WCMC Biodiversity Series No. 1

BIODIVERSITY DATA SOURCEBOOK

WORLD CONSERVATION MONITORING CENTRE

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Compiled by the

World Conservation Monitoring Centre

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In collaboration with

IUCN - The World Conservation Union
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INTRODUCTION

This document

An extended introduction to many theoretical and applied aspects of biological diversity was provided in *Global Biodiversity: status of the Earth's living resources* (WCMC, 1992). That document, which benefitted from collaboration with many organisations and individual scientists, was produced[1] at the time of the United Nations Conference on Environment and Development held in 1992 in Rio de Janeiro. The purpose of the book was to provide conceptual background and baseline data both to practitioners in the biodiversity field, and to all concerned persons who needed a guide into that complex and suddenly highly topical area.

The present sourcebook is being released in part as a contribution to the First Conference of the Parties to the Convention on Biological Diversity (Bahamas, 28 November - 9 December) in anticipation that it will provide information of interest and relevance. Given the grounding previously provided in *Global Biodiversity*, the present volume concentrates on data rather than text and provides an illustrative set of data tables, in part revised and expanded from the earlier volume. The choice of data to be included and the manner of presentation have been determined with the likely end-users borne strongly in mind. With this aim, most data are presented in standardised tables by country, so that they are immediately available to users working at a national level but can also be placed easily in regional and global contexts.

Tables cover the following subjects: country species diversity; threatened species within each country; national red data books; major food crops of the world; domestic livestock; marine and coastal resources; forests in the tropics; national protected areas; systematics collections.

Some tables, such as that giving data on threatened species within each country, are a direct update of earlier material; some, such as those on food crops and forests in the tropics, comprise data presented previously combined with new information; some are mostly new. Overall, they give a good indication of the global availability of information on many aspects of biodiversity, drawing attention to some of the gaps that exist and to the regional imbalances in the distribution of biodiversity and the resources that have been devoted to its assessment and study.

Other important topics which bear consideration but which have been excluded from this volume include biodiversity investment, temperate forests, introduced species and pharmaceutical use of plant and animal products. These and others may figure in future publications.

General aims of the Convention on Biological Diversity

The Convention on Biological Diversity (CBD) was signed at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992 by 154 nations. The CBD is now in force, and as of 28 October 1994 there were 96 contracting Parties.

The objectives of the Convention on Biological Diversity are threefold (paraphrased from Article 1 of the CBD text):

- the conservation of biological diversity,
- the sustainable use of its components, and
- the equitable sharing of benefits from use of genetic resources.

In effect, the CBD aims to encourage and enable all countries to conserve biological diversity, to ensure that its use in support of national development is sustainable, and to reconcile national interests with the maintenance of highest possible levels of global biodiversity.

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[1] with project sponsorship from the Overseas Development Administration, UK, and additional support from The Ministry of Foreign Affairs of The Netherlands, The Ministry of the Environment, Denmark, and The World Bank.

Each country has its own unique combination of living species, habitats and ecosystems which together make up its biodiversity resource. Implicit in the CBD is the concept that each country may exploit sustainably its own biodiversity in any way which it sees fit. However, because each country also contributes to overall global biodiversity, it has a corresponding responsibility to play a part in its maintenance.

To enable it to carry out these two functions effectively, each country needs to have as accurate as possible an understanding of its own biodiversity and also an understanding of exactly how its biodiversity fits into the global pattern. In the latter regard, it is particularly important to understand which parts of a country's biodiversity may be of regional or global importance.

Some requirements of the CBD

Overall, the CBD imposes a very substantial set of obligations upon contracting Parties, virtually all of which demand sound information as a basis for policy development, management action, and investment. Each Party will need for its own planning to obtain and manage data on biodiversity within its jurisdiction, and the global community will be interested in data capable of allowing funds, technology and expertise to be directed and used wisely and effectively. Countries will also attempt to identify, limit, and consult upon, adverse effects that originate within their boundaries but occur outside their national jurisdiction.

Emphasis is placed throughout the CBD text on the importance of capacity-building in developing countries and the need to take appropriate account of rights over resources and access to technologies. The Convention text also explicitly recognises that economic and social development, and eradication of poverty, are the overriding priorities of developing countries. Thus, effective implementation of the CBD in developing countries will largely depend on the degree to which developed country Parties assist in building capacity and the transfer of technology and financial resources.

Article 6 of the CBD calls upon the Parties to prepare national strategies, plans or programmes for the conservation and sustainable use of their biological resources. Resolution 2 agreed at the Conference for the Adoption of the Convention on Biological Diversity ('the Final Act') held in Nairobi in May 1992 recognised the importance of Country Studies to the preparation of national strategies and action plans, and outlined the coverage of such a study. UNEP, with assistance from WCMC, has since published *Guidelines for Country Studies on Biological Diversity*; these provide a suggested framework for the collection of data both for national planning purposes and as a contribution to regional international assessments. Article 7, supported by Annex I, further specifies for contracting Parties a range of components of biological diversity that need by reason of social, economic, cultural or scientific importance, to be identified and monitored. These range from genes and genomes, through populations, cultivars, breeds and species, to communities, habitats and ecosystems. Article 20 stipulates that a flow of funds from developed to developing countries would be required in addition to those already provided under current bilateral and multilateral agreements, and Article 21 outlines the kind of financial mechanism that will be required to regulate this flow for the purposes of the CBD.

The need for data

Information is the foundation of all types of activities involved in the conservation of biodiversity. The kinds of data needed to support national and international endeavours in biodiversity conservation are as wide as the scope of the CBD, and in addition to biological diversity itself, the CBD is concerned with the social, economic, legislative, and technological aspects of human interaction with the biosphere. The status and distribution of species and habitats is continually changing, as are the costs of their conservation and the benefits of their use. Regular and systematic revision of information, and collection of new data, are therefore necessary. However, in many parts of the world, the data needed for biodiversity assessment are incomplete, sometimes startlingly so. Methods therefore have to be found for extrapolating in a reasonable way from what information there is to ensure that decisions which affect the future of biodiversity are made on the best available data and analysis.

Table 1. Country species diversity

Biodiversity may be evaluated at several different levels (eg. genes, species, habitats, ecosystems). It is widely accepted that, of all these, the species is the single most useful unit to use in biodiversity assessments, whether these are carried out locally, nationally, regionally or globally.

Species best fill this role because, of all the possibilities, they best reflect observable diversity in nature and there is at least working agreement as to their definition and content. This is certainly not to imply that there is no argument: taxonomy is an inexact practice. Indeed, in virtually no higher taxonomic group can all species be recognised and enumerated with total precision. Furthermore, the concept of what exactly a species is differs considerably between groups of organisms. The difficulty of defining a species applies most strongly to organisms which do not always reproduce by outbreeding (exogamy), that is by sexual reproduction between two different individuals. This applies to many microorganisms (viruses, bacteria, unicellular organisms) and plants, including some of considerable commercial importance to humans, where individuals may be self-fertile, or reproduce asexually. Another practical difficulty is in deciding where to draw the line in geographically separate (allopatric) populations; ie. in any one site it is usually possible to count the number of species but in comparing biota at two sites with elements in common it may be difficult to tell whether populations should be placed in the same species or not.

Species richness

Nevertheless, it is possible in most cases to reach reasonable consensus on what constitutes a species, and it is theoretically possible to count the number of species at a given site or in a given country. This approach gives a figure for species richness and this is one of the most straightforward measures of biodiversity.

Ideally this measure would consist of a complete catalogue of all the species occurring in the area under consideration. In practice, this is extremely difficult to achieve. This is because the great majority of species are very small and are difficult to identify and count *in situ* or to collect comprehensively for counting in laboratories. Carrying out such whole species counts is only conceivable for very small areas and even then, collecting and counting all microorganisms is extremely difficult. Furthermore, in many parts of the world, a high proportion of the small species have never been scientifically named, to such an extent that it is thought that between 80% and 95% of all living species have not yet been described. Moreover the expertise to identify these species satisfactorily is missing - it is widely acknowledged that there is a chronic shortage worldwide of taxonomists and systematists.

To circumvent these problems, estimates of species richness almost always have to be based on some form of sampling and extrapolation. One way to do this is to take groups of organisms which are fairly easy to observe, count and identify and to try to establish how many there are in a given area, be it a woodland, national park, state, country or even continent. It is then assumed that these groups act as surrogates for the whole of biodiversity - ie. areas which are rich in these are presumed rich in biodiversity overall. Another way is to try to count the number of species in a sample plot of fixed size (this may be an attempt at a complete species count or may consist of counting all species in particular groups) and extrapolate from this to a larger area. This assumes that the richness in the sample plots is truly representative of the richness of the area that the plot is a sample of. It is thus more of an ecologically based measure of diversity, as it attempts to compare different habitats or ecosystems.

These measures of biodiversity - total number of species, and number of species per unit area - are fairly crude, and ecologists argue that they do not reflect the true complexity of biological diversity. Other, more sophisticated measures have been proposed, which take into account factors such as the relative abundance of different species or the complexity of the interactions between them. However, in general, the more complex the measure the more difficult it is to gather the information to derive it, the more limited its application and the more contentious its meaning.

In practice, overall species counts tend to be used for terrestrial vertebrates (mammals, birds, reptiles, amphibians), for some groups of fishes and a few well known invertebrate groups such as butterflies and dragonflies. Sampling of plots is usually the technique used for small animals (most invertebrates and microorganisms). Both techniques are applied to measuring plant diversity.

Endemism

While counts of species numbers may reasonably reflect the biological richness of a given area, they do not necessarily reflect its uniqueness. The latter is an equally significant measure of an area's importance in a wider context. Probably the single most useful measure of an area's uniqueness is a count or estimate of the number of endemic species it contains. A species is *endemic* to some defined area if it is confined entirely to that area. The term is derived from medical science, where a disease is described as endemic if confined to a certain area, and epidemic if widespread. It can also be applied to other taxonomic levels, or to faunas, floras and communities of species. Distribution areas change through time so endemism is usually understood to refer to contemporary conditions.

Geographic endemism

The area of concern in assessing endemism is typically defined by geographic features, so a species may be described as endemic to a desert basin, a river system or lake, a mountain peak or an island. Information on the distribution area of a species is basic to most evolutionary and biogeographic studies, so geographic endemism is of considerable biological interest. Its significance varies with scale. In general the concept of endemism becomes more meaningful as the defined area is reduced in size.

Areas rich in endemic species might variously be interpreted as sites of active speciation, or of refuge for relict species, but whatever the theoretical interest, it is important for practical biodiversity management to be able to identify such discrete areas of high endemism. By definition, species endemic to a given site occur nowhere else. The smaller the area of endemism, the more at risk the endemic species will be through deterministic or stochastic population events. Whilst all may be vulnerable to the same episode of habitat modification, by the same token, all might in principle benefit from the same conservation action. It is desirable to identify any such opportunities for cost-effective conservation action. However, for most species the basic distribution data needed in order to determine areas of high endemism are unavailable or remain uncollated.

Political endemism

Endemism can also be defined in purely political terms, so that a species is described as endemic to a particular country, or administrative unit within a country. There is no direct biological interest in the concept of political endemism, except where the country is geographically distinct, perhaps an island state.

However, political endemism is of immense importance to the conservation of biological diversity because, almost without exception, conservation and management actions are applied and maintained in a national political context. This is the case regardless of the source of scientific advice or of financial support for the actions undertaken.

Assessing the number of endemics in an area is more problematic than trying to count the total number of species in a given group in that area. The latter does not depend on knowledge of where else the species counted may occur. In contrast, the former cannot be carried out in isolation, as it relies on having a complete knowledge of the distribution of the species involved (ie. to be able to count a species as endemic, one has to be sure that it does not occur anywhere else). Problems of taxonomy may also be felt more keenly, in particular in deciding whether geographically separate (allopatric) populations of similar organisms belong to the same species or not (ie. two populations of birds on adjacent islands may be considered races of the same species, in which case neither island has an endemic, or may be regarded as two separate though closely related species, in which case both islands have one endemic species each; the total species count for each island remains the same in both cases).

A large proportion of described species are endemic to single countries. For example, around 45% of the c 25,000 species of tetrapod vertebrates (ie. vertebrates other than fishes) are endemic to a single country. The proportion of country endemics varies between vertebrate classes, from around 30% in birds to 60% in reptiles and in amphibians.

National biodiversity index

The need for a simplified index to represent national levels of biodiversity has often been recognised, mainly in order to provide regional or global context for activities undertaken at national level. WCMC has developed a preliminary version of such an index (unpublished; see Notes below for outline details of this system). Figure 2 shows the countries with the 20 highest scores according to this index, taking account of overall species diversity (richness and endemism) and country area. This provides an indication, for working purposes, of which countries are particularly rich in biodiversity.

Regional analysis

Ideally, analysis of how important an area or country was for biodiversity (in terms of species) would make use of more elaborate measures than those above. One way of doing this is to lessen the distinction between endemic and non-endemic by taking into account how widespread is each species counted. Thus an area containing species occurring in only one or two other areas should be regarded as more important than one containing only widespread species. As an example, Haiti and the Dominican Republic which together comprise the Caribbean island of Hispaniola, share the great majority of their plant and animal species. Each country therefore has very few endemic species and therefore does not score highly in any comparative assessment of biodiversity based on number of endemics. However, many of the species on Hispaniola only occur there, and are thus endemic to the island, making the island itself of great importance for biodiversity. To reflect this it would theoretically be possible to weight the importance of each species by factoring in the number of countries it occurred in, for example by giving an endemic a score of 1, a species which occurred in two countries a score of 1/2, one which occurred in three countries a score of 1/3 etc.

In reality carrying out this form of analysis on a global scale for any more than a small number of species would be an extremely elaborate and time-consuming procedure, dependent on the availability of complete distribution data for all the species to be analysed. This is clearly not a realistic proposition at present.

Chapter 15 in *Global Biodiversity* (WCMC, 1992) provides an overview of some important attempts to use species distribution data to define geographical areas (often individual forests or mountain ranges) that are especially rich in species of some given subject taxon. This kind of approach, of which there are several variants, offers considerable promise although the extent to which areas defined as important for one group may be similarly important for some other group is as yet little investigated, and simultaneous analysis of data on a large number of groups presents a substantial challenge.

NOTES TO TABLE 1

Table 1 provides working estimates of the number of species in selected taxa present in each country of the world, and the number in those taxa thought to be endemic to each country.

Key:

- Indicates lack of data.

The groups covered are: mammals, birds, reptiles, amphibians, fishes (freshwater only), flowering plants (angiosperms), conifers and cycads (gymnosperms), ferns and relatives. Many overseas territories, dependencies, and other categories, are listed separately from the 'parent' country if relatively large and/or geographically remote (eg. the Canaries are included with Spain, but New Caledonia is listed separately from France). Many gaps in the data remain, and although further research could fill many such gaps, the lack of readily available data for many countries and groups of species is of concern. We have not been able to obtain complete sets of data for all recently independent states, and in some such cases partial data for the former, more inclusive, country are given.

For **Mammals, Birds, Reptiles** and **Amphibians** there are two data columns, the left (**total species**) giving an estimate of the number of species present in each country, the right (**endemic species**) giving an estimate of the number restricted to each country. For **Birds**, there is a third data column (**breeding species**) giving an estimate of the number of breeding birds in each country. For **Freshwater Fishes, Flowering plants, Conifers and Cycads,** and **Ferns**, there is an estimate of total species present. An estimate of country endemism in the three plant groups combined is given (**Higher Plants** - endemic species).

The table is based on expansion and revision of material originally collated for *Global Biodiversity* (WCMC, 1992). The most extensive change is the addition of a third column of bird data: the information on birds now includes an estimate of the total number of bird species recorded in each country (in addition to the number of breeding species and the number of endemic species). Certain wide-ranging animal groups restricted to marine waters (whales and dolphins, turtles, snakes) are excluded where possible from the estimates. Introduced and recently feral species are also excluded where possible.

Data in the table are derived from a large number of sources; information on the source of any estimate can be obtained from WCMC. Lists of mammal, bird and amphibian species thought on current evidence to be restricted to a single country were derived from world taxonomic checklists (respectively: Wilson and Reeder, 1993; Sibley and Monroe, 1990, 1993; Frost, 1985, and supplement by Duellman 1993), and this database used to calculate the 'endemic species' data column. The reptile endemism and plant data were derived from a number of country or regional sources; these data columns are less complete and less consistent in approach. It is important to keep in mind that lack of precision in the delineation of species boundaries, differences in taxonomy used by country sources, and the continuing description of new species, ensures that a large margin of error will inevitably be associated with species lists and statistical measures of biodiversity.

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NOTES TO FIGURE 2

The map shows the countries with the 20 highest scores according to an index estimating overall levels of national biodiversity. This index (WCMC, unpublished) uses the kind of data in Table 1. Note that the map in Figure 2 was based on an earlier version of this table and may not reflect current information. In deriving this index, it is assumed that the four (non-fish) vertebrate classes are each of equal importance and plants are equal to these four combined. The data for each category for each country are first normalised, reducing numbers to a value between 0 and 1. A richness index and endemism index is produced for plants and vertebrates separately by averaging the relevant figures, and an overall diversity index is calculated as the mean of the vertebrate and plant figures for each country. This index could readily be weighted toward either richness or endemism. Regression analysis using the standard species-area (Arrhenius) relationship allows an area-adjusted index to be calculated. For many purposes, absolute richness is as relevant as area-adjusted richness. The overall richness represented in Figure 2 is therefore based on the average of the direct and the area-adjusted indices.

