts were established, and the material presented herein is taken entirely from the recent literature. In one case (Costa Rica), good information was received on the wetlands, but no general introduction to wetland conservation in the country was provided.

The comprehensiveness of the individual country reports varies greatly; in general, the smaller the country, the better the knowledge of the wetlands and thus the more comprehensive the inventory. In the case of some very small countries, a single individual or institution with an intimate knowledge of that country's wetlands has been able to provide a detailed national wetland inventory including all wetlands of any significance.

In South America, most countries are large to very large, with low human population density, extensive areas which remain poorly known, and numerous wetlands, some of enormous size and many still relatively undisturbed. The wetland inventories for most of these countries are still at a very preliminary stage. Most if not all of the larger wetlands and other

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sites of great international importance are now known and have been included in this Directory, but there doubtless remain many smaller wetlands which will in time be found to possess special qualities which justify their designation as wetlands of international importance. At the other extreme, most Caribbean states are small to very small, with high human population density and rather few wetlands, most of which are now well known and many of which are under serious threat. The wetland inventories for most of these countries are thought to be very comprehensive; all sites of international importance have been included in this Directory, along with a number of sites which are probably of only local or national importance. The inclusion of these latter sites is at least partly justified by the rapid rate at which wetlands are disappearing throughout the Caribbean and consequent rate at which the remaining undisturbed wetlands are increasing in importance. The situation in Central America lies somewhere between these two extremes, and it is felt that for most countries in this region, the Directory gives a realistic assessment of the number of wetlands of international importance.

One of the primary objectives of the Directory is to provide the stimulus and basis for the completion of detailed national wetland inventories which should include not only more information on the sites which meet international criteria, but also details of sites of only national or even local importance. One or two such national inventories have existed for some years (e.g. in Puerto Rico), while many of the original contributions to this Directory constitute very good national inventories. Only a summary of these contributions has been incorporated here, and they will, it is hoped, be published in full in their country of origin. Most of the other contributions provide excellent skeletons upon which comprehensive national inventories can be based. Much more field work needs to be carried out, the larger wetland areas must be surveyed in detail so that key sites within them can be identified, and many new sites of national rather than international importance should be considered. Only when detailed national inventories are available for all the countries of the region will it be possible to compile the definitive directory of wetlands of international importance for the Neotropical Realm.

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