Table 1. Country species diversity

	Mammals total species	Mammals endemic species	Birds total species	Birds breeding species	Birds endemic species	Reptiles total species	Reptiles endemic species
EUROPE							
Albania	88	0	306	230	0	31	0
Andorra	-	0	-	111	0	-	0
Austria	83	0	414	213	0	14	0
Belarus	-	0	-	221	0	8	0
Belgium	58	0	429	180	0	8	0
Bosnia & Herzegovina	-	0	-	-	0	-	0
Bulgaria	81	0	374	240	0	33	0
Croatia	-	0	-	224	0	-	0
Czech Republic	-	0	-	199	0	-	0
former Czechoslovakia	74	-	-	-	-	-	-
Denmark	43	0	439	196	0	5	0
Estonia	65	0	330	213	0	5	0
Faeroe Islands	-	0	259	71	0	0	0
Finland	60	0	425	248	0	5	0
France	93	0	506	269	9	32	0
Germany	76	0	503	239	0	12	0
Gibraltar	-	-	282	34	0	9	0
Greece	95	2	398	251	0	51	3
Hungary	72	0	363	205	0	15	0
Iceland	11	0	316	88	0	0	0
Ireland	25	0	417	142	0	1	0
Italy	90	3	490	234	0	40	1
Latvia	83	0	325	217	0	7	0
Liechtenstein	64	0	235	124	0	7	0
Lithuania	68	0	305	202	0	7	0
Luxembourg	55	0	289	126	0	7	0
Macedonia	-	0	-	-	0	-	0
Malta	22	0	395	26	0	8	1
Moldova	68	0	270	177	0	9	0
Monaco	-	0	-	-	0	6	0
Netherlands	55	0	456	191	0	7	0
Norway	54	0	453	243	0	5	0
Poland	79	0	421	227	0	9	0
Portugal	63	1	441	207	2	29	2
Romania	84	0	368	247	0	25	0
San Marino	13	0	137	-	0	9	0
Slovakia	-	0	-	209	0	-	0
Slovenia	69	0	361	207	0	21	0
Spain	82	4	506	278	5	53	9
Sweden	60	0	463	249	0	6	0
Switzerland	75	0	400	193	0	14	0
Ukraine	-	1	-	263	0	19	0
United Kingdom	50	0	590	230	1	8	0
former Yugoslavia	98	1	-	-	0	-	0

Table 1. Country species diversity

Amphibians total species	Amphibians endemic species	Freshwater Fishes total species	Flowering Plants total species	Conifers & Cycads total species	Ferns total species	Higher Plants endemic species
13	0	-	2,965	21	45	24
-	0	-	980	8	26	-
20	0	-	2,950	12	66	35
10	0	-	-	-	-	-
17	0	-	1,400	2	50	1
-	0	-	-	-	-	-
17	0	-	3,505	15	52	320
-	0	-	-	-	-	-
-	0	-	-	-	-	-
-	-	-	2,507	11	72	62
14	0	-	1,200	2	50	1
11	0	30	1,630	40	4	-
0	0	-	236	1	25	1
5	0	66	1,040	4	58	-
32	2	-	4,500	20	110	133
20	0	-	2,600	10	72	6
-	-	-	-	-	-	-
15	1	98	4,900	21	71	742
17	0	7	2,148	8	58	38
0	0	-	340	1	36	1
3	0	25	892	2	56	-
34	5	-	5,463	29	106	712
13	0	109	1,153	4	48	-
10	0	-	1,400	10	-	-
13	0	-	1,200	-	-	-
14	0	-	1,200	4	42	-
-	0	-	-	-	-	-
1	0	-	900	3	11	5
13	0	82	-	-	-	-
3	0	-	-	4	18	-
16	0	-	1,170	3	48	-
5	0	-	1,650	4	61	1
18	0	-	2,300	10	62	3
17	0	28	2,500	8	65	150
19	0	87	3,176	11	62	41
3	0	4	-	-	-	-
-	0	-	-	-	-	-
-	0	98	-	-	-	-
25	1	50	4,916	18	114	941
13	0	-	1,650	4	60	1
18	0	-	2,927	16	87	1
16	0	-	-	-	-	-
7	0	36	1,550	3	70	16
-	0	-	5,250	23	78	137

Table 1. Country species diversity

	Mammals total species	Mammals endemic species	Birds total species	Birds breading species	Birds andamic species	Reptiles total species	Reptiles endamic species
ASIA							
Afghanistan	123	1	460	235	0	103	4
Armenia	-	3	-	-	0	46	1
Azerbaijan	-	0	-	-	0	52	0
Bahrain	17	0	294	28	0	25	0
Bangladesh	109	0	684	295	0	119	1
Bhutan	99	0	543	448	0	19	2
BIOT	-	0	45	14	0	0	0
Brunei	157	0	438	359	0	44	0
Cambodia	123	0	429	307	0	82	1
China	394	77	1,244	1,100	67	340	111
Cyprus	21	1	347	79	2	23	1
Georgia	-	2	-	-	0	46	0
Hong Kong	24	0	381	76	0	72	2
India	316	44	1,219	923	55	389	186
Indonesia	436	201	1,531	1,519	397	511	302
Iran	140	5	502	323	1	164	26
Iraq	81	1	381	172	1	81	1
Israel	92	3	500	180	0	-	1
Japan	132	38	583	>250	21	66	27
Jordan	71	0	361	141	0	-	0
Kazakhstan	-	4	-	-	0	37	0
Korea, D.P.R.	-	0	390	115	0	19	1
Korea, Republic	49	0	372	112	0	25	3
Kuwait	21	0	321	20	0	29	0
Kyrgyzstan	-	1	-	-	0	23	0
Laos	172	0	651	487	1	66	1
Lebanon	54	0	329	154	0	-	2
Malaysia	286	27	736	501	11	268	69
Maldives	3	0	125	23	0	0	0
Mongolia	134	6	390	-	0	21	0
Myanmar	251	6	999	867	4	203	38
Nepal	167	1	824	611	2	80	3
Oman	56	2	430	107	0	64	9
Pakistan	151	3	671	375	0	172	23
Philippines	153	97	556	395	183	190	158
Qatar	11	0	255	23	0	17	0
Russia	-	20	-	-	13	58	0
Saudi Arabia	77	1	413	155	0	84	4
Singapore	45	1	295	118	0	-	0
Sri Lanka	88	13	428	250	23	144	75
Syria	63	2	341	204	0	-	2
Taiwan	63	10	445	160	14	80	20
Tajikistan	-	2	-	-	0	38	0
Thailand	265	7	915	616	3	298	35

Table 1. Country species diversity

Amphibians total species	Amphibians endemic species	Freshwater Fishes total species	Flowering Plants total species	Conifers & Cycads total species	Ferns total species	Higher Plants endemic species
6	1	84	3,500	-	-	800
6	0	-	-	-	-	-
8	0	-	-	-	-	-
1	0	0	195	-	-	-
19	0	-	5,000	-	-	-
24	0	-	5,446	22	-	75
0	0	0	100	-	-	-
76	0	-	3,000	-	-	7
28	0	>215	-	-	-	-
263	131	686	30,000	200	2,000	18,000
4	0	-	1,650	-	-	-
11	0	-	-	-	-	-
23	1	-	1,800	4	180	25
197	110	-	15,000	-	1,000	5,000
270	100	-	27,500	-	1,875	17,500
11	5	269	-	-	-	-
6	0	-	-	-	-	-
-	1	26	-	-	-	-
52	36	186	4,700	42	630	2,000
-	0	26	2,200	-	-	-
10	0	-	-	-	-	-
14	0	-	2,898	-	-	107
14	1	130	2,898	-	-	224
2	0	-	234	-	-	-
3	0	-	-	-	-	-
37	1	244	-	-	-	-
-	0	-	-	-	-	-
158	39	449	15,000	-	500	3,600
0	0	1	-	-	-	-
8	0	70	2,272	-	-	229
75	9	-	7,000	-	-	1,071
36	8	120	6,500	23	450	315
-	0	3	1,018	3	14	73
17	2	156	4,929	21	-	372
63	44	-	8,000	31	900	3,500
-	0	0	220	-	-	-
23	0	-	-	-	-	-
-	0	8	1,729	-	-	-
-	0	73	2,000	2	166	2
39	21	65	3,000	-	314	890
-	0	-	-	-	-	-
31	9	57	2,983	20	565	-
2	0	-	-	-	-	-
107	16	>600	11,000	25	600	-

Table 1. Country species diversity

	Mammals Total	Mammals endemic species	Birds total species	Birds breading species	Birds endemic species	Reptiles total species	Reptiles endemic species
ASIA continued							
Turkey	116	1	418	302	0	102	4
Turkmenistan	-	0	-	-	0	67	0
United Arab Emirates	25	0	360	67	0	37	1
former USSR	276	55	-	-	13	168	-
Uzbekistan	-	0	-	-	0	51	0
Viet Nam	213	7	761	535	10	180	39
Yemen	66	2	366	143	8	77	31
OCEANIA							
American Samoa	3	0	50	34	0	11	0
Australia	252	198	751	649	355	748	657
Cook Islands	-	0	50	27	7	-	0
Fed. States Micronesia	-	3	104	40	17	-	2
Fiji	4	1	109	74	26	25	11
French Polynesia	0	0	81	60	26	10	1
Guam	-	0	79	18	2	11	0
Kiribati	-	0	69	26	1	-	0
Marshall Islands	0	0	75	17	0	7	1
Nauru	-	0	22	9	1	-	0
New Caledonia	11	3	-	107	20	51	38
New Zealand	10	4	287	150	76	40	36
Niua	1	0	29	15	0	4	0
Northern Marianas	-	0	88	28	2	11	0
Palau	-	0	135	45	10	22	1
Papua New Guinea	214	57	708	644	85	280	81
Pitcairn Islands	0	0	26	19	5	5	0
Solomon Islands	53	19	223	163	44	61	10
Tokalau	0	0	15	5	0	7	0
Tonga	1	0	48	37	2	6	1
Tuvalu	-	0	27	9	0	-	0
USA Pacific Islands	-	-	-	-	-	-	-
Vanuatu	12	2	111	76	9	20	4
Wallis & Futuna	-	0	-	25	0	-	0
Western Samoa	3	1	60	40	8	8	0
NORTH & CENTRAL AMERICA							
Anguilla	3	0	61	-	0	11	2
Antigua & Barbuda	7	0	140	49	0	13	4
Aruba	-	0	172	48	0	10	2
Bahamas	12	3	>222	88	4	35	16
Barbados	6	0	172	24	0	9	3
Belize	125	0	533	356	0	107	2
Bermuda	3	0	345	8	1	1	1
Canada	193	7	578	426	3	41	0

Table 1. Country species diversity

Amphibians total species	Amphibians endemic species	Freshwater Fishes total species	Flowering Plants total species	Conifers & Cycads total species	Ferns total species	Higher Plants endemic species
18	2	>152	8,472	22	85	2,675
2	0	-	-	-	-	-
-	0	5	-	-	-	-
37	2	-	22,000	-	-	-
2	0	-	-	-	-	-
80	26	-	>7,000	-	-	1,260
-	1	5	-	-	-	135
0	0	-	336	0	135	15
205	188	216	15,000	90	400	14,074
0	0	-	184	0	100	3
0	0	-	-	-	-	293
2	2	-	1,307	11	310	760
0	0	-	-	-	-	560
0	0	-	330	-	-	69
0	0	-	60	0	-	2
0	0	-	100	1	10	5
0	0	-	50	0	4	1
0	0	-	3,017	44	261	2,551
3	3	29	2,160	22	200	1,942
0	0	-	150	0	28	1
0	0	-	250	1	64	81
1	1	-	-	-	-	-
197	100	282	10,000	-	-	-
0	0	-	56	0	20	14
17	9	-	2,780	22	370	30
0	0	-	26	0	6	-
0	0	-	360	1	102	25
0	0	-	-	-	-	-
-	-	-	-	-	-	-
0	0	-	870	-	-	150
0	0	-	475	-	-	7
-	-	-	-	-	-	-
1	0	0	321	-	0	1
2	0	0	766	1	33	-
2	0	-	460	-	-	25
2	0	5	1,172	3	43	118
1	0	0	542	0	30	3
32	0	63	2,750	10	134	150
0	0	-	147	0	20	15
41	0	177	2,920	33	65	147

Table 1. Country species diversity

	Mammals total species	Mammals endemic species	Birds total species	Birds breeding species	Birds endemic species	Reptiles total species	Reptiles endemic species
NORTH & CENTRAL AMERICA continued							
Cayman Islands	8	0	180	45	0	18	6
Costa Rica	205	6	850	600	7	214	36
Cuba	31	12	342	137	22	102	80
Dominica	12	1	163	52	2	14	2
Dominican Republic	20	0	254	136	0	105	22
El Salvador	135	1	420	251	0	73	4
Greenland (Denmark)	-	0	-	62	0	-	0
Granada	15	0	150	50	1	16	1
Guadeloupe	11	3	134	52	2	20	2
Guatemala	250	3	669	458	1	231	20
Haiti	3	0	220	75	0	102	29
Honduras	173	1	684	422	1	152	12
Jamaica	24	3	262	113	25	36	26
Martinique	9	1	131	52	1	9	3
Mexico	450	140	1,026	769	89	687	369
Montserrat	7	0	111	37	1	11	2
Netherlands Antilles	-	0	252	77	0	18	4
Nicaragua	200	2	750	482	0	161	6
Panama	218	14	929	732	8	226	25
Puerto Rico	16	1	239	105	12	46	28
St Kitts-Nevis	7	0	99	32	0	10	0
St Lucia	9	1	169	50	4	17	5
St Vincent	8	1	129	108	2	16	4
Trinidad & Tobago	100	1	433	260	1	70	2
Turks & Caicos Islands	-	0	175	42	0	12	5
USA	428	101	768	650	71	280	72
Virgin Islands (British)	3	0	199	70	0	18	3
Virgin Islands (US)	-	0	199	70	0	-	3
SOUTH AMERICA							
Argentina	320	47	976	897	19	220	64
Bolivia	316	20	1,274	-	16	208	17
Brazil	394	96	1,635	1,492	177	468	178
Chile	91	16	448	296	15	72	33
Colombia	359	28	1,695	1,721	62	584	106
Ecuador	302	23	1,559	1,388	37	374	114
French Guiana	150	2	707	-	1	131	1
Guyana	193	1	737	678	0	-	2
Paraguay	305	2	600	556	0	120	3
Peru	344	45	1,678	1,538	109	298	95
Suriname	180	2	673	603	0	151	0
Uruguay	81	1	365	237	0	-	1
Venezuela	305	16	1,296	1,308	42	259	57

Table 1. Country species diversity

Amphibians total species	Amphibians endemic species	Freshwater Fishes total species	Flowering Plants total species	Conifers & Cycads total species	Ferns total species	Higher Plants endemic species
1	0	4	518	1	19	19
162	33	130	11,000	9	1,110	950
41	36	28	6,004	23	495	3,229
2	0	0	1,027	1	200	11
35	15	16	5,000	7	650	1,800
23	0	16	2,500	11	400	17
-	0	-	497	1	31	15
3	0	0	919	1	148	4
5	2	0	-	1	261	26
99	26	220	8,000	29	652	1,171
46	17	16	4,685	7	550	1,623
56	9	46	5,000	30	650	148
21	18	6	2,746	4	558	923
1	0	1	-	1	259	30
285	169	-	25,000	71	1,000	12,500
2	0	0	554	-	117	2
2	0	-	-	-	-	-
59	2	50	7,000	14	576	40
164	20	101	9,000	15	900	1,222
19	16	0	2,128	1	364	235
1	1	0	533	0	126	1
2	0	0	909	-	119	11
3	0	0	1,000	1	165	-
26	2	76	1,982	0	277	236
0	0	0	440	1	7	9
233	122	822	16,302	125	549	4,036
5	1	0	-	-	-	-
5	1	0	-	-	-	-
145	37	410	9,000	13	359	1,100
112	18	389	16,500	17	850	4,000
502	296	-	55,000	15	1,200	-
41	26	44	5,125	17	150	2,698
585	131	-	50,000	20	1,200	1,500
402	138	706	18,250	12	1,100	4,000
89	2	-	5,300	5	320	144
-	10	-	6,000	2	407	-
85	4	-	7,500	1	350	-
315	91	-	17,121	24	1,100	5,356
95	7	300	4,700	3	315	-
-	2	-	2,184	1	93	40
199	76	-	20,000	14	1,059	8,000

Table 1. Country species diversity

	Mammals total species	Mammals endemic species	Birds total species	Birds breeding species	Birds endemic species	Reptiles total species	Reptiles endemic species
AFRICA							
Algeria	92	2	375	192	1	-	3
Angola	276	7	909	765	13	-	18
Benin	188	0	423	307	0	-	1
Botswana	164	0	550	643	0	157	2
Burkina Faso	147	1	453	335	0	-	3
Burundi	107	0	596	451	0	-	0
Cameroon	297	13	874	690	8	-	19
Cape Verde	5	0	128	38	4	12	9
Central African Republic	209	2	662	537	0	-	0
Chad	134	1	532	370	0	-	1
Comoros	12	2	91	50	9	22	7
Congo	200	2	569	449	0	-	1
Côte d'Ivoire	230	1	694	535	0	-	2
Djibouti	-	0	326	126	1	-	0
Egypt	102	7	439	153	0	83	1
Equatorial Guinea	184	3	322	273	3	-	3
Eritrea	112	0	537	319	0	-	0
Ethiopia	255	31	813	626	29	-	6
Gabon	190	2	629	466	0	-	3
Gambia	108	0	504	280	0	-	1
Ghana	222	1	725	529	1	-	1
Guinea	190	1	552	409	0	-	3
Guinea-Bissau	108	0	319	243	0	-	2
Kenya	359	21	1,068	844	6	187	15
Lesotho	33	0	281	58	0	-	2
Liberia	193	1	581	372	1	62	2
Libya	76	5	323	91	0	-	1
Madagascar	105	77	253	202	103	252	198
Malawi	195	0	645	521	0	124	6
Mali	137	0	622	397	0	16	2
Mauritania	61	1	541	273	0	-	1
Mauritius	4	2	81	27	9	11	2
Mayotte	-	0	-	27	0	15	1
Morocco	105	4	416	210	0	-	8
Mozambique	179	1	678	498	0	-	5
Namibia	154	3	609	469	1	-	26
Niger	131	0	482	299	0	-	0
Nigeria	274	6	862	681	2	>135	7
Réunion	2	0	43	18	0	2	3
Rwanda	151	0	666	513	0	-	1
Saint Helena & depend.	2	0	915	53	8	0	0
São Tomé & Príncipe	8	2	111	63	24	16	7
Senegal	155	1	610	384	0	-	1
Seychelles	-	2	170	38	11	15	14

Table 1. Country species diversity

Amphibians total species	Amphibians endemic species	Freshwater Fishes total species	Flowering Plants total species	Conifers & Cycads total species	Ferns total species	Higher Plants endemic species
-	0	-	3,100	18	46	250
-	23	-	5,000	-	185	1,260
-	0	-	2,000	1	200	-
38	1	92	-	0	15	17
-	0	-	1,100	0	-	-
-	2	-	2,500	-	-	-
-	65	-	8,000	3	257	156
0	0	-	740	0	34	86
-	0	-	3,600	2	-	100
-	0	-	1,600	-	-	-
-	0	15	660	1	60	136
-	1	-	4,350	7	-	1,200
-	2	-	3,517	0	143	62
-	0	-	635	2	4	2
6	0	-	2,066	4	6	70
-	2	-	3,000	0	250	66
-	0	-	-	-	-	-
-	30	-	6,500	3	100	1,000
-	4	-	6,500	1	150	-
-	0	79	966	0	8	-
-	4	-	3,600	1	124	43
-	3	-	3,000	0	-	88
-	1	-	1,000	0	-	12
88	10	-	6,000	6	500	265
-	1	8	1,576	0	15	2
38	4	-	2,200	0	-	103
-	0	-	1,800	10	15	134
144	140	40	9,000	5	500	6,500
69	1	-	3,600	4	161	49
-	1	-	1,741	0	-	11
-	0	-	1,100	0	-	-
0	0	-	700	0	178	325
-	0	-	-	-	-	-
-	2	-	3,600	19	56	625
62	2	-	5,500	9	183	219
32	2	102	3,128	1	45	-
-	0	-	1,170	0	8	-
>109	1	260	4,614	1	100	205
0	0	-	750	0	240	165
-	0	-	2,288	2	-	26
0	0	-	50	0	24	50
9	9	-	744	1	150	134
-	1	83	2,062	0	24	26
12	11	-	1,139	1	-	182

Table 1. Country species diversity

	Mammals total species	Mammals endemic species	Birds total species	Birds breeding species	Birds endemic species	Reptiles total species	Reptiles endemic species
AFRICA continued							
Sierra Leone	147	0	622	466	0	-	1
Somalia	171	11	649	422	10	193	48
South Africa	247	27	790	596	7	299	81
Sudan	267	11	937	680	0	-	6
Sweziland	47	0	485	364	0	102	1
Tanzenia	322	14	1,005	822	19	245	56
Togo	196	1	558	391	0	-	1
Tunisia	78	1	356	173	0	-	1
Uganda	338	6	992	830	3	149	2
Western Sahara	32	1	162	60	0	26	0
Zaire	415	28	1,096	929	22	-	33
Zambia	229	3	736	605	1	-	2
Zimbabwe	270	1	648	532	0	153	2
ANTARCTICA							
Antarctica	-	0	-	-	1	0	0
Falkland Islands	4	0	183	59	3	0	0
French S. & Anterctic Terr.	-	0	-	48	1	0	0

Table 1. Country species diversity

Amphibians total species	Amphibians endemic species	Freshwater Fishes total species	Flowering Plants total species	Conifers & Cycads total species	Ferns total species	Higher Plants endemic species
-	2	-	2,090	0	-	74
27	3	-	3,000	2	26	500
95	36	94	23,000	40	380	-
-	2	-	3,132	5	-	50
40	0	40	2,636	8	71	4
121	40	-	10,000	8	-	1,122
-	3	-	2,000	1	200	-
-	0	-	2,150	10	36	-
50	0	291	5,000	6	400	-
-	0	-	330	-	-	-
-	53	-	11,000	7	-	1,100
83	1	-	4,600	1	146	211
120	3	112	4,200	6	234	95
0	0	0	41	0	11	11
0	0	2	146	0	19	14
0	0	-	-	-	-	-

Table 2. Threatened Species

Measures of species richness and endemism are some of the most straightforward ways of indicating how important areas are for biodiversity. However, in order to try to maintain maximum biodiversity in the most efficient way possible, it is also important to know which aspects of it are under most immediate threat. This can be done in two ways. The first is to assess the status of individual species and try to determine the degree of threat they are under (ie. the likelihood of their going extinct in a given length of time). The second is to assess the status of particular areas and to draw inferences from this regarding the likelihood of extinction of the species or populations inhabiting that area.

The first approach requires the accumulation of a large amount of information on the distribution, biology and status of the species concerned, followed by expert analysis to attempt to decide exactly how threatened the species might be. Often there is simply insufficient information to make anything other than an informed guess; where there is enough information, its collection and analysis is usually very time-consuming. This approach also implies continued monitoring of the status of individual species, this is also an expensive and often difficult process. For this reason, global analyses of threatened species status have only been carried out for a relatively few groups of organisms. The birds (Class Aves) form the only large higher taxon in which the conservation status of all member species has been assessed; the birds have now been subject to two such assessments. Only the mammals approach birds in this respect, but an estimated 45% of mammal species (mostly among insectivora, micro-bats and rodents) remain to be assessed. The number of invertebrates whose conservation status has been assessed at the species level is essentially zero in relation to estimates of the total number of invertebrate species (c 10 million), but certain higher taxa of insects (swallowtail butterflies, dragonflies) have been assessed quite comprehensively.

An assessment of the conservation status of species is fundamental to setting priorities among possible management actions. Disregarding other factors that need to be considered in assigning priorities, those species regarded by IUCN as globally threatened are of major concern. At the country level, it is clearly desirable for conservation or management agencies to know which species regarded as globally threatened are endemic to the country in question because these agencies bear special responsibility for them. Threatened endemic species should be highest national priorities in terms of preventing loss of global biodiversity.

The *1994 IUCN Red List of Threatened Animals* includes 5,929 threatened species of which 3,175 are vertebrates and 2,754 are invertebrates. Around 65% of threatened vertebrate species and 78% of threatened invertebrates are single-country endemics. Overall, 71% of globally-threatened animal species are endemic to a single country. This proportion of course reflects the extent to which the status of the world fauna has been assessed; it is in general easier to determine the status of species that are not widely distributed, and national lists of threatened species have been taken into account by WCMC in compilation of the current IUCN Red List. Nevertheless, other than an unknown number of threatened species whose demise may be inevitable and a result of natural intrinsic factors, the security of the majority of species now known to be threatened could be assured if all countries were able to manage their own biological resources in accordance with the aims of the Convention on Biological Diversity.

NOTES TO TABLE 2

The table below contains information country by country on the number of species present that are currently regarded by IUCN/SSC (and BirdLife International in the case of birds) as threatened at the global level.

Key:

- Indicates lack of data.

[1] For **Kanya, Tanzania** and **Uganda** the estimate for fishes does not include a large number of cichlids in Lake Victoria for which we have insufficient data on the country range of individual species. A total of 250 haplochromine and 2 tilapiine cichlid fishes in Laka Victoria is given in the 1990 Red List, but recent estimates suggest >300 haplochromine species ara present of which some 200 may be critically threatened.

[2] The figure for invertebrates does not include 62 earthworms of the genera *Microscolex* and *Udeina* which occur in **Lesotho** and **South Africa** but for which we have insufficient data on the range of individual species.

[3] The invertebrate total does not include species of the insect genera *Itodacnus* and *Oodemus* for which we lack data on the number of recognised species.

Data for mammals, reptiles, amphibians, fishes and invertebrates are from the animals sector of the species database at WCMC, from which the IUCN Red List is produced. The status category designations and some other data are derived from the IUCN/SSC Specialist Group network. Except for birds the data tabulated reflect the *1994 IUCN Red List of Threatened Animals* (Groombridge, ed., 1993). New data on the status of birds, to appear in the revised world list of threatened birds (Collar *et al.*, 1994), were most generously made available by BirdLife International in advance of publication. Widespread marine cetaceans lacking full country-specific range data are excluded. The table covers animal taxa of species rank only, but among plants a number of subspecies are included. The plant information is derived from the plants sector of the WCMC species database; these data are provisional only, and will shortly be superseded by the forthcoming world Red List of threatened plants (expected 1995).

Except for birds, the species counted are those that have been assessed and found to meet one of the standard IUCN status categories indicating threatened status. Birds have been categorised by BirdLife International using a version of the revised categories and criteria developed by IUCN/SSC. This revised system has not yet been formally approved by IUCN Council; the penultimate draft is presented by Mace and Stuart (1994). Other species have been categorised according to the existing IUCN category system (outline definitions given below). The new revised IUCN system and the version used by BirdLife International do not have an Insufficiently Known ('K') category. In order make information on non-birds more closely comparable with that for birds, K species among the former have been excluded; only species categorised as Endangered, Vulnerable, Rare or Indeterminate have been counted.

IUCN Threatened Species Categories (non-revised version)

E - ENDANGERED

Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included are taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction. Also included are taxa that may be extinct but have definitely been seen in the wild in the past 50 years.

V - VULNERABLE

Taxa believed likely to move into the 'Endangered' category in the near future if the causal factors continue operating. Included are taxa of which most or all the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security has not yet been assured; and taxa with populations that are still abundant but are under threat from severe adverse factors throughout their range.

R - RARE

Taxa with small world populations that are not at present 'Endangered' or 'Vulnerable', but are at risk. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

I - INDETERMINATE

Taxa *known* to be 'Endangered', 'Vulnerable' or 'Rare' but where there is not enough information to say which of the three categories is appropriate.

K - INSUFFICIENTLY KNOWN

Taxa that are *suspected* but not definitely known to belong to any of the above categories, because of lack of information.

Table 2. Threatened species

	Mammals	Birds	Reptiles	Amphibians	Fishes	Invarts.	Plants
EUROPE							
Albania	3	5	2	0	1	8	50
Andorra	1	0	0	0	0	2	0
Austria	3	3	0	0	2	62	22
Belarus	5	4	0	0	0	19	0
Belgium	2	3	0	0	1	29	3
Bosnia & Herzegovina	-	2	-	-	-	-	0
Bulgaria	1	11	1	0	1	24	94
Croatia	-	4	-	-	-	-	0
Czech Republic	3	5	0	0	2	32	-
former Czechoslovakia	0	6	0	0	0	1	83
Danmark	1	2	0	0	1	19	6
Estonia	5	2	0	0	1	16	2
Finland	3	4	0	0	2	25	11
France	5	5	2	2	3	92	117
Germany	2	5	0	0	4	57	16
Gibraltar	0	1	0	0	0	2	3
Greece	5	9	4	1	17	17	539
Hungary	2	7	0	0	1	37	24
Iceland	0	1	0	0	1	1	1
Ireland	0	1	0	0	2	6	9
Italy	4	6	3	9	2	45	273
Latvie	4	5	0	0	1	20	0
Liechtenstein	1	1	0	0	0	6	1
Lithuanie	4	4	0	0	1	21	0
Luxembourg	2	1	0	0	0	10	2
Macedonia	-	-	-	-	-	-	-
Malta	2	2	0	0	0	6	14
Moldova	1	6	0	0	2	18	1
Moneco	-	-	-	-	-	-	0
Netherlands	2	3	0	0	1	21	1
Norwey	3	3	0	0	2	19	20
Poland	4	5	0	0	3	37	27
Portugal	6	7	0	1	9	83	240
Romania	3	11	1	0	3	29	122
San Marino	-	-	-	-	-	-	0
Slovakia	3	4	0	0	2	33	-
Slovenia	3	3	0	2	0	0	11
Spain	7	10	4	3	13	82	896
Sweden	3	4	0	0	2	32	19
Switzerland	2	3	0	1	3	44	9
Ukraine	4	10	0	0	3	28	16
United Kingdom	1	2	0	0	2	18	28
former Yugoslavia	4	8	1	1	5	34	149
ASIA							
Afghanistan	8	12	0	0	0	2	6
Armenia	1	5	2	0	0	13	0

	Mammals	Birds	Reptiles	Amphibians	Fishes	Inverts.	Plants
ASIA continued							
Azarbaijan	3	6	1	0	0	12	1
Bahrain	1	2	0	0	1	0	0
Bangladash	16	28	17	0	0	0	24
Bhutan	18	12	1	0	0	3	20
BIOT	0	0	2	0	0	1	0
Brunai	9	14	3	0	1	1	27
Cambodia	19	16	7	0	4	0	7
China	42	86	8	1	16	13	343
Cyprus	2	4	3	0	0	0	49
Gaorgia	3	5	5	1	0	15	1
Hong Kong	0	13	1	0	0	0	5
India	40	71	21	3	2	18	1,256
Indonesia	57	104	16	0	65	59	281
Iran	9	12	6	0	2	8	1
Iraq	4	11	0	0	2	6	2
Israal	7	8	4	0	0	5	38
Japan	17	31	10	11	10	67	704
Jordan	8	4	0	0	0	4	10
Kazakhstan	9	14	0	0	1	17	0
Koraa, D.P.R.	7	16	0	0	0	0	7
Koraa, Rapublic	6	19	0	0	0	0	69
Kuwait	2	3	2	0	0	0	0
Kyrgyzstan	4	5	0	0	1	3	1
Laos	25	23	3	0	3	0	5
Labanon	5	5	1	0	0	3	4
Malaysia	20	31	10	0	4	16	510
Maldivas	0	1	2	0	0	1	0
Mongolia	8	11	0	0	0	6	1
Myanmar	20	43	11	0	1	8	29
Napal	23	23	8	0	0	2	21
Oman	5	5	4	0	2	1	4
Pakistan	10	22	7	0	0	1	12
Philippines	22	86	8	2	21	27	371
Qatar	0	1	2	0	0	0	0
Russia	17	35	3	0	4	35	127
Saudi Arabia	6	10	2	0	0	6	6
Singapora	3	6	1	0	0	3	14
Sri Lanka	4	11	9	0	19	4	436
Syria	4	6	1	0	0	8	10
Taiwan	6	12	2	0	1	6	95
Tajikistan	6	9	0	0	0	3	0
Thailand	22	44	11	0	11	5	382
Turkay	4	13	10	3	18	18	1,827
Turkmanistan	8	9	0	0	1	4	1
Unitad Arab Emiratas	2	4	2	0	0	0	0
former USSR	-	-	-	-	-	1	-
Uzbakistan	7	11	0	0	0	3	5

Table 2. Threatened species

	Mammals	Birds	Reptiles	Amphibians	Fishes	Inverts.	Plants
ASIA continued							
Viet Nam	25	45	8	1	2	3	350
Yemen	4	12	2	0	0	1	149
OCEANIA							
American Samoa	2	1	2	0	0	7	8
Australia	43	51	42	20	54	372	1,597
Cook Islands	0	6	2	0	0	0	12
Fed. States of Micronesia	5	5	2	0	0	59	3
Fiji	4	8	6	0	0	4	72
French Polynesia	0	20	2	0	0	13	63
Guam	3	2	2	0	0	55	17
Kiribati	0	2	2	0	0	3	0
Marshall Islands	0	1	2	0	0	5	0
Nauru	0	1	0	0	0	0	0
New Caledonia	4	10	4	0	0	9	193
New Zealand	3	45	12	3	6	46	236
Niue	0	1	1	0	0	0	0
Northern Marianas	2	6	2	0	0	15	8
Palau	3	2	3	0	0	60	0
Papua New Guinea	33	31	7	0	49	23	95
Pitcairn Islands	0	5	0	0	0	2	7
Solomon Islands	5	18	6	0	0	10	43
Tokelau	0	1	2	0	0	1	0
Tonga	0	2	3	0	0	3	0
Tuvalu	0	1	2	0	0	4	0
USA Pacific Is	0	0	1	0	0	0	0
Vanuatu	4	6	3	0	0	4	23
Wallis & Futuna	-	-	-	-	-	-	0
Western Samoa	2	6	2	0	0	3	20
NORTH AND CENTRAL AMERICA							
Anguilla	0	0	5	0	0	0	3
Antigua & Barbuda	0	1	5	0	0	0	2
Aruba	0	1	2	0	0	1	0
Bahamas	3	3	6	0	1	1	27
Barbados	0	1	2	0	0	0	3
Belize	5	1	5	0	0	1	41
Bermuda	0	2	0	0	0	1	8
Canada	6	5	0	0	20	12	649
Cayman Islands	0	1	2	0	0	0	12
Costa Rica	8	10	7	1	0	10	456
Cuba	10	13	8	0	0	5	811
Dominica	0	2	4	0	0	0	56
Dominican Republic	3	10	8	1	0	7	73
El Salvador	2	0	6	0	0	1	35
Greenland	2	1	0	0	0	0	0

	Mammals	Birds	Reptiles	Amphibians	Fishes	Inverts.	Plants
NORTH AND CENTRAL AMERICA continued							
Granada	0	1	4	0	0	0	5
Guadaloupa	1	0	7	0	0	0	21
Guatemala	5	4	9	0	0	5	315
Haiti	3	10	6	2	0	5	28
Honduras	5	4	7	0	0	2	55
Jamaica	2	7	10	4	0	7	371
Martinique	0	2	5	0	0	0	42
Maxico	24	34	18	3	98	32	1,048
Montsarrat	0	0	5	0	0	0	1
Netharlands Antillas	0	1	6	0	0	0	1
Nicaragua	6	3	7	0	0	0	78
Panama	11	9	7	0	0	2	561
Puarto Rico	1	6	8	3	0	2	84
Saint Kitts-Navis	0	1	5	0	0	0	3
Saint Lucia	0	3	6	0	0	0	9
Saint Vincent	0	2	4	0	0	0	8
Trinidad & Tobago	1	2	5	0	0	1	16
Turks & Caicos Islands	0	2	4	0	0	0	2
USA[3]	22	46	23	16	174	860[3]	1,845
Virgin Islands (British)	0	2	5	1	0	0	5
Virgin Islands (US)	0	2	4	0	0	0	8
SOUTH AMERICA							
Argentina	20	40	6	5	1	2	170
Bolivia	21	27	4	0	1	0	49
Brazil	45	103	10	1	8	14	463
Chile	11	15	18	20	27	0	292
Colombia	24	62	12	0	3	0	376
Ecuador	20	50	12	0	0	30	375
French Guiana	6	2	8	0	0	0	36
Guyana	7	1	7	0	0	0	47
Paraguay	8	22	3	0	0	0	12
Paru	29	60	7	0	0	1	377
Suriname	6	1	5	0	0	0	48
Uruguay	4	9	0	0	0	1	11
Venezuela	12	22	10	0	0	0	107
AFRICA							
Algaria	11	7	0	0	1	5	145
Angola	16	13	5	0	0	3	25
Benin	7	1	2	0	0	1	3
Botswana	8	5	0	0	0	0	4
Burkina faso	6	1	1	0	0	0	0
Burundi	6	5	0	0	0	1	1
Camaroon	21	14	3	1	20	3	74
Capa Varda	0	3	3	0	0	0	1
Cantral African Rapublic	9	2	1	0	0	1	0

Table 2. Threatened species

	Mammals	Birds	Reptiles	Amphibians	Fishes	Inverts.	Plants
AFRICA continued							
Chad	13	3	1	0	0	0	12
Comoros	3	6	2	0	1	4	3
Congo	13	3	2	0	0	2	3
Côte d'Ivoire	16	11	4	1	0	1	66
Djibouti	3	3	2	0	0	0	2
Egypt	7	10	4	0	1	9	84
Equatoriel Guinea	12	4	3	1	0	3	9
Eritraa	3	3	0	0	0	0	-
Ethiopia	21	17	2	0	0	1	153
Gabon	12	4	3	0	0	2	78
Gambia	3	1	1	0	0	0	0
Ghana	12	7	4	0	0	1	32
Guinea	13	11	3	1	0	1	35
Guinea-Bissau	5	1	3	0	0	1	0
Kenya[1]	16	22	3	0	-[1]	3	158
Lasotho[2]	2	3	1	2	1	1[2]	7
Liberia	13	13	3	1	0	2	1
Libya	8	2	2	0	0	0	57
Madegescar	33	28	10	0	10	18	189
Malawi	6	9	0	0	0	2	61
Mali	12	5	1	0	0	0	14
Mauritenia	10	3	3	0	0	0	3
Mauritius	3	9	6	0	0	19	222
Mayotte	0	2	2	0	0	0	0
Morocco	7	11	1	0	1	6	195
Mozambique	9	13	6	1	1	3	92
Namibia	12	8	2	1	5	0	23
Niger	10	2	0	0	0	1	0
Nigaria	22	8	3	0	0	1	9
Réunion	0	3	2	0	0	21	86
Rwanda	14	6	0	0	0	2	0
Saint Helana & depend.	0	9	1	0	0	5	57
São Tomé & Príncipa	1	9	2	0	0	4	1
Senegal	9	5	6	0	0	0	32
Seychelles	1	8	3	4	0	5	80
Sierra Leone	12	12	3	0	0	2	12
Somalia	12	8	2	0	1	0	57
South Africa[2]	25	16	36	16	34	96[2]	953
Sudan	16	9	2	0	0	2	8
Swaziland	4	4	2	1	0	0	41
Tanzania[1]	16	30	4	0	-[1]	11	406
Togo	8	1	3	0	0	1	0
Tunisia	5	6	1	0	0	3	24
Uganda[1]	15	10	0	0	-[1]	2	6
Western Sahara	4	3	2	0	0	0	0
Zaire	23	26	3	0	1	1	7
Zambia	7	10	1	0	0	1	9

Table 2. Threatened species

	Mammals	Birds	Reptiles	Amphibians	Fishes	Inverts.	Plants
AFRICA continued							
Zimbabwe	9	7	0	0	0	2	94
ANTARCTICA							
Falkland Islands	1	1	0	0	0	0	5
French S & Antarctic Terr.	0	2	0	0	0	0	0

Table 3. National Red Data Books

Given that a central goal of national biodiversity conservation is maintenance of maximum species diversity, one important task is to assess which elements of the national flora and fauna are most at risk of extinction.

Until quite recently only a small number of countries had produced a national assessment of species status. This activity has been largely restricted to developed countries; in general, these countries are relatively low in diversity, have well-inventoried floras and faunas, and have the required infrastructure. Most publications have been patterned after the IUCN global Red Data Books and Red Lists. Now a growing number of less developed countries have undertaken this task, and more may be expected to do so within the framework of the Convention on Biological Diversity. By virtue of monitoring programmes, several countries have produced revised editions of their earlier Red Data Books.

Some countries have adapted existing IUCN status categories to their own national use. The revised system (Mace and Stuart, 1994) is explicitly designed to be applied at the global scale and to wild populations within their natural range (and to benign introductions); it is recommended that application of the global system at regional or national scale should include consideration information on the global status and the proportion of the species that occurs within the larger-scale unit.

The table below indicates for which countries an authoritative published listing of threatened species, or compilation of information in the standard 'Red Data Book' format, is available, and which groups of organisms are assessed. The intention is to show in general terms where efforts have been made toward assessment of the status of species at the national, as opposed to global, level. This is shown graphically in Figure 3; this reflects the data collated in Table 3. A small number of national listings are based initially on the global IUCN list rather than an independent national assessment.

We give below partial citations for the Red Data Books and lists we are currently aware of that have been published during the past decade (since and including 1985), and for one or two that are in advanced preparation.

NOTES TO TABLE 3

This table indicates for which countries an authoritative published listing of threatened species, or compilation of information in the standard 'Red Data Book' format, is available, and which groups of organisms are assessed. The table reflects the current state of a review not yet completed, and should be taken as indicative only, not fully comprehensive. Full bibliographic details are expected to be disseminated at a later date.

Key:

- \- Indicates lack of data.
- • Species within group indicated have appeared in a national Red Data Book or equivalent. Note that this does not necessarily mean than all species of that group present in the country have been assessed, nor that all parts of the country have been covered.
- ? Indicates that we have reason to believe the group is represented in a national Red Data Book but that we have not examined the publication.
- p Document in advanced draft

Some publications are prepared or sponsored by an official government body or other authoritative organisation within the country, others are prepared by non-governmental organisations, with or without any official backing or endorsement, and others are made by individual researchers. We have not attempted to collate details of all listings published or prepared by individual researchers. A few documents not yet formally published have been taken into account. It has not always been possible to distinguish between kinds of source, particularly if the document in question has not been examined. We have not attempted to include all works covering single higher taxa unless part of a series having the aim of covering all major groups. Some countries appear not to have published an official Red Data Book, but nonetheless have appropriate assessments and monitoring programmes in place. We have not traced a Red Data Book for Russia; however, it made up the greater part of the former USSR and is covered in the Red Data Book volumes for that region.

Major national Red Data Books since 1985

EUROPE

Austria: Gepp, 1994; Niklfeld, 1986. **Belerus:** Parfenov *et al.*, 1987 **Bulgaria:** Botev, & Peshev, 1985; Mel'nik, 1987. former **Czechoslovakia, Czech Republic:** Barus, *et al.*, 1988; Sedlacek, *et al.*, 1988; Skapec, *et al.*, 1992. **Denmark:** Ingelög *et al.*, 1993; Lojtnant, 1985; Lojtnant & Gregersen, 1986. **Estonia:** Ingelög *et al.*, 1993. **Finland:** Anon. 1986; Forsman *et al.*, 1936; Ingelög *et al.*, 1993; Koistinen *et al.*, 1986. **Germany:** Ingelög *et al.*, 1993; Nowak, 1989. **Greece:** Karandinos, 1992. **Iceland:** Einarsson, 1988. **Ireland:** Curtis & McGoueh, 1988; Whilde, 1993. **Italy:** Conti *et al.*, 1992. **Latvia:** Andrusaitis, 1985; Ingelög *et al.*, 1993. **Liechtenstein:** Broggi & Willi, 1985. **Lithuania:** Ingelög *et al.*, 1993; Lapele & Vaiciunaite, 1992; Parfenov *et al.*, 1987. **Luxembourg:** Weiss, 1988. **Malta:** Schembri & Sultana, 1989. **Moldova:** Gania, 1989. **Netherlands:** Weeda *et al.*, 1990. **Norway:** Anon. 1988; Kramme & Hagvar, 1985. **Poland:** Glowacinski, 1992a; Glowacinski, 1992b; Ingelög *et al.*, 1993; Zarzycki & Wojewoda, 1987. **Portugal:** Anon. 1991c; Anon. 1991d; Dray, 1985. **Russia:** Ingelög *et al.*, 1993. **Slovenia:** Vidic, 1992. **Spain:** Blanco & González, 1992; Gomez-Campo, 1987; ICONA. 1986. **Sweden:** Ahlen & Tjernberg, 1988; Ahlen & Tjernberg, 1992; Ehnström & Waldén, 1986; Ingelög *et al.*, 1993. **Switzerland:** Duelli, 1994; Landolt, 1992; Landolt, 1991. **United Kingdom:** Batten *et al.*, 1990; Bratton, 1991; Morris, 1994; Shirt, 1987.

ASIA

Armenia: Kazarian, 1989; Movsesian, 1987. **China:** Fu Li-Kuo & Jin Jiang-ming, 1992; National Environment Protection Agency, 1994. **India:** Nayar & Sastry, 1987. **Japan:** Anon, 1991e. **Kazakhstan:** Baitenov, 1985; Kovshar, & Bekenov, 1985. **Sri Lanka:** Abeywickreme, 1987. **Taiwan:** Severinghaus & Liu, 1990. **Tajikistan:** Abdusaliamov, 1988. **Thailand:** Ecological Research Department, TISTR. 1991. **Turkey:** Anon, 1991a. **Turkmenistan:** Babaev, 1985. **Viet Nam:** Ministry of Science, Technology and Environment, 1992.

NORTH & CENTRAL AMERICA

Canada: Argus & Pryer, 1990; COSEWIC, 1994; Lowe, 1990; Moseley, 1992. **Guadeloupe:** Benito-Espinal & Hautcastel, 1988. **Guatemala:** Anon, 1994. (NB. not shown in Fig. 3); **Martinique:** Benito-Espinal & Hautcastel, 1988. **Mexico:** Flores-Villela & Gerez, 1988. **United States:** Anon. 1992; Lowe, 1990; Moseley, 1992.

SOUTH AMERICA

Argentina: Bertonatti & González, 1993; Chebez, 1994. **Brazil:** Bernardes *et al.*, 1990; da Fonseca *et al.*, 1994. **Chile:** Glade, 1993; Ivan Benoit, 1989. **French Guiana:** Thiollay, 1988. **Peru:** Pulido, 1991. **Venezuela:** Rodriguez & Rojas-Suarez, (in prep).

OCEANIA

Australia: Anon, 1991b; Briggs & Leigh, 1988; Cogger *et al.*, 1993; Garnett, 1992; Jackson & Wager, 1993; Kennedy, 1992. **French Polynesia:** Thibault, 1988. **New Caledonia:** Hannecart, 1988. **New Zealand:** Bell, 1986; Given *et al.*, 1987. **Wallis and Futuna Islands:** Guyot & Thibault, 1988.

AFRICA

Mauritius: Strahm, 1989. **Mayotte:** Louette, 1988. **Réunion:** Barre, 1988; Dupont *et al.*, 1989. **South Africa:** Branch, 1988; Hall & Veldhuis, 1985; Henning & Henning, 1989; Skelton, 1987; Smithers, 1986.

Table 3. National Red Data Books

	Mammals	Birds	Amphibians & Reptiles	Fishes	Inverts.	Plants
EUROPE						
Albania	-	-	-	-	-	-
Andorra	-	-	-	-	-	-
Austria	●	●	●	●	●	●
Belarus	-	-	-	-	-	●
Belgium	●	●	●	●	●	●
Bosnia & Herzegovina	-	-	-	-	-	-
Bulgaria	●	●	●	●	●	●
Croatia	-	-	-	-	-	-
Czech Republic	●	●	●	●	●	●
former Czechoslovakia	-	-	-	-	-	●
Denmark	●	●	●	●	●	●
Estonia	●	●	●	-	-	●
Finland	●	●	●	●	●	●
France	●	●	●	●	●	●
Germany	●	●	●	●	●	●
Gibraltar	-	-	-	-	-	-
Greece	●	●	●	●	-	●
Hungary	-	●	p ●	-	-	●
Iceland	-	-	-	-	-	●
Ireland	●	●	●	●	-	●
Italy	●	●	●	-	-	●
Latvia	●	●	●	? ●	? ●	●
Liechtenstein	-	●	-	-	-	●
Lithuania	●	●	●	? ●	? ●	●
Luxembourg	●	●	●	-	●	●
Macedonia	-	-	-	-	-	-
Malta	●	●	●	●	●	●
Moldova	-	●	-	-	-	●
Monaco	-	-	-	-	-	-
Netherlands	●	●	●	-	-	●
Norway	●	●	●	-	●	●
Poland	●	●	●	●	●	●
Portugal	●	●	●	●	-	●
Romania	-	●	-	-	-	●
San Marino	-	-	-	-	-	-
Slovakia	●	●	●	●	-	●
Slovenia	●	●	●	●	●	●
Spain	●	●	●	●	●	●
Sweden	●	●	●	●	-	●
Switzerland	●	●	●	●	●	●
Ukraine	●	●	●	●	●	●
United Kingdom	●	●	-	●	●	●
former Yugoslavia	-	-	-	-	-	●
ASIA						
Afghanistan	-	-	-	-	-	-

Table 3. National Red Data Books

	Mammals	Birds	Amphibians & Reptiles	Fishes	Inverts.	Plants
ASIA continued						
Armenia	●	? ●	? ●	? ●	? ●	●
Azerbaijan	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-
Bangladesh	-	-	-	-	-	●
Bhutan	-	-	-	-	-	-
BIOT	-	-	-	-	-	-
Brunei	-	-	-	-	-	-
Cambodia	-	-	-	-	-	-
China	●	●	●	●	●	●
Cyprus	-	-	-	-	-	-
Georgia	-	-	-	-	-	-
Hong Kong	-	-	-	-	-	-
India	●	●	●	●	-	●
Indonesia	-	-	-	-	-	-
Iran	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Israel	-	-	-	-	-	●
Japan	●	●	●	●	●	●
Jordan	-	-	-	-	-	-
Kazakhstan	●	●	●	●	●	●
Korea, D.P.R.	-	-	-	-	-	-
Korea, Republic	●	●	●	●	-	●
Kuwait	-	-	-	-	-	-
Kyrgyzstan	●	●	? ●	? ●	? ●	-
Laos	-	-	-	-	-	-
Lebanon	-	-	-	-	-	-
Malaysia	-	-	-	-	-	●
Maldivas	-	-	-	-	-	-
Mongolia	-	-	-	-	-	-
Myanmar	-	-	-	-	-	-
Nepal	-	-	-	-	-	-
Oman	-	-	-	-	-	-
Pakistan	-	-	-	-	-	-
Philippines	-	-	-	-	-	●
Qatar	-	-	-	-	-	-
Russia	-	-	-	-	-	-
Saudi Arabia	-	-	-	-	-	●
Singapore	-	-	-	-	-	-
Sri Lanka	●	●	●	●	●	●
Syria	-	-	-	-	-	-
Taiwan	●	●	●	●	●	●
Tajikistan	●	? ●	? ●	? ●	? ●	? ●
Thailand	●	●	●	●	●	●
Turkey	p ●	p ●	p ●	p ●	p ●	●
Turkmanistan	●	? ●	? ●	? ●	? ●	●

Table 3. National Red Data Books

	Mammals	Birds	Amphibians & Reptiles	Fishes	Inverts.	Plants
ASIA continued						
United Arab Emiratas	-	-	-	-	-	-
former USSR	●	●	●	●	●	●
Uzbekistan	? ●	? ●	? ●	? ●	? ●	●
Viet Nam	●	●	●	●	●	-
Yaman	-	-	-	-	-	-
OCEANIA						
American Samoa	-	-	-	-	-	-
Australia	●	●	●	●	●	●
Cook Islands	-	-	-	-	-	-
Fed. States of Micronesia	-	-	-	-	-	-
Fiji	-	-	-	-	-	-
Franch Polynasie	-	●	-	-	-	●
Guam	-	-	-	-	-	-
Kiribati	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-
Nauru	-	-	-	-	-	-
New Caledonia	-	●	-	-	-	-
New Zealand	●	●	●	●	●	●
Niue	-	-	-	-	-	-
Northern Marianas	-	-	-	-	-	-
Palau	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-
Pitcairn Islands	-	-	-	-	-	-
Solomon Islands	-	-	-	-	-	-
Tokelau	-	-	-	-	-	-
Tonga	-	-	-	-	-	-
Tuvalu	-	-	-	-	-	-
USA Pacific Islands	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-
Wallis & Futuna	-	●	-	-	-	-
Western Samoa	-	-	-	-	-	-
NORTH & CENTRAL AMERICA						
Anguilla	-	-	-	-	-	-
Antigua & Barbuda	-	-	-	-	-	-
Aruba	-	-	-	-	-	-
Bahamas	●	●	●	-	-	●
Barbados	-	-	-	-	-	-
Belize	-	-	-	-	-	-
Bermuda	-	-	-	-	-	-
Canada	●	●	●	●	●	●
Cayman Islands	-	-	-	-	-	-
Costa Rica	-	-	-	-	-	-
Cuba	-	-	-	-	-	●
Dominica	-	-	-	-	-	-

	Mammals	Birds	Amphibians & Reptiles	Fishes	Inverts.	Plants
NORTH & CENTRAL AMERICA continued						
Dominican Republic	-	-	-	-	-	-
El Salvedor	-	-	-	-	-	●
Greenland	-	-	-	-	-	-
Grenada	-	-	-	-	-	-
Guadeloupe	-	●	-	-	-	●
Guatemala	●	●	●	-	-	●
Haiti	-	-	-	-	-	-
Honduras	-	-	-	-	-	-
Jamaica	-	-	-	-	-	●
Martinique	-	●	-	-	-	●
Maxico	●	●	●	-	-	●
Montserrat	-	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-	-
Niceragua	-	-	-	-	-	-
Panama	-	-	-	-	-	●
Puerto Rico	-	-	-	-	-	●
Saint Kitts-Nevis	-	-	-	-	-	-
Saint Lucie	-	-	-	-	-	-
Saint Vincent	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-
Turks & Caicos Islands	-	-	-	-	-	-
USA	●	●	●	●	●	●
Virgin Islands (British)	-	-	-	-	-	-
Virgin Islands (US)	-	-	-	-	-	●
SOUTH AMERICA						
Argentina	●	●	●	●	-	-
Bolivia	-	-	-	-	-	●
Brazil	●	●	●	●	●	●
Chile	●	●	●	-	-	●
Colombia	-	-	-	-	-	-
Ecuador	-	-	-	-	-	-
French Guiana	-	●	-	-	-	-
Guyana	-	-	-	-	-	-
Paraguay	-	-	-	-	-	-
Peru	●	●	●	●	-	●
Suriname	-	-	-	-	-	-
Uruguay	-	-	-	-	-	-
Venezuela	●	●	●	●	●	-
AFRICA						
Algeria	●	●	●	●	●	●
Angola	-	-	-	-	-	-
Benin	-	-	-	-	-	-
Botswana	-	-	-	-	-	-
Burkina faso	-	-	-	-	-	-

Table 3. National Red Data Books

	Mammals	Birds	Amphibians & Reptiles	Fishes	Inverts.	Plants
AFRICA continued						
Burundi	-	-	-	-	-	-
Camaroon	-	-	-	-	-	-
Cape Verde	-	-	-	-	-	-
Central African Republic	-	-	-	-	-	-
Chad	-	-	-	-	-	-
Comoros	-	-	-	-	-	-
Congo	-	-	-	-	-	-
Côte d'Ivoire	-	-	-	-	-	-
Djibouti	-	-	-	-	-	-
Egypt	-	-	-	-	-	●
Equatorial Guinee	-	-	-	-	-	-
Eritree	-	-	-	-	-	-
Ethiopia	-	-	-	-	-	-
Gabon	-	-	-	-	-	-
Gambie	●	-	-	-	-	-
Ghana	-	-	-	-	-	-
Guinea	-	-	-	-	-	-
Guinea-Bissau	-	-	-	-	-	-
Kenye	-	-	-	-	-	●
Lesotho	-	-	-	-	-	●
Liberia	-	-	-	-	-	-
Libya	-	-	-	-	-	-
Madagascar	-	-	-	-	-	-
Malawi	-	-	-	-	-	-
Mali	-	-	-	-	-	-
Mauritanie	-	-	-	-	-	-
Mauritius	-	-	-	-	-	●
Mayotte	-	●	-	-	-	-
Morocco	-	-	-	-	-	●
Mozambique	-	-	-	-	-	-
Namibia	-	-	-	-	-	●
Niger	-	-	-	-	-	-
Nigeria	-	-	-	-	-	●
Réunion	-	●	-	-	-	●
Rwanda	-	-	-	-	-	-
Saint Helena & depend.	-	-	-	-	-	●
Sao Tomé & Príncipe	-	-	-	-	-	-
Senegal	-	-	-	-	-	-
Saychellas	-	-	-	-	-	-
Sierra Laona	-	-	-	-	-	-
Somelie	-	-	-	-	-	-
South Africa	●	●	●	●	-	●
Sudan	-	-	-	-	-	-
Swaziland	-	-	-	-	-	●
Tanzania	-	-	-	-	-	-
Togo	-	-	-	-	-	-

Table 3. National Red Data Books

	Mammals	Birds	Amphibians & Reptiles	Fishes	Inverts.	Plants
AFRICA continued						
Tunisia	-	-	-	-	-	-
Uganda	-	-	-	-	-	-
Western Sahara	-	-	-	-	-	-
Zaire	-	-	-	-	-	-
Zambia	-	-	-	-	-	-
Zimbabwe	-	-	-	-	-	-

Table 4. Major food crops

Plants are used as sources of medicinal products, timber and as ornamentals; their products figure in a very wide variety of manufacturing processes; fuelwood provides a source of energy for rural communities. Most fundamentally, plants are the basis of world food supply, either for direct human consumption or as livestock feed.

Wild plants began to be modified into crops for agricultural production, probably independently in different continents, between 5,000 and 10,000 years ago; the later part of this period also saw the appearance of domestic animal populations. The earliest evidence is from Mesopotamia (Iraq-Syria), where wheat, barley and lentils are first recorded; others crops originated in China, where millets were domesticated; in Mexico, where maize, beans, peppers and squashes were developed as crops; and in Andean South America, which remains a centre of potato diversity. Crop plant populations have further diversified by crossing with wild relatives (accidentally or by human design), by introduction to new environments and different continents, and by generations of artificial selection by farming communities, and latterly by commercial crop development interests.

Of the more than 250,000 flowering plant species, around 200 have been domesticated as food plants, of which 25-30 are crops of major world importance, judged largely by global production and economic criteria. When non-aggregated national data, as collated by FAO (FAO, 1984), are examined, it is clear that a much wider spectrum of plant diversity provides the basis of world food supply (Prescott-Allen and Prescott-Allen, 1990); the table below includes data on more than 100 species that appear of particular significance at this level. Within this group, the families Graminae (grasses) and Leguminosae (legumes) are most important, followed by Cruciferae, Rosaceae, Umbelliferae, Solanaceae and Labiatae. Because much crop production, eg. from home gardens, is not covered in national-level statistics, and several countries were not covered in the FAO (1984) database, more detailed review would doubtless demonstrate that many more than these 100 species are important at national level (Prescott-Allen and Prescott-Allen, 1990).

Crop genetic resources are comprised of existing crop plants, often including a variety of locally adapted populations, together with the wild species from which they were derived, and wild species closely related to the latter. Crop relatives have often been used as a source of genetic material to confer disease or pest resistance or other properties on existing crops, but this, or other kinds of genetic improvement, cannot be done efficiently unless key elements in the total pool of crop genetic resources have been identified, located, documented and collected in a form allowing genetic material to be used. The importance of these activities is heightened by the extent to which genetic diversity is being eroded, both by the global adoption of genetically uniform commercial varieties and by modifications to the habitat of crop relatives with consequent loss of populations. Many national organisations are now active in this field, and the network of International Agricultural Research Centres (IARCs) play an international coordinating rôle. Among the IARCs, the International Plant Genetic Resources Institute (IPGRI, formerly IBPGR) is involved in setting of priorities for research and inventory, and in furthering development of a network of national and regional centres for plant germplasm conservation.

NOTES TO TABLE 4

This table presents data on principal food crops and closely related wild species. The intention is to integrate data on uses and diversity of the former with information on the status and distribution of the latter. Part of the table based on data in Prescott-Allen and Prescott-Allen (1990) and Simmonds (1976) was included in material assembled by Sara Oldfield for WCMC (1992).

We are especially grateful to IPGRI who provided information on number of accessions per country for each crop species in this table (as reported to the IPGRI database, current at 27 September 1994), in particular to Tom Hazekamp who generated and transferred this large datafile. We also thank J.G. Hawkes for information on the status of wild potato species, and Oswaldo Télles Valdés for similar data on *Dioscorea*.

Column 2, Production, *Area*: upper figure is the volume of production, lower figure (in italics) where present is the area of land on which that production is based, as reported in FAO (1990). *FAO Production Yearbook. Vol. 46.*

Column 3, Origin of species: notes mainly on the documented or suspected geographic origin of the crop, based on Simmonds (1976), Mabberley (1990), Smith *et al.*, (1992).

Column 4, Major germplasm collections: number of accessions of crop in the ten countries with the largest collections as reported through the IPGRI network; for some crops fewer than ten countries have reported collections. These data, produced from the IPGRI database on 27 September 1994, do not cover all collections in the world because not all supply data to IPGRI.

Column 5, Number of species in genus: approximate number of congeneric wild species, data mainly from Mabberley (1990) and, indicated by [1], from Smith *et al.*, (1992).

Column 6, Species status: Information from the WCMC species (threatened plants) database. Letters in the left of this column represent the IUCN status categories (see Notes to Table 2, above, for definition of categories); the numbers to the right of this column indicate the number of congeneric species in each category. These numbers cover only those species that have been reviewed and categorised as non-threatened (nt) or in one of the threatened categories.

Column 7, Distribution of genus: generalised world distribution, data from Mabberley (1990) and Smith *et al.*, (1992).

Column 8, Other species in genus used: data from Mabberley (1990) and, indicated by [1], Smith *et al.*, (1992).

Column 9, Conservation notes: largely reproduced from Table 25.1 in WCMC (1992), data compiled by Sara Oldfield from multiple sources. This column also includes data on the documented presence of certain crops in Biosphere Reserves, collated for WCMC (1992) by G.B. Ingram from material on file at Man and Biosphere office, UNESCO. Although this review is not fully comprehensive, it serves to stress the small number of crop species for which data on presence in protected areas are available.

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area* *(thousand ha)*	Origin of species	Major garmplasm collections (number of accessions)
Anacardiaceae			
Mangifera indica Mango	16,987	NE India, the majority of fruit-bearing trees are more or less wild.	India 1,100; Brazil 823; USA 461; Cuba 350; Philippines 343; Thailand 294; Indonesia 292; Taiwan 176; Mexico 143; Fiji 143. Major collections also: Bangladesh, Malaysia, Portugal, Venezuela.
Pistacia vera Pistechio	288	Native to the Near East and western Asia, cultiveted in tha Mediterranean and western Asia for 3,000-4,000 years.	Mexico 77; Australia 51; USA 48; Spain 45; Iran 40; Syria 25; Italy 13; Israel 10; Turkey 10
Araceae			
Colocasia esculenta Taro	5,607 *993*	India.	Papua New Guinea 747; India 650; USA 468; Philippines 380; Solomon Islands 267; Viet Nam 210; Australia 193; Bangladesh 130; Japan 120; Indonesia 82
Xanthostoma sagittifolium Yautia		A tropicel American plant developed by Amerindian people.	Nicaragua 71; Trinidad & Tobago 52; Cuba 15; Nigeria 14; Costa Rica 11; Papua New Guinea 11; Guadeloupe 10
Aquifoliaceae			
Ilex paraguariensis Mate		Native to S Brazil, Paraguay and N. Argentina, cultivated throughout its natural range. Leaves are also still collected from wild plants.	
Betulaceae			
Corylus avellana Hazel	700 (hazel & filbert)	Europe and SW Asia. Domesticated in the 17th century.	Italy 2,456; Spain 124; France 88; USA 70; UK 43; Turkey 42; Portugal 32; Australia 23
Corylus maxima Filbert		SE Europe and W Asia.	Argentina 35; Norway 12
Bromeliaceae			
Ananas comosus Pineapple	10,490	Thought to be a lowland South American domesticate.	Brazil 260; Côte d'Ivoire 119; Japan 98; Nigeria 84; India 58; USA 58; Malaysia 54; Taiwan 53; Indonesia 48; Australia 50
Camelliaceae			
Camellia sinensis Tea	2,473 *2,531*	Probably the lower Tibetan mountains or Central Asia.	Viet Nam 70; Iran 50; South Africa 28
Caricaceae			
Carica papaya Papaya	3,929	Lowlands of eastern Central America.	Philippines 301; India 252; Brazil 208; Nigeria 180; Peru 171; France 41; Colombia 40; Malaysia 35; Mexico 29; Cuba 20. Major collection also in USA (Hawaii).
Chenopodiaceae			
Beta vulgaris Sugar Beet	279,991 *8,293*	Europe, developed as a crop for sugar in the 18th century.	Germany 3,993; USA 2,178; France 1,572; Japan 1,387; Russia 600; UK 588; Czech Republic 483; Greece 436; Spain 358; Romania 230

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
35 (40-60)[1]	E V R I nt	4 3 2 3 7	Indomalaysia.	Fruits of >12 wild spp. collected. Also cultivated: *M. pajang* (Borneo), *M. caesia* (W. Malaysia) *M. foetida, M. odorata, M. laganifera, M. zeylanica*[1].	Wild species of mango are threatened in Southeast Asia as a result of deforestation and replacement by commercial species. WWF is funding conservation of wild fruit trees in Peninsular Malaysia.
9	R nt	2 1	Mediterranean (3 spp. in Europe), Asiatic, Melanesian. S. U.S.A. and C. America.	Other spp. have a variety of uses.	Many wild populations have been destroyed by forest clearance, over-cutting for charcoal and grazing. Biosphere Reserves: El Kala (Algeria), Gano (Iran), Circeo (Italy).
6			Tropical Asia.	Also ornamental.	Collection, preservation and research are needed for aroid cultivars. More than 1,000 cultivars of *Colocasia* exist as a result of efforts by subsistence farmers.
c45			Tropical America.	*X. lindenii, X. nigrum* are also eaten.	
c400	Ex Ex/E E V R I nt	1 1 3 6 11 8 5	Cosmopolitan, especially tropical and temperate Americas and Asia.	Also ornamental, some timber. Other spp. drunk as stimulants include: *I. cassine* (E. & N.E. N America), *I guayusa*, Peru, *I. verticillata*, (N America), *I. vomitoria* E. N America.	
c10	V nt	1 1	Northern Temperate (3 spp. in Europe).	All spp. have edible nuts. *C. colurna* (SE Europe, SW Asia) is cultivated for nuts.	
8			Tropical America	*A. ananassoides* is used in Hawai'i for hybridising.	Species of wild pineapple are native to botanically under-explored parts of lowland South America. They are now being used in breeding programmes. Collection and conservation of clones from the upper Amazon and Upper Orinoco is considered desirable.
82	E V R I	2 3 9 1	Indomalaysia, E. Asia	Also ornamentals and source of seed-oil.	Truly wild teas probably no longer exist. In cultivation a substantial loss of genetic variability has been anticipated which needs to be countered by deliberate conservation measures.
21	E V R I nt	1 1 3 1 1	Warm America	At least 6 other spp. domesticated: *C. pubescens* (high Andes); *C. pentagona* (Babaco) (Ecuador and elsewhere) (possibly hybrid); *C. stipulata* (S. Ecuador); *C. monoica; C. goudotiana*; at least 12 other spp. are harvested for fruits[1].	Though a 'weed', papaya does not thrive in secondary growth. Domesticated papaya readily forms feral populations; gene pool of wild papaya has widened considerably as a result.
6	E V R	1 2 3	Europe		

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area* *(thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Chenopodiaceae continued			
Chenopodium quinoa Quinoa		A native American crop of the high central Andes developed by Indian agriculturists in pre-Colombian times.	Bolivia 2,000; Germany 953; Ecuador 872; UK 24; Chile 14; Ethiopia 11
Spinacia oleracea Spinach		Native to SW Asia.	Russia 365; Netherlands 344; USA 251; Czech Republic 107; Turkey 103; Bulgaria 60; China 48; Sweden 29; Japan 20; Hungary 16
Compositae			
Carthamus tinctorius Safflowerseed	727 *1,203*	The cultivated species had its origins in the Near East.	India 1,978; USA 1,754; Mexico 1,550; Canada 490; Russia 311; China 178; Germany 156; Ethiopia 133; Australia 100; Czech Republic 46
Cynara scolymus Artichoke	1,253 *105*	Native to the Mediterranean area and Canary Islands, domesticated several thousand years ago.	USA 45; Italy 20
Helianthus annuus Sunflowerseed	21,645 *17,641*	Domesticated in central USA probably before the arrival of maize, beans and squash.	Romania 8,418; USA 3,122; Russia 1,602; France 1,100; Canada 608; Bulgaria 527; China 515; Germany 436; India 350; South Africa 162
Lactuca sativa Lettuce		Mediterranean.	USA 2,352; UK 1,218; Netherlands 1,055; Russia 980; Bulgaria 412; Czech Republic 397; Hungary 348; Spain 149; China 104; Italy 55
Convolvulaceae			
Ipomoea batatas Sweet Potato	128,016 *9,262*	Central and South America. A 5-n plant possibly derived from 6-n *I. trifida* in turn possibly derived from *I. leucantha*	Peru 4,872; Japan 2,412; Nigeria 1,867; Philippines 1,526; Papua New Guinea 1,425; Taiwan 1,372; China 1,295; USA 998; Vietnam 822; Brazil 799
Cruciferae			
Brassica oleracea/B. rapa Cabbage	38,109 *1,723*	The wild cabbage is native to Europe; development of cultivars took place in the Mediterranean region.	*Brassica oleracea* Russia 2,910; UK 2,869; Netherlands 1,568; Bulgaria 1,500; France 1,500; Portugal 835; USA 824; Czech Republic 528; Philippines 516; Slovakia 452; Taiwan 420 *Brassica rapa* India 3,010; Canada 1,262; UK 782; Japan 548; USA 270; Germany 235; Netherlands 220; Bulgaria 194; S Korea 88; Portugal 78
Brassica juncea Mustardseed		The primary centre of origin is believed to be Central Asia - Himalaya. Probably *B. nigra* x *B. rapa* ssp. *campestris*	India 7,781; Canada 703; China 631; UK 258; USA 258; France 170; Germany 107; Australia 100; Japan 96; Israel 90
Brassica napus, *B. rapa* Rapeseed	26,661 *20,736*	*B. napus* is probably a hybrid of *B. oleracea* x *B. rapa* ssp. *campestris*.	Germany 1,632; Canada 677; UK 514; China 450; Bulgaria 296; USA 246; Israel 160; Poland 120; Australia 91; France 63
Cucurbitaceae			
Citrullus lanatus Melonseed		Native to S Africa, chiefly in the Kalahari Desert.	USA 927; Israel 433; Iran 280 Hungary 203; Bulgaria 200; Philippines 149; Spain 134; Germany 130; China 95; Ecuador 49

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
150	Ex	1	Mostly temperate regions, inclucing S. America.	Grains, ornamental, medicinal etc. Including *C. album, C. bonus-henricus* (leaf vegetable) (Europe), *C. ambrosiodes* (Tropical America) medicinal, *C. pallidicaule* (Andes) grain.	
	E	4			
	V	2			
	R	1			
	I	1			
	nt	10			
3			SW Asia		
14	R	1	Mediterranean		
	nt	1	Asiatic		
10	nt	4	Mediterranean Canary Is	*C. cardunculus* (Cardoon) (S Europe) is also eaten	
67	Ex	1	Americas	Also ornamental; *H. tuberosus* (Jerusalem artichoke) is also eaten.	Some of the American varieties have been preserved. A large genetic reservoir exists among the weed and wild sunflowers. Wild gene pools are disappearing owing to habitat loss.
	R	2			
	nt	2			
c100	E	5	Cosmopolitan especially N Temperate	*L. virosa* (opium lettuce) (C&S Europe) cultivated for medicine. *L. scariola* (prickly lettuce) (originally Europe now subcosmopolitan weed) also eaten locally.	
	V	2			
	R	5			
	I	2			
	K	2			
	nt	4			
c500	E	5	Tropical and warm temperate.	*I. equatice* (water spinach OW) - leaves eaten. Other spp. ornamental, purgatives.	The conservation of variability is a major concern in breeding for subsistence agriculture. Biosphere Reserves: Komodo (Indonesia).
	V	4			
	R	16			
	I	15			
	K	1			
	nt	19			
c30	E	3	Eurasia	Wide range of crops (variously leaves, buds, florets, stems and roots eaten); also used for oil production *B. carinate* (Texsel greens) (NE Africa), *B. hirta* (white and yellow mustard) (Mediterranean); *B. juncea* (Indian mustard) (Eurasia); *B. juncea* v. *crispifolia* (Chinese mustard);	IPGRI has designated the collection of wild forms of *B.oleracee* as a conservation priority. Several related Mediterranean taxa are threatened in the wild. Large collections of *B. juncea* form a substantial gene pool and wild material is widely distributed. Biosphere Reserves: Shennongjia (China).
	V	3			
	R	7			
	I	1			
3			Tropical and S. Africa, probably also Asia	*C. colocynthis* (vine of Sodom) (Mediterranean & India) - purgative etc.	

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area (thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Cucurbitaceae continued			
Cucumis melo Melon/Water melon	40,853 *2,629* (& canteloups, etc)	Wild forms are found in eastern tropical Africa.	Russia 4,550; USA 3,402; Spain 1,176; Iran 850; France 480; Germany 267; Bulgaria 250; Hungary 212; Israel 200; Taiwan 189
Cucumis sativus Cucumber	14,542 *975* (& gherkins)	Native to India, probably cultivated for over 3,000 years.	Russia 3,380; Bulgaria 1,426; USA 1,334; Germany 483; Slovakia 376; Taiwan 354; Viet Nam 299; China 255; Hungary 184; Czech Republic 136
Cucurbita moschata, *C. maxima,* *C. argyrosperma,* *C. pepo, C. ficifolia* Pumpkin, Squash, Gourd	7,473 *656*	5 cultigens. Domesticated in the Americas at least 10,000 years ago. *C. moschata* is most like the wild species and was domesticated independently in Central & South America.	*Cucurbita maxima* Argentina 630; USA 514; Hungary 253; Philippines 227; Brazil 215; China 141; Germany 52; Japan 18; Colombia 17; South Africa 14 *C. moschata* Costa Rica 915; Mexico 320; Philippines 318; Brazil 215; USA 187; Colombia 113; Cuba 82; Japan 44; Argentina 20; India 18 *C. pepo* USA 1,367; Hungary 483; Mexico 312; Costa Rica 123; Iran 119; Germany 94; Turkey 54; Philippines 33; Canada 15; South Africa 13
Dioscoraceae			
Dioscorea spp. *D. alata, D. batatas,* *D. bulbifera, D. cayenensis,* *D. esculenta, D. trifida* Yam	27,814 *2,803*	Domestication of yams in Asia, Africa and tropical America took place separately with different species involved.	*Dioscorea trifida* Guadeloupe 77; Costa Rica 21; France 17
Euphorbiaceae			
Manihot esculenta Cassava	152,218 *15,757*	A cultigen, unknown in the wild state.	Philippines 5,715; Colombia 5,035; Nigeria 2,864; Brazil 2,785; India 1,327; Uganda 1,133; Malawi 978; Peru 839; Congo 634
Gramineae			
Avena sativa Oats	33,900 *20,499*	Generally regarded as a secondary crop, evolved in W and N Europe from weed oat components of wheat and barley crops.	Russia 12,792; USA 12,725; Kenya 9,000; UK 2,335; Indonesia 2,210; Israel 2,000; Hungary 1,747; Ecuador 1,496; Poland 1,083; Canada 1,047
Echinochloa frumentacea Japanese Barnyard Millet		Different strains are thought to have at least partially different origins.	India 646; Australia 25
Eleusine coracana Finger Millet		Central Africa. Taken to India probably over 3,000 years ago where a second centre of diversity became established.	India 7,341; Kenya 1,526; USA 1,212; Ethiopia 940; Uganda 931; Malawi 277; Russia 220; Japan 207; Sri Lanka 31; Australia 14
Digitaria exilis Fonio		West Africa, thought to be a cultigen.	France 687; Ethiopia 19
Hordeum vulgare Barley	160,134 *73,449*	One of the first crops domesticated in the Near East.	Brazil 37,709; Germany 24,079; Russia 23,582; USA 22,539; Syria 16,706; Ethiopa 12,716; UK 12,657; Ecuador 12,548; Japan 11,366; Mexico 6,808

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
30	R	1	OW Tropics	*C. anguria* (West Indian Gherkin) possibly derived from *C. longipes*.	
27	E	1	Tropical and Warm Americas	Also eaten: C. *foetidissima* (buffalo gourd).	Many of the wild *Cucurbita* species have restricted ranges.
c600	E	4	Tropical and warm	Also used for production of oral contraceptives.	Serious genetic erosion has occurred among cultivated yams and there is an urgent need to collect and conserve genetic diversity. Insufficient data on the status of wild yams but much cause for concern.
	V	24			
	R	50			
	I	11			
	nt	6			
98	V	1	Tropical & warm Americas	*M. glaziovii* is the source of Ceara or Manicoba rubber and oilseeds.	The virtually unexplored wild relatives are an important genetic resource for crop improvement. Centre of diversity of wild relatives are in east-central Brazil, NE Brazil and SW Mexico.
	nt	3			
25	R	2	Temperate old world		The potential of wild populations in breeding programmes remains to be determined. Biosphere Reserves: Shennongjia (China), Palava (Czech Republic).
	I	1			
	nt	3			
35	R	1	Warm	*E. frumentacea* is also grown for fodder in the USA; *E. pyramidalis* (tropical & S. Africa and Madagascar) is used as fodder and locally as flour; *E. turnerana* Channel Millet (Australia) is a promising forage and grain crop. Several other spp. are weeds.	
c9					This species is still capable of genetic exchange with related wild forms living in the same area.
230	E	2	Tropical and warm	*D. iburu* (W. Africa) eaten like millet; *D. decumbens* (S. Africa) pasture grass in USA.	
	V	4			
	R	3			
	I	7			
	nt	4			
c40	E	1	N. temperate	*H. distichon* (2-rowed berley) is possibly *H. vulgare* x *H. spontaneum*.	Concern about genetic erosion e.g. in Ethiopia, where cultivars are valuable for genetic resistance to disease and improved nutritional quality. Biosphere Reserves: Touran (Iran), Great Gobi (Mongolia).
	R	2			
	K	1			
	nt	3			

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area (thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Gramineae continued			
Oryza glaberrima, *O. sativa* Rice	525,475 *147,168*	The origin of Asian rice *O. sativa* is uncertain. The African *O. glaberrima* probably originated 3,500 years ago. Its primary centre of diversity is the swampy area of the Upper Niger.	*Oryza glaberrima* Nigeria 2,578; Philippines 2,412; Côte d'Ivoire 650; France 650; USA 462; Bangladesh 200; Liberia 60; India 22; Thailand 17 *Oryza sativa* Philippines 82,583; USA 29,987; Thailand 17,267; China 16,885; Nigeria 13,098; India 12,790; Japan 11,559; Indonesia 7,263; France 6,125; Russia 5,900
Panicum miliaceum Common Millet	28,550 *37,850*	A millet of ancient cultivation which is not known in its wild state.	Russia 8,733; India 1,490; USA 1,103; Mexica 400; Kenya 216; Japan 126; Bulgaria 97; Romania 84; Hungary 50; Pakistan 21
Pennisetum americanum Bulrush Millet		Probably in western tropical Africa where the greatest number of cultivated and related wild forms occur. A second centre of diversity became established in India.	France 6,171; Australia 346; South Africa 10
Saccarhum officinarum Sugarcane	1,104,580 *17,934*	New Guinea (cultigen).	Nigeria 386; Philippines 68; Dominican Republic 23
Secale cereale Rye	29,212 *13,435*	SW Asia, culitgen arising from *S. montanum*. a weed of wheat and barley.	USA 3,678; Poland 2,523; Germany 1,808; Canada 1,430; Portugal 603; Spain 366; Sweden 360; Bulgaria 262; South Africa 231; Finland 210
Sataria italica Foxtail Millet		Unknown in the wild state, the crop is thought to have arisen from the common Old World weed *S. viridis*.	China 6,696; Russia 4,720; India 2,707; USA 1,241; France 670; Kenya 451; Mexico 350; Japan 274; Hungary 109; Australia 50
Sorghum bicolor Sorghum	70,448 *45,695*	Developed primarily from the wild *S. arundinaceum* in Africa at least 1000 years ago.	USA 18,971; Brazil 15,500; France 7,330; Ethiopia 7,297; Australia 7,178; Russia 6,200; Mexico 5,500; China 5,263; Yemen 4,024; Puerto Rico 4,000
Triticum aestivum, *T. turgidum* Wheat	563,649 *220,007*	Mediterranean and Near East. Origin is complex and not fully understood, involving *Aegilops* spp.	*Triticum aestivum* USA 31,691; Mexico 20,094; India 16,875; Ecuador 13,116; Hungary 10,341; UK 10,082; Germany 8,911; Romania 8,222; Czech Republic 7,300; Japan 7,000 *Triticum turgidum* Syria 916; USA 883; Brazil 326; Spain 300; Germany 174; Brazil 117; South Africa 82; Bulgaria 57; Switzerland 46; Czech Republic 40
Zea mays Maize	526,410 *132,266*	Maize was domesticated in prehistoric times in Mexico and Central America.	Mexico 31,195; USA 23,573; Russia 18,324; Croatia 12,000; Colombia 9,933; Romania 9,619; China 8,004; France 7,277; Ecuador 6,294; Japan 6,177

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
19	R I nt	1 1 1	Tropical	*O.sativa* possibly derived from *O. rufipogon* (selected weed in *Colocasia* fields) with several centres of domesticetion.	As rice cultivation has become more intensive, many wild populations heve disappeered. The International Rice Research Centre in the Philippines coordinetes the collection of indigenous verieties. Little effort has been made to conserve *O. glaberrima* and its wild reletives, however. Biosphere Reserves: Waza (Cameroon).
470	E V R I K nt	1 1 4 2 2 20	Trop. to werm temp.	*P. hemiotum* (pifine grass) (N Americe) end *P. texanum* (Colorado grass) (s N Americe) - both fodder; *P. maximum* (Guinea gress) (Africa, naturalized Americe) - cultiveted forage crop; *P. sumatrense* (little millet, Malaysia) minor grain.	
80	E R I nt	1 1 3 1	Tropical and warm	Fodders, lawn-gresses, some grains. *P. hohenackeri* (moya grass) (E Africa to India) is suggested for paper making; *P. clandestinum* (Kikuyu grass) (tropical Africa) - pesture gress, erosion control, lawns; *P. purpureum* (elephant or Napier gress) (Africa) - fodder and paper.	This species is still capeble of genetic exchenge with related wild forms living in the same aree. Biosphere Reserves: Bénoué (Cameroon).
30			Tropical and warm	Hybrids of *S. officinarum* with other spp. and cultigens now grown, especielly in W. Indies and Hewaii.	Valuable germplasm of wild sugarcane end related species has been lost as a result of hebitat destruction in Malaysia, Indonesie and Pepue New Guinea.
3	R I	1 1	Eurasia		
100	I nt	1 7	Tropical end warm	*S. gleuca* (Yellow foxteil) (werm) cattle fodder; *S. palmifolia* (India) - shoots eeten in Jeva; *S. sphacelata* (S Africa) is an important silage crop.	
24	R nt	1 2	Warm Old World end 1 sp. in Mexico	Backcrosses with *S. arundinaceum* gave *S. drummondii* cultivated for forage; *S. halepense* (Mediterranean), is a widely naturalized fodder plant, often weedy.	Biosphere Reserves: Weza (Cameroon), Shennongjia (China).
20	I	1	Europe		A number of wild relatives are restricted to small areas. There is a need for further *ex situ* conservation.
4	E V	1 1	Central Americe		A wild species *Z. perennis* was presumed extinct in the wild until its rediscovery in 1977. A new species was also discovered, *Z. diploperennis*, end is now protected in the Sierra de Manantlan Biosphere Reserve, Mexico.

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area (thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Grossulariaceae			
Ribes nigrum, R. rubrum Currants	618	Domesticated in northern Europe within the past 500 years. Black and red currants are native to northern Europe and northern Asia, with the blackcurrant extending to the Himalayas.	*Ribes nigrum* Poland 156; UK 133; Sweden 116; Denmark 88; Czech Republic 52 *Ribes rubrum* Denmark 77; Poland 56; Sweden 42
Illiciaceae			
Illicium verum Star Anise		China, Viet Nam.	
Juglandaceae			
Juglans regia Walnut	918	Native from SE China to Europe.	France 130; Argentina 127; Turkey 100; Spain 60; Poland 52; Switzerland 40; Italy 39; Chile 35; Portugal 33; India 32
Lauraceae			
Persea americana Avocado	2,052	Origin in Central America; has been cultiveted for several thousand years; 3 races (Mexican, Guatemalan, W. Indian) indicate parallel domestication.	USA 697; Brazil 462; Israel 422; Thailand 363; Cuba 327; Mexico 326; Australia 294; Philippines 246; Jamaica 108; Venezuela 93. Major collections also in: Jamaica, Puerto Rico.
Leguminosae			
Arachis hypogaea Groundnut	23,506 *20,609*	A cultigen domesticated thousands of years ago in South America. Probably originated as an allopolyploid hybrid of annual and perennial spp. of E Andes.	India 27,280; USA 15,329; China 4,563; Argentina 3,153; Indonesia 1,885; Brazil 1,300; Russia 1,200; Vanazuala 1,061; Uganda 900, Senegal 900
Cajanus cajan Pigeonpea		Cultigen; centre of origin assumed to be India	India 13,542; Kenya 1,080; Philippines 433; Indonesia 377; Thailand 201; Uganda 200; Ethiopia 176; Australia 176; Ghana 154; Vietnam 122
Cicer arietinum Chickpea	6,887 *9,660*	Western Asia; possibly derived from *C. reticulatum*.	India 17,995; Syria 7,232; USA 5,796; Pakistan 5,168; Mexico 2,399; Spain 2,356; Russia 1,685; Iran 755; Ethiopia 684; Italy 671
Glycine max Soybean	114,011 *54,046*	A cultigen not known in the wild, soybean is thought to have arisen as a domesticate in the eastern half of northern China c 3000 years ago probably from *G. soja*; the weedy form is *G. gracilis*.	China 27,746; USA 22,252; Taiwan 16,360; India 8,262; Korea 6,478; Japan 6,124; Brazil 5,522; Russia 4,500;France 3,045; Indonesia 3,012
Lablab purpureus Lablab bean		Domesticate is probably of tropical African origin and derived from the wild ssp. *uncinetus*; now widespread in the tropics.	Ethiopa 213; India 170; Australia 76; Indonesia 69; Philippines 66; South Africa 31; Brazil 28; Belgium 25; Colombia 23

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
150	Ex E E/V V R I	1 2 1 2 4 4	Temp. N. Hemis, Andes	Many spp. with edible fruits: *R. americanum* (American Blackcurrant (E N America); *R. aureum* (Golden currant) (W N America); *R. curvatum* (granite gooseberry) (S & SE USA); *R. divaricatum* (Worcesterberry) (W N America); *R. hirtellum* (E N America) edible gooseberry used in hybridising; *R. odoratum* buffelo currant (E USA); *R. uve-crispa* gooseberry (Europe).	Biosphere Reserves: La Compana-Peñuelas (Chile), Shennongjia (China), Mt Paekdu (Korea PDR).
42	V R nt	2 1 1	E & SE Asia, SE N America to Hispaniola.	Some commerical oils; *I. anisetum* (Japanese anise).	
21	E nt	1 5	Mediterranean to E Asia, N America to Andes.	Edible seeds, timber, ornamentals. Also eaten: *J. ailantifolia* (Japanese walnut)(Japan); *J. cinerea* (butternut) (E N America); *J. neotropica* (S America); *J. nigra* (Black walnut) (E N America);	Biosphere Reserves: Cinturón Andino Cluster (Colombia), Arasbaran (Iran), Retezat (Romania,.
150	E V R I nt	3 1 1 3 3	Tropics	Other spp. used for timber. *P. schiedeana* (C America) wild fruits collected, also cultivated on small scale, graft compatible with *P. americana*; *P. nubigene* fruits collected, sometimes by felling; *P. borbonia* has high resistance to root rot; *P. floccosa* has been crossed with *P. americana*. The endangered caoba tree from Ecuador *Caryodephnopsis (Persea) theobromifolia* is a wild relative resistant to blight.	Primitive wild relatives are restricted to small areas in Central America. Typically occurs in forest areas, often threatened by coffee or marijuana cultivation. Biosphere Reserves: Tikal (Guatemala), Montes Azul (Mexico). Present in La Tigra NP (Honduras).
22			S America		Much unexplored genetic variability in wild relatives of potential importance in breeding programmes. The protection of perennial *Arachis* species in Latin America is considered a conservation priority.
2	I	1	Old World tropics	Should probably be included in *Atylosia* (35 Asia to Australia).	
40	R	6	C & W Asia + one sp. each in Greece, Morocco, Ethiopia.		Many of the wild relatives of chickpea are threatened or rare.
9	V	1	Asia to Australia		Soybean cultivars grown in the USA show a high degree of genetic uniformity. The germplasm base in Asian countries is being destroyed partly through the introduction of modern cultivars. Conservation of traditional land races is urgently needed.
1			Tropical Africa		

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area* *(thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Leguminosae continued			
Lens culinaris Lentil	2,403 *3,166*	The wild progenitor of the cultivated lentil is *Lens orientalis*, a Near Eastern species.	Syria 6,966; USA 2,876; Russia 2,484; Pakistan 1,280; India 1,192; Bangladesh 798; Ecuador 659; Mexico 599; Hungary 566; Greece 395
Lupinus mutabilis Lupin		A very variable cultigen of the high Andes.	Peru 2,149; Spain 1,799; Germany 1,020; Ecuador 488; USA 268; France 250; Bolivia 201; Chile 103; South Africa 18; Colombia 14
Phaseolus lunatus Lima bean		It is thought that separate domestications occurred in Central and South America from conspecific geographic races.	Indonesia 3,846; USA 2,172; Colombia 1,836; Cuba 834; Brazil 774; Mexico 610; Philippines 515; Ghana 201; Belgium 190; Peru 62
Phaseolus vulgaris Haricot bean		It is thought that separate domestications occurred in Central and South America from conspecific geographic races.	Colombia 24,660; USA 14,203; Brazil 8,404; Mexico 8,315; Malawi 6,000; UK 5,455; Germany 5,188; Romania 4,227; India 1,700; China 1,683
Pisum sativum Pea	15,918 (dry) *8,693*	The wild progenitor is unknown and the early history of the pea crop is unclear. Probable centres of origin are Ethiopia, the Mediterranean and Central Asia.	Sweden 7,512; USA 6,678; Russia 5,546; Germany 4,578; Italy 4,440; UK 3,813; Poland 2,990; Czech Republic 2,562; Brazil 1,431; India 1,400
Vicia faba Broad bean	4,067 (dry) *3,005*	Usually considered a cultigen from *V. narbonensis* but may be from C. Asia.	Syria 3,684; Germany 2,730; Ecuador 2,636; Spain 1,859; Italy 1,795; Ethiopa 1,208; France 1,161; Netherlands 760; Peru 597; Poland 550
Vigna unguiculata Cowpea		The common cultivated subspecies is thought to be derivad from wild plants in Ethiopie several thousand years ago.	Nigeria 15,200; USA 4,705; Indonesia 3,930; Brazil 2,284; Philippines 1,457; Botswana 852; India 518; Uganda 350; Venezuela 347; Ethiopa 268
Lacythidaceae			
Bertholletia excelsa Brazil nut		Tropical South America. Nuts are still collected from wild trees as experimental plantations heve mainly failed.	Brazil 45
Liliaceae			
Allium cepa, Allium fistulosum Onion	28,223 (dry) *1,883*	Central Asia; a cultigen, possibly derivad from *A. oschaninii*.	*Allium cepa* Russia 2,050; India 1,508; UK 960; Israel 550; Netherlands 508; USA 362; Czech Republic 299; Italy 274; Spain 268 *Allium fistulosum* Russia 222.
Allium sativum Garlic	3,379 *512*	Known only in cultivation. *A. longicuspis*, a species endemic to cantral Asia, mey be its wild ancestor.	India 559; Czach Republic 309; Germany 162; Poland 143; Spain 128; Brazil 111; USA 102; Cuba 78; Taiwan 50; Japan 41

No. of species in genus	Species status	Distribution of genus	Other species in genus used	Conservation notes
6		Mediterranean, W Asia, Africa. There are possibly only 2 spp (*L. nigricans* and *L. culinaris*).		
200	Ex 1 E 8 V 10 R 8 I 13 K 1 nt 2	E S America, Andes, Rockies, Mediterranean, tropical African highlands.	Fodder, *L. albus* (Mediterranean) eaten by Romans, coffee substitute; *L. luteus* (Mediterranean) green manure, coffee substitute; *L. perennis* (E N America) fodder.	
50	E 1 nt 1	Tropical & warm Americas	Also eaten: *P. acutifolius* v. *latifolius* (tepary bean)(S N America); *P. coccineus* (scarlet runner) (C America).	Most wild relatives are widespread but populations of several taxa are being lost to overgrazing in south-west USA and northern Mexico.
5		Mediterranean; W Asia.		Breeding relies on a fairly narrow genetic resource base and efforts to conserve genetic variability of the cultivated crop have been fairly limited.
140	Ex 1 E 4 V 7 R 13 I 3 nt 15	N temperate with extensions to S America, Hawaii and tropical E Africa.	Other spp. are used for forage & green manure - *V. articulata* (bitter vetch) (S Europe); *V. villosa* (Russian vetch) (Eurasia).	
150		Tropical, especially Old World.	Other spp. are used for forage & green manure etc. Other pulses include: *V. aconitifolia* (moth bean) S. Asia; *V. angularis* (Aduki bean) (Asia);*V. mungo* (urd) (Tropical Asia); *V. radiata* (mung bean)(?Indonesia) - possible ancestor of *V. subterranea* (Bambara groundnut)(W Africa); *V. umbellata* (rice bean)(S Asia); *V. unguiculata* (cowpea)(Old World); *V. vexillata* (tropical Old World) - roots edible.	
1		Tropical S America		The species is threatened in the wild because of logging for its valuable timber. Commercial collection of wild nuts is a sustainable form of forest exploitation and is being promoted in extractive reserves.
700	Ex 1 E 10 V 13 R 61 I 11 K 9 nt 40	N. Hemisphere.	Also eaten: *A. ampeloprasum* (Europe & N Africa); *A. canadense* (Canada garlic); *A. carnuum* (Lady's leek) (N America); *A. chinense* (Asia); *A. oleraceum* (field garlic) (Europe); *A. schoenoprasum* (chives, Eurasia); *A. scordoprasum* (sand leek) (Eurasia); *A. sphaerocephalon* (round-headed garlic), Europe & Mediterranean); *A. tuberosum* (Chinese chives) (SE Asia).	Biosphere Reserves: Waterton Lakes (Canada), Shennongjia (China), Southeast Rügen (Germany), Mt Olympus (Greece), Great Gobi (Mongolia), Mt Paekdu (Korea PDR), Babia Gora (Poland), Pietrosul Mare (Romania).

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area* *(thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Malvaceae			
Gossypium barbadense, G. hirsutum Cottonseeds	34,613	Cotton has a complex and controversial history, although was apparently domesticated indapandently in the Old World and New World around 5000 BP; 99% of current world crop is from 4n plants principally derivad from New World *G. barbadense* and *G. hirsutum*, but with some ganetic contribution from tha 2n Old World *G. arboreum* and *G. herbaceum*, the former having been selected from the lattar in Africa.	*Gossypium barbadense* Russia 820; India 803; USA 603; France 562; Argantine 225; Pakistan 132; Sudan 23; Greece 16 *Gossypium hirsutum* India 12,662; Russia 3,307; Franca 1,889; Pakistan 1,716; USA 1,587; Brazil 1,249; Greece 750; Sudan 413
Moraceae			
Ficus carica Fig		Southern Arabia, allied to *F. palmata* of NE Africa to India.	Syria 370; Turkey 291; Ukraine 270; Italy 250; France 149; Albania 126; Algeria 58; Iran 48; Cyprus 39; Japan 37
Musaceae			
Musa acuminata, M. x paradisiaca Banana, Plantain	49,630 (banana) 26,797 (plantain)	Most cultivated clonas are 3n, some derivad directly from *M. acuminata* (2n), othars from crossas of this with *M. balbisiana*.	*Musa acuminata* Honduras 676; Belgium 77; France 36; Cameroon 26; Brazil 25; Spain 18; South Africa 14; Malaysia 11 *Musa paradisiaca* Ecuador 150; Colombia 61; Taiwan 18 Major *Musa* collections also in: Côte d'Ivoire, Cube, India, Indonesia, Jamaica, Martinique, Pepue New Guinea, Philippines, Thailand, Uganda, Zaire,
Myrtaceae			
Pimenta dioica Pimanto		West Indies and Central America.	
Oleaceae			
Olea europaea Oliva	10,669	A cultigan probably derivad from *O. europea* ssp. *africana* in tha eastern Maditerraneen.	France 151; Greece 112; Iran 38; Albenia 20
Palmae			
Cocos nucifera Coconut	41,044	The origin of the coconut is obscure. Wild types predominate on the African and Indian coasts of the Indian Ocean, and scattered in Southeast Asia and the Pacific.	Sierra Leone 200; Venezuela 183; India 121; Viet Nam 30; Brazil 14; Kenya 11
Phoenix dactylifera Date	3,737	A food plant of ancient cultivation in North Africa and the Middle East.	Algaria 413; Iraq 182; Nigeria 174; USA 68; India 34; Morocco 31; Sudan 26; South Africa 18; Brazil 18; Iran 16
Elaeis guineensis Oil Palm	12,822	West Africa, originally a species of the transition zone between savanna and rain forest.	Zaire 16,938; Malaysia 1,300; Ecuador 304; Sierra Leone 200; Nicaragua 20; Costa Rica 14; Zaire 421; Indonesia 220
Pedaliaceae			
Sesamum orientale Sasamasaad	2,433 *6,945*	Possibly Ethiopia or peninsular India.	

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
39	V R nt	2 3 4	Warm temperate & tropical.		
c800	E V R I nt	1 5 8 5 17	Tropical & werm, especially Indomalaya.	Other spp. ere sources of rubber, fibres, paper, medicines etc; *F. pumile* (Vietnam to Japen) fruits used for jelly in Chine (okgue).	
35			Tropicel Asia	Fe'i bananes (2n) believed derived from *M. maclayi* and possibly other related spp., origin New Guinea (perhaps domesticated >9000 years BP). *M. textilis* recent domesticate in Philippines used for Menila hemp. Related *Ensete ventricosum* cultivated in Ethiopie for starchy pseudostem.	The genetic base of benena breeding is narrow. Forest clearence is threetening the variability of wild bananes *M. acuminata* and other *Musa* spp. Protection of wild species in Asia is an IPGRI conservation priority. Biosphere Reserves: Gunung Leuser, Siberut (Indonesia).
2-5	E V R I	1 3 1 1	Tropical America	*P. acris* (Bay rum tree) (tropical America introduced to Pacific) used for scent and soap.	
20	R nt	1 2	Tropical & temperate Old World.	Other species provide good timber.	Olive production is in decline and loss of traditionally managed olive groves has serious consequences for wildlife in the Mediterranean region. In Algeria and Niger the wild olive relative *Olea laperrinei* is threatened partly by over-cutting for cattle fodder. Biosphere Reserves: Tassili, El Kala (Algeria), Samaria (Greece), Gano (Iran), Mt Kulal (Kenye), Donaña (Spain).
1	nt	1	?E Malesia or Barrier Reef		The tendency to plant uniform, improved hybrids is reducing genetic variation perticulerly in domesticeted types.
17	V nt	2 10	Tropical & warm Africa and Asia (1 Europe).	*P. sylvestris* (Indie) - palm suger and toddy; *P. acaulis* (Assam to Myanmar) fruit chewed like betel.	*P. theophrasti*, allied to date palm, restricted to Crete where Vulnerable.
2	nt	2	1 tropical America; 1 tropical Africa.	*E. oleifera* (Tropical America) is less important than *E. guineensis*.	In West Africa oil palm groves ere being thinned to make way for other food crops. Conservation of the entire genepool in Africa and parts of Latin America is considered a priority by IPGRI.
15			Old World Tropics & S Africa		

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Family *Species*	Production (thousand mt) *Area (thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Piperaceae			
Piper nigrum Pepper		Wild pepper plants grow in the Western Ghats of Malabar, southwestern India and this is presumed to be the crop's centre of origin.	
Rosaceae			
Fragaria x ananassa Strawberry	2,307	A hybrid between two American species, *F. chiloensis* and *F. virginiana*. Both species were harvested from the wild and also planted by Indians before European settlement. Crossing took place in Europe in the 18th century.	*Fragaria chiloensis* Canada 2,859; USA 661; Slovakia 68 *Fragaria x ananassa* USA 439; Belgium 351; UK 310; Ireland 270; Denmark 229; Sweden 140; Germany 99; France 98; Poland 96; South Africa 55
Malus domestica Apple	43,087	An aggregate of over 1000 cultivars, or ancient and complex hybrid origin, probably originally from *M. dasyphylla* (Danube & Balkans), *M. praecox* (S Russia), *M. pumila* (S Europe, SW Asia), poss *M. sylvestris* (Europe, SW Asia). *M. prunifolia* (NE Asia) is the possible ancestor of some Orchard apples.	France 1,300; Canada 470; UK 270; China 262; Mexico 169; Spain 69; Germany 67; Pakistan 47
Prunus amygdalus Almond	1,284	Central to western Asia.	
Prunus armeniaca Apricot	2,153	Western China.	Italy 738; Australia 693; France 317; Czech Republic 187; Iran 173; USA 161; Turkey 158; Canada 144; Yugoslavia 101; Poland 74
Prunus avium Cherry		Western Asia.	Italy 1,155; Czech Republic 339; UK 323; USA 241; Germany 232; Switzerland 230; Poland 222; Turkey 203; Greece 85; Australia 76
Prunus communis Pear	10,692	Central Asia and the Himalayas.	
Prunus domestica Plum	6,181	An ancient 6n cultigen with complex origin, possibly in SW Asia and involving *P. cerasifera* and *P. spinosa*, possibly also *P. institia*; North American plums may be native American spp. or hybrids with *P. salicina* (China).	UK 495; Italy 361; Poland 214; Switzerland 159; Sweden 125; Denmark 115; France 99; Australia 82; Spain 68; Norway 47
Prunus persica Peach	10,076 (peach & nectarine)	Western China; possibly a cultigen derived from *P. davidiana*.	Italy 3,107; USA 2,064; Italy 430; Australia 520; France 335; Greece 280; Argentina 297; Spain 217; Ecuador 163; Israel 153
Rubiaceae			
Coffea arabica, C. canephora Coffee	5,919 (green) *10,927*	Ethiopia.	Ethiopia 1,806; Côte d'Ivoire 1,770; Costa Rica 1,184; Colombia 886; Kenya 592; Cameroon 584; Ecuador 428; India 329; USA 316; Brazil 275

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
1000+	E	5	Tropics	Also important *P. aduncum* (S America); *P. betle* (betel pepper)(Indomalaysia); *P. clusii* (W Africa black pepper); *P. cubeba* (S E Asia); *P. guineense* (W Africa); *P. longum* (India); *P. methysticum* (Fiji & W Pacific).	
	V	4			
	R	24			
	I	8			
	nt	26			
12	I	1	N. Temperate & Chile	Also eaten: *F. moschata* (hautbois) (Europe); *F. vesca* (wild strewberry) (N temperate).	Biosphere Reserves: Southeast Rügen (Germany).
	nt	2			
25	V	1	N Temperate	*M. baccata* (E Asia) fruits eaten; *M. hupehensis* (China, Assam) leaves used for tea.	Conservation of wild relatives of *Malus* in Europe and Asia is an IPGRI priority. Biosphere Reserves: Shennongjia (China), Middle Elbe, Southeast Rügen (Germany), Chatkal Mts, (Kyrgyzstan).
	R	1			
	nt	3			
400	E	2	Temperate, esp N Hemis	*P. angustifolia* (Chickasaw plum)(E N America) cultivated edible fruit; *P. brigantina* (Briençon apricot) (S France) seed-oil scented; *P. cerasifera* (myrobalan) (C Asia to Balkans) smell edible fruit; *P. cerasus* (Morello cherry) origin unclear; *P.xgondouinii* (*P. cerasus* x *P. avium*) - (Duke Cherry) leaves used for tea; *P. gracilis* (Oklahoma plum, Arkansas to Texas) edible fruit; *P. hortulana* (wild goose plum) (C & SE USA) cultivars with edible fruit; *P. institia* (damson) (Europe & Mediterranean); *P. mahaleb* (mahaleb)(Eurasia, introduced to N America); *P. maritima* (beach plum) (E N America); *P. mume* (Japanese apricot) (China SW Japan); *P. saliciana* (Japanese plum) (China); *P. simonii* (Apricot plum) (China, not known wild); *P. spinosa* (sloe blackthorn) (Europe, W Asia); *P. tomentosa* (Nanking cherry) (Temperate E Asia); *P. virginiana* (chokeberry) (E N America).	A reserve for the conservation of almond and other important fruit trees has been created in the Kopet mountains (Turkmenistan). Biosphere Reserves: Vale do Ribeira, Serra de Graciosa (Brazil), Boetine (Bulgeria), Shennongjia (China), Gano (Iran), Mt Paekdu (Korea PDR), Palava (Slovakia), Montseny (Spain). Protection of wild species in Europe and Asia is considered a conservation priority by IPGRI
	V	4			
	R	5			
	I	4			
	nt	6			
40	R	2	Old World Tropics, especially Africa	*C. liberica* is cultivated in W Africa; *C. stenophylla* (W Africa) cultivated & berries wild-collected; *C. bengalensis* (India) cultivated; *C. zanguebariae* (Zanzibar); *C. eugenioides* (Congo basin); *C. racemosa* is harvested wild in Mozambique.	Coffee grows wild in the threatened forests of the Ethiopian massif. Much of the forest habitat in Ethiopie hes been destroyed. Habitats of wild coffee are also threatened in Kenya. Protection of *C. arabica* in the wild is a conservation priority. The genetic base of domestic coffee is v. narrow (c 30 forms of *C. arabica* worldwide). Biosphere Reserves: Macchabee-Bel Ombre (Mauritius).
	I	1			

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area (thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Rutaceae			
Citrus aurantiifolia Lime	7,187 (lime & lemon)	Cultivated hybrid with obscura origins, possibly a hybrid of *C. madica* with another sp.	Morocco 63; Thailand 51; Japan 41; India 40; USA 40; Sudan 35; Brazil 22; France 19; South Africa 18; China 16
Citrus limon Lemon		Probably a hybrid of lime with *C. medica*.	Brazil 195; Turkey 162; USA 98; Italy 75; Japan 73; Morocco 60; South Africa 59; India 57; China 47; France 47
Citrus grandis (C. maxima) Pomelo	4,672 (pomelo & grapefruit)	Probably a native of the Malay peninsula.	Thailand 228; Japan 111; China 100; USA 56; Brazil 52; Philippines 43; Morocco 28; South Africa 28; India 21; France 18
Citrus x paradisi Grapefruit		Probably a hybrid of *C. maxima* with sweet orange beckcrossed with *C. maxima*.	Brazil 114; South Africa 98; Japan 71; France 48 Indonesia 44; Turkey 41; USA 40; India 27; Iran 25; Greece 19
Citrus reticulata Tangerine	8,465 (& mandarins etc)	Southeast Asia.	Brazil 333; China 310; France 227; South Africa 227; Japan 182; USA 138; Morocco 97; Turkey 88; Spain 72; India 69
Citrus sinensis Sweet Orange	50,630	Probably introgressed hybrids of *C. maxima* and *C. reticulata*, perhaps originating in China.	Brazil 1,363; South Africa 357; China 311; Japan 280; Turkey 269; USA 242; France 170; Morocco 157; India 132; Algeria 96
Sapotaceae			
Vitelleria paradoxa Karite Nut, Sheenut		West Africa;, grown in plantations in Ghana and Nigeria.	
Solanaceae			
Capsicum annuum Chili Pepper, Sweet Pepper	9,638 *1,149* (greenchillies & peppers)	Domestication first occurred in Middle America.	Taiwan 3,093; USA 1,981; Mexico 1,241; Netherlands 880; Germany 783; Hungary 691; France 516; Israel 500; Bulgaria 368; S Korea 350
Lycopersicon esculentum Tomato	70,443 *2,896*	South America where derived from Andean *L. lycopersicon*.	USA 17,706; Taiwan 6,291; Russia 5,500; Philippines 5,051; Germany 2,816; France 1,800; Canada 1,800; Colombia 1,707; Netherlands 1,600; Hungary 1,466
Solenum melongena Eggplant	5,735 *409*	India.	USA 1.165; Russia 950; India 535; Philippines 433; China 393; Japan 303; France 260; Italy 158; Netherlands 131; Spain 81
Solenum tuberosum Potato	268,492 *18,031*	The area of domestication is assumed to be the high plateau of Bolivia-Peru.	Germany 6,992; USA 4,303; Japan 1,496; Bulgaria 1,259; Sweden 1,212; Bangladesh 1,067; Colombia 942; Chile 898; India 897; Philippines 859;
Sterculiaceae			
Theobrome cacao Cocoa	2,329 *5,300*	Centre of origin is the eastern slopes of the Andes and the centre of cultivation is Central America.	Trinidad and Tobago 1,880; Ecuador 604; Costa Rica 540; India 63; Nicaragua 45; Guatemala 30; Peru 23. Major collections also: Ghana, Brazil, Ecuador, Puerto Rico, USA, Côte d'Ivoire, Malaysia
Umbelliferae			
Daucus carota Carrot	14,028 *630*	The species is widespread in Europe and Asia. The primary centre of origin for cultivated forms is thought to be Afghanistan.	Russia 1,700; USA 880; Czech Republic 772; United Kingdom 509; Germany 97; Hungary 90; Sweden 42; Poland 40; Japan 40; Turkey 35

Table 4. Major food crops

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
	E V	1 1	S & SE Asia	*C. madica* (Citron) (India); *C. hystrix* (liman-purat) (?); *C. aurantium* (Seville orange) is probably introgressed hybrids of *C. maxima* & *C. reticulata*; *C.* x *nobilis* (tangor) is sweet orange back crossed with *C. reticulata*; C. x *tangelo* (tangelo) is grapefruit crossed with *C. reticulata*.	Protection of wild *Citrus* species in Asia is a conservation priority. Biosphara Resarvas: Gunung Leuser (Indonasia).
1					
10	R	1	Tropical America	*C. frutescens, C. chinense, C. baccatum, C. pubescens.*	Wild peppers are still collected and sold locally. A large number of as yet unexploited varieties exists in the Tropics. More collection for seed banks is needed.
7			W S America & Galapagos	*L. pimpinellifolium* (cherry tomato) (Andes) has very small fruits.	The wild relatives of the tomato have limited ranges. The crop's wild gene pools are prone to erosion by habitat destruction. Biosphere Reserves: Galapagos (Ecuador), Tikal (Guatamala).
1400	Ex Ex/E E V R I nt	5 1 11 27 19 18 10	Sub-cosmopolitan	*S. centrale* (arid Australia) and *S. muricatum* (pepino) (Andes) have edible fruit; *S. quitoense* (naranjillo) (Andes) is used for fruit juice; *S. melanocerasum* (?cultigan) (cultivated tropical W Africa) fruit; *S. hyporhodium* (upper Amazon); *S. americanum* (yerba mora).	3,000-5,000 varieties of potato are recognised by farmers in the Andes. Conservation of genatically valuable local varieties is being carried out at the International Potato Centre in Paru. Biosphere Reserves: Palava (Czech Republic).
20	I	1	Tropical America	All the following are cultivated: *T. grandiflorum* (cupuaçu) (E & C Amazonia); *T. speciosum* (cacaui) (N S America & S C America); *T. subincanum* (N S America); *T. obovatum* (Amazon); *T. engustifolium* (C America); *T. bicolor* (N S America & C America); *T. glaucum* (Amazonia in Ecuador & Colombia).	Cultivated variatias suffer from a lack of ganatic variation. Forests harbouring ganetic diversity in the wild are being rapidly destroyed.
22	R I K nt	1 1 1 1	Europe; SW & C Asia; tropical Africa; Australia; New Zealand; America.		

Table 4. Major food crops

Family *Species*	Production (thousand mt) *Area (thousand ha)*	Origin of species	Major germplasm collections (number of accessions)
Vitaceae			
Vitis vinifera Grape	8,180	10,000 Old World cultivers are thought to be derived from this single wild species which still occurs in Middle Asia. New World varieties were produced by hybridising this with *V. labrusca* and other spp.	
Zingiberaceae			
Elettaria cardamomum Cardemom		Native to India.	

No. of species in genus	Species status		Distribution of genus	Other species in genus used	Conservation notes
	I nt	1 1	N Hemisphere	Fruits also edible of: *V. acerifolia* (bush grape) (S N America); *V. arizonica* (canyon grape) (SW N America); *V. labrusca* (fox grape) (E N America); *V. rotundifolia* (bullace grape) (N America); *V. rupestris* (sand grape) (E N America); *V. vulpina* (chicken grape) (E N America).	Wild relatives are suffering genetic erosion in the USA. Biosphere Reserves: Shennongjia (China), Rosca-Letea (Romania).
c7			India to W Malaysia		Collection from the wild contributes to the commercial trade.

Table 5. Domestic livestock

At the local level, a great many wild animal species are used primarily to meet subsistence needs, the kind depending largely on availability and convenience, and to some extent, tradition. Globally, a small number of animal species are used in extensive ranching or farming systems, while fewer still are used in domestic livestock production. Breeds of domestic goat, sheep, cattle, pigs and domestic fowl are cosmopolitan in distribution and the basis for most of the world's agricultural animal food production. Marine and inland fisheries exceed the principal domestic stock in terms of production volume, although use of fishery products is unevenly distributed.

The four principal mammalian livestock species have diversified under more than 5,000 years of domestication and artificial selection into more than 2,000 recognised breeds, each with unique characteristics. Other livestock, including remaining mammals, chickens, honey bees, silk worms, etc., have been fully domestic for less time (but many more generations in the case of non-mammals). Some breed characteristics may be of no apparent significance to humans, others, perhaps involving milk yield, fleece type, food utilisation, fecundity, or resistance to parasites or climatic stress, may be of great value.

Although, especially among cattle and pigs, intensification of production has gone hand in hand with narrowing of the genetic base, such that semen from individually documented and tested lines commands a premium, there is increasing recognition of the genetic potential resident in less commercially-developed breeds and blood lines, and of the often neglected value of locally adapted stock in comparison with commercial stock from advanced industrial countries. The pool of genetic resources represented by domestic animal diversity is an essential basis for efficient and sustainable food production, and is likely to be of increasing importance in the more demanding production environments.

In this context, one intention of the table below is to draw attention to the extent to which both the diversity of existing livestock breeds (column 5, 'rare breeds') and of wild relatives of livestock (columns 8 and 9) are at risk.

NOTES TO TABLE 5

This table presents information on the major domestic mammals and closely related wild species. The intention is to integrate data on uses, history and diversity of the former with information on the status and distribution of the latter.

Part of the table based on data in Clutton-Brock (1981) was included in material assembled by Stephen J.G. Hall for WCMC (1992). Nomenclature mainly follows Wilson and Reeder (1993); an alternative treatment of generic names among large bovids is used by Loftus and Scherf (1993).

Column 3, Notes on domestication: miscellaneous notes on history and geography of domestication, feral populations, etc., principally from authors in Mason (1984).

Column 4, No. breeds: number of domestic breeds, from Loftus and Scherf (1993); this publication is founded on the FAO database being developed as part of the Global Information System for Domestic Animal Resources.

Column 5, Rare breeds: number of domestic breeds categorised by FAO as 'Critical' (probably fewer than 100 breeding females or five or fewer breeding males) or 'Endangered' (probably fewer than 1,000 breeding females or 20 or fewer breeding males); data from Loftus and Scherf (1993).

Column 6, Wild progenitor: name and range of wild ancestor of domestic stock, data from Clutton-Brock (1981) and Mason (1984).

Column 7, Distribution of genus: generalised range and content of the genus, data from Wilson and Reeder (1993).

Column 8, No. species: number of species in genus, data from Wilson and Reeder (1993).

Column 9, Status of wild relatives: status category, name and range of congeneric species regarded by IUCN as globally-threatened. Nomenclature mainly from Wilson and Reeder (1993); data on the status of wild relatives are based on assessments by the IUCN/SSC Specialist Groups, as in the 1994 IUCN Red List (Groombridge, ed. 1993). The status category is denoted by the letter on the left of each entry (see Notes to Table 2 above for definition of categories).

The term "wild relatives" is here taken to refer to members of the same genus according to the taxonomy of Wilson and Reeder (1993).

A distinction is sometimes made between 'domestic' and 'domesticated' animals; all aspects of breeding and food supply are under direct human control in the former ('man-made animals'), but partially so in the latter ('exploited captives'). It is difficult to make a clear distinction in practice. We have dealt with mammals only, and with a mixture of truly domestic stock (dogs, sheep) and others less closely controlled (alpaca, reindeer). We have not dealt with domestic species among other groups of animals (birds, insects) nor with the very wide range of non-domestic species used in ranching and farming systems.

There is no universally accepted system for naming domestic stock. Some authorities give the earliest valid name, even if first applied to domestic stock, to the wild relatives of domestic stock; others prefer to retain separate names for domestic stock where such a name has been in common use, and apply the next available valid name to the wild species. In the first case (eg. Grubb, in Wilson and Reeder, 1993), *Capra hircus* Linn. 1758 would be applied to the wild goat and all domestic derivatives; in the latter case (eg. Clutton-Brock, 1981), that name would be restricted to domestic stock and *Capra aegagrus* Erxleben 1777 applied to the wild goat of Eurasia. The second approach is adopted below.

Table 5. Domestic livestock

Family Species	Use	Notes on domestication
Canidae		
Canis familiaris Dog	Companion, hunting, security, food, transport	Domestication may have begun c 40,000 yrs ago; first evidence 12,000 BC in Middle East; distinct kinds of dog evident by 5,000 BC. The Dingo is a feral domestic dog taken to Australia c 12,000 yrs ago.
Felidae		
Felis catus Cat	Companion, pest control	Domestication perhaps linked to settled farming systems and need to limit rodent pests of stored grain. Evidence from 1,600 BC in Egypt. Present around Mediterranean by 500 BC, to India and China by 200 BC, Europe c 500 AD. Transported worldwide by colonists.
Mustelidae		
Mustela furo Ferret	Hunting	Possibly domesticated by c 20 AD in S Europe. Used in Europe and N Africa; range similar to European Rabbit & probably developed as rabbit hunter. Introduced to New Zealand. Some feral island populations.
Equidae		
Equus asinus Ass or Donkey	Transport, draught Sire of mule (ass x horse hybrid)	Probably domesticated in NE Africa; records from 4,000 BC in Egypt. The only domestic animal certainly of African origin. Widespread in Middle East by 100 BC. To Americas in 16th C. Much more important than horse in Africa where present in N and W. Common in S and Central Asia; also present S Europe. Mostly for transport; specialised riding and pack breeds exist. Formerly milked, meat sometimes used. Feral asses widespread incl. Socotra, Galapagos, USA, Australia, Sahara etc. Numbers worldwide likely to decline, but because of hardiness and low cost will retain importance in less developed areas.
Equus caballus Horse	Transport, draught, sport Dam of mule (ass x horse hybrid)	First evidence of domestic horses c 3,500 BC in central Eurasia (Ukraine). Spread through Eurasia during Bronze and Iron Ages. Important early military use, to draw chariots and for riding, especially after invention of stirrups before 500 AD. Wild horses present with Amerindians in N America but extinct by 10,000 BC; domestic horses introduced by European colonists. Most horses occur in South America where numbers also highest in relation to humans; numbers high in N America and Asia. Specialised for draught or riding, but both uses in decline. Feral horses on all continents (except Antarctica).
Suidae		
Sus domesticus Pig	Meat	First evidence of domestic pigs by 7,000 BC in Anatolia; widespread in Eurasia, incl. Egypt, by 3,000 BC. Worldwide; nearly half the world's pigs occur in non-Muslim Asia, mostly in China. Management varied: may free-range in woodland or be sty-fed. Pigs introduced to the Americas from Europe; few in Africa or Australia, NZ. Several feral herds. Large number of breeds. Commercial production now dominated by few lines. Production increasingly specialised, but still an important rôle for local variation in utilising household waste and wild foods. Pigs have a major cultural significance in parts of SE Asia and Melanesia.
Camelidae		
Camelus bactrianus Bactrian Camel	Draught, transport, meat, milk, wool, dung	Fossil camels known from N America (where no extant camels) and Eurasia west to N Africa. Rock drawing in Mongolia of two-humped camel may be 10,000 yrs old. First evidence of domestication in Iran & Turkmenistan c 3,000 BC. Widespread in Central Asia by 1st millenium BC. Main transport on 'Silk Route' between Mesopotamia and China but replaced by Dromedary in west and south from 1st C BC. Restricted to Central Asia, incl. Mongolia and China. Numbers probably in decline.
Camelus dromedarius Dromedary	Transport (draught, meat, milk, wool, dung)	Remains of Dromedary or similar species at Palaeolithic sites in N Africa c 80,000 yrs ago. Wild camels apparently extinct in Africa by 3,000 BC but persisted in S Arabia, where perhaps first domesticated c 3,000 BC, until early Christian times. Domestic camel to Horn of Africa c 2,000 BC and Egypt c 1,000 BC. Reached present importance with rise and spread of Arab power from 7th C onward. Most camels in NE Africa and Afghanistan-Pakistan-India, where numbers rising; fewer and decreasing in Mid East. Primarily for transport; specialised pack and riding breeds exist. Introduced to Canaries and Australia (where feral herds). Ability to withstand long periods without drinking and use thorny browse key to human use of hot deserts.

No. breeds	Rare breeds	Wild progenitor	Distribution of genus	No. Species	Status of wild relatives
>400		*Canis lupus* Wolf N America, Europa, Asia	*Canis* Wolves, jackels, Coyote N hemisphara, Africe, Australia (feral)	7	E *C. rufus* USA E *C. simensis* Ethiopia V *C. lupus*
		Felis silvestris Wild Cat Europa, Asia, Africa	*Felis* Desert, Jungle, Sand Cat etc Europe, Africe, Asia	5	K 2 spp. (plus 13 other spp formerly includad in *Felis* K or I)
		Mustela putorius Polecat Europa *M. avarsmanni* ? Stappe polecat E Europe, Asia	*Mustela* Weesels, mink, polecets atc Europa, Asia, Americes	16	E *M. felipai* Colombia, Ecuador E *M. lutreola* Europe E *M. nigripes* USA I *M. africana* K 2 spp.
78	11	*Equus africanus* Africen Wild Ass N Africa to Somelia	*Equus* Zebras, esses, horses Europe, Africa, Asia	9	E *E. africanus* Ethiopia, Somalia E *E. grevyi* Ethiopia, Kenya V *E. hemionus*, China, India, Iran, Kazakhstan, Mongolia, Turkmanistan V *E. zebra*, Angola, Namibia, S Africa
357	81	*Equus ferus* Wild Horsa formarly Americes, Europe, Asia			Ex? *Equus farus* Wild horsas probably extinct in wild; racantly rastrictad (Przawalskii's Horse) to SW Mongolia and adjacent China whara last seen 1966. Extinct in Europa (Terpan) in 19th C, extinct in Amaricas c 10,000 BC
263	53	*Sus scrofa* Eurasian Wild Pig N Africe, Europe, Asia	*Sus* Warty pigs, Beerdad Pig Europe, Asia	10	E *S. cabifrons* Philippinas E *S. salvanius* India, Bhutan?, Napal? V *S. verrucosus*
		Camelus bactrianus Bectrian Camal SW Mongolia, NW China	*Camelus* Camals Asia	1	V *C. bactrianus* Presumad wild (possibly faral) populations only in China & Mongolia
		unknown in wild, prasumed extinct *Camelus* spacies			

Title 5. Domestic livestock

Family Species	Use	Notes on domestication
Camelidae continued		
Lama glama Llama	Transport, wool (coarse), meat, dung	Domesticated by 4,000 BC in high altitude Andean pastures, possibly centred around Lake Titicaca basin of S Peru and W Bolivia. Alpaca textiles known from 500 BC. Domestic camelids spread to lower altitudes and along Andean chain by 2000 BC and reached greatest extent during Inca period; in decline since Spanish conquest in early 16th C and introduction of European stock. Remain important to Andean culture and for superior adaption to poor high altitude grazing. Pad feet may cause less pasture damage than hoofs of sheep. Two breeds of each species are recognised. Llamas and most alpacas held by small-scale pastoralists on communal grazing; some alpaca kept in large herds by cooperatives in Peru. Not milked. Alpace wool has high commercial value. Llama flocks in USA and Europe.
Lama pacos Alpaca	Wool (fine)	
Cervidae		
Rangifer tarandus Reindeer or Caribou	Meat, milk, transport	Fossil evidence for use of reindeer from 80,000 yrs ago, domesticated before 500 BC. Management varies: riding or milk animals may be separated from herd and fed, or herds may roam widely and be gathered annually for marking or slaughter. Reindeer industry important in north Scandinavia, NW Russia and Siberian Russia, less so in N America. Reindear exploitation key to settling the far north. Wild reindeer include four major types, all used in husbandry systems. Some potential for better use; numbers have been increasing but with local indications of overgrazing. Lichens, the main winter feed, very vulnerable to atmospheric pollution.
Bovidae		
Bos taurus Humpless, mainly European cattle (taurine) *Bos indicus* Humped, mainly Asian cattle (zebu)	Meat, milk, transport, draught, dung, etc.	Domestic longhorn cattle from c 6,000 BC at several Mid East sites, later in Nile region, circum-Mediterranean by 1,000 BC. First domesticated in S Europe or Anatolia-Mid East. Shorthorn breeds dominant from 3,000 BC. Humps, assumed result of artificial selection, at base of neck or over shoulder (zebu type). Zebu generally heat and paresite resistent, dominant in Asia and Africa (some longhorns persist eg. trypenosome resistent N'Dama in W Africa). Cattle were first draught farm animals, in Europe only specialised for meat or milk when replaced as power source by horse. Very high breed diversity, many now rare. British breeds to N America, Australia in 19th C, Iberian breeds earlier to S America. Cattle certain to continue as major farm animals for meat and milk. Much potential in tropics for development of local stock, eg zebu dairy breeds. Several feral herds.
Bos frontalis Mithan or Gayal	Ceremonial sacrifice, barter	No firm evidence but probably of early origin. Restricted to Bhutan, hills in NE India bordering China and Myanmar, and Chittagong hills of Bangladesh. Typically higher elevation than cattle and lower than yak. Kept mainly by hill tribes, usually by men of high status, for use in ceremonial sacrifice, exchange, and trophy display. Not much used for draught or milk. Mithan generally forage freely in forest during day or for months, restrained at intervals, lack human control over breeding. May breed with cattle and gaur.
Bos grunniens Yak	Milk, transport, meat Dam of 'dzo' (cattle x yak hybrid draught animal)	Possibly domesticated at same time as cattle, probably on Tibetan Plateau or the Himalaya. Most yak in W China, many in Mongolia, fewer in Tajikistan, Kyrgyzstan, Nepal, Bhutan, Afghanistan, India. Usually at 3,000-5,000 m alt. Variable size and pelage, usually smaller than wild yak. Yak tail in trade for centuries; white tips favoured for ease of dyeing. Yak can graze where other livestock cannot. Much medical or religious use in Tibet, where milk and butter most important; used as meat source in Mongolia. Hair used for rope, felt; skin for leather; dung for fuel; important pack animal.
Bos javanicus Bali Cattle	Draught, meat	Domestic cattle present in SE Asia c 3,500 BC. Banteng possibly domesticated in prehistory in SE Asia or Java. Now in many parts of Indonesia; small herds Malaysia, Philippines, Australia. Very uniform in type. Organised selction in 20th C: no entire males exported, no crossing with other cattle. Small size, highly fertile, little fat, uses poor pasture in hot humid conditions. Good draught animal for small fields and terraced slopes; much potential as meat or crossing stock. Feral herd in Cobourg Peninsula (Australia).
Bubalus bubalis Water Buffalo	Draught, milk	Probably domesticated before 2,500 BC in Middle East. Wild ancestor occurred from Mesopotamia east to SE Asia; by the 19th C restricted to India and adjacent areas, where very local. Domestic buffalo reached SE Europe by 12th C where from 14th C much used in Muslim communities; later taken to the Americas and Australia, and Africa in 20th C. Breed development centred in India & Pakistan. Broadly divided into swamp buffalo in SE Asia, mainly for draught, and river buffalo in S Asia, mainly for milk. Do better than cattle on swamp and floodplain grazing. Much potential for development as meat producer. Milk rich in fat. Large feral herds in Australia.

No. breeds	Rare breeds	Wild progenitor	Distribution of genus	No. Species	Status of wild relatives
2		*Lama guanicoe* ? Guanaco S Peru, W Bolivia, NW Argentina	*Lama* Guanaco mountains of central S America	1 (2)	*L. guanicoe* not threatened
2		unknown in wild, presumed *Lama* sp. or *Lama* x *Vicugna* hybrid	The Vicuña, *V. vicugna*, of central montane S America sometimes included in *Lama*		V *Vicugna vicugna*
		Rangifer tarandus Reindeer, Caribou N America, N Eurasia	*Rangifer* as for single species	1	*R. tarandus* not threatened as species; Peary Caribou *R. t. pearyi* (Canada) listed Endangered
783	112	*Bos primigenius* Wild Ox, Aurochs (extinct)	*Bos* Wild Cattle Asia, extinct in Europe	4	Ex *B. primigenius* extinct, last recorded in Poland c 1627; formerly throughout Eurasia and N Africa. Much hunted in Neolithic times; extinct during 1st millenium BC in Egypt, N Africa etc. E *Bos sauveli* Cambodia, Laos, Viet Nam
		Bos gaurus Gaur S & SE Asia			V *Bos gaurus*
		Bos mutus Yak China: N of Tibet plateau (Altun Shan, Qilien Shan)			E *Bos mutus*
		Bos javanicus Benteng SE Asia			V *Bos javanicus*
§2	1	*Bubalus arnee* Wild Water Buffalo Bhutan, India, Nepal, Thailand?	*Bubalus* Buffalo S & SE Asia	4	E *Bubalus arnee* E *B. depressicornis* Indonesia E *B. mindorensis* Philippines E *B. quarlesi* Indonesia

Table 5. Domestic livestock

Family Species	Use	Notes on domestication
Bovidae continued		
Capra hircus Goat	Meat, milk, hair	Goats and sheep next to be domesticated after dog. Domestic by 7,000 BC in Middle East; to Europe by mid Neolithic. Worldwide distribution. Great variety in form of horns and ears, hair colour, etc. Highest numbers in South Asia. Milk breeds developed in Switzerland have influenced many milk breeds worldwide. The Boer (South Africa) is major meat breed. Two fleece breeds: Angora (Turkey) and Cashmere (Central Asia). Very many feral populations, where often adverse impact on native biota. Much potential for further breed development, eg. for specialised tropical dairy animals.
Ovis aries Sheep	Meat, milk, wool	Sheep & goats next to be domesticated after dog. Sheep in use in Mesolithic; evidence for domestication c 9,000 BC in Mid East; to N Africa (where no wild sheep) by 4,000 BC; to Americas in 16th C. Worldwide distribution; very important in Europe, Middle East, Central Asia. Coat of wild sheep has outer hairs over woolly inner coat; hairs lost during domestication to produce fine fleece breeds. Wool and milk often more important than meat. Wool trade basis of great wealth in mediaeval and early modern Europe. Very many breeds; some multi-purpose, others specialised for milk, fleece or meat. Sheep numbers in decline in some developed countries eg. USA, Australia, but elsewhere provide vital support to human life in marginal and rangeland environments.
Caviidae		
Cavia porcellus Guinea Pig	Meat, laboratory, companion	One of few domestic animals of S American origin. Probably domesticated between 4,000-1,000 BC, but in use long before. Taken to Caribbean and Europe by mid 16th C. Some planned selective breeding during past 30 yrs. Potential for more development as meat source, especially in original Andean range, but broiler fowl increasingly used instead.
Leporidae		
Oryctolagus cuniculus European Rabbit	Meat, fur, laboratory, companion	Kept enclosed (in *leporarie*) by Romans since 100 BC. Kept by mediaeval monks; newborn or unborn young were permissable food during Lent. Distributed worldwide by mariners; many feral populations. Some development of meat breeds since WWII; much potential as low-cost converter of surplus vegetation into meat.

No. breeds	Rare breeds	Wild progenitor	Distribution of genus	No. Species	Status of wild relatives
313	32	*Capra aegagrus* Wild Goat SW Asia: Turkey east to Pakistan	*Capra* Goats, Merkhor Euresia, NE Africa	9	E *C. falconeri* Afghanisten, India, Pakisten, Tejikistan, Turkmenisten, Uzbekistan? E *C. walia* Ethiopie R *C. caucasica, C. cylindricornis* I *C. nubiana*
863	101	*Ovis orientalis* Mouflon SW Asia: Turkey east to Iran; Mediterrenean populations (Corsica, Sardinia, Cyprus) possibly feral primitive domestic stock	*Ovis* Sheep Eurasia, N Americe	6	*Ovis orientalis*: V *O. o. ophion* Cyprus Mouflon R *O. o. musimon* Europeen Mouflon I *O. o. gmelini* Armenian Mouflon K 2 remaining subspecies *Ovis ammon* Centrel Asia: ell subspecies threatened (4 E, 3 I) V *O. canadensis*, 3 subspecies V *O. nivicola*, 1 subspecies *O. vignei*: all subspecies listed threatened (as *O. orientalis* subspp)(3 E, 1 V, 1 I, 1 K)
		Cavia aperea widespread in S America, or *C. tschudii* Peru, S Bolivie, NW Argentina, N Chile	*Cavia* Cevies South Americe	4 (5)	
		Oryctolagus cuniculus Europeen Rebbit W & S Europe to NW Africe	*Oryctolagus* original renge probebly Iberia, possibly NW Africe; now introduced to most continents & worldwide as domestic form	1	*Oryctolagus* one of 8 monospecific genera in the family, which contains 54 species in 11 genere. *O. cuniculus* is not listed threatened but 15 other species are: E *Bunolagus monticularis, Caprolagus hispidus, Lepus flavigularis, Nesolagus netscheri, Pentalagus furnessi, Romerolagus diezi, Sylvilagus graysoni, S. insonus* V *Brachylagus idahoensis* R *Lepus insularis* elso 2 species I, 3 K

Table 6. Marine resources

Oceans cover 71% of the world's surface. They hold a significant proportion of living biomass and play an ill-understood though evidently vital part in regulating climate. Much remains to be discovered about the diversity of life in the seas. It is well known that diversity at the highest taxonomic levels (Phyla) is much greater in the sea than on land or in freshwater, but is has generally been assumed that species diversity is much lower than on land. Recent work, discussed in more detail in *Global Biodiversity* (WCMC, 1992), indicates that this may not be the case: studies of some marine environments, particularly bottom sediments, show extremely high levels of invertebrate species diversity, the great majority comprising previously unknown species.

The seas provide many biological resources used by humans. In the form of marine fisheries they provide by far the most important source of wild protein, a source which is of particular importance to many subsistence communities around the world and which makes use of a wide range of animal species, notably fishes, molluscs and crustaceans. Marine algae are also an increasingly important foodstuff, notably in the Far East, with current annual world production of around two million tonnes. Marine organisms are also proving extremely fruitful sources of pharmaceuticals and other materials used in medicines. More minor although locally important uses include exploitation of coastal resources for building materials (eg. coral limestone and mangrove poles and timber) and other industrial products (eg. tannins from mangroves).

Traditionally, all marine resources outside territorial waters (usually up to 12 nautical miles from shore) were considered 'open-access' resources. This covered most of the world's oceans and virtually all deep-sea areas. These resources were theoretically highly susceptible to overexploitation, although, with a few exceptions (eg. whales), harvesting technologies until relatively recently were not sufficiently sophisticated to pose a serious threat. In the past few decades this has changed dramatically and many open-ocean resources have been gravely depleted leading to the collapse of a number of fisheries, sometimes bringing individuals and nations into conflict. With the introduction of the Exclusive Economic Zone (EEZ) under the United Nations Convention of the Law of the Sea (UNCLOS), which allows nations control over resources (including living resources) in an area up to 200 nautical miles offshore, a far greater proportion of the world's seas now come within the control of individual nations. This should theoretically allow better management of resources in these areas, although this generally has yet to materialise.

Access to marine resources is not equitably distributed amongst the world's nations. Most obviously, some 39 states are landlocked, ie. have no seaboard (although three of these have seaboards on the Caspian, which is functionally a sea). Those that do have seaboards show great variation in length of coastline, and area of territorial waters and EEZs, both absolutely and relative to their land areas. They also show great variation in their capacities to exploit marine resources, both on the high seas and within their territorial waters and EEZs.

NOTES TO TABLE 6

This table integrates several kinds of data relating to marine biodiversity, fishery production and protection systems.

Key:

*	An asterisk against any figure indicates that an explanatory note is given below.
-	Indicates lack of data.
–	In column 3 (EEZ) indicates that an EEZ has not been formally declared, the adjacent figure is the marine area potentially subject to EEZ declaration.
F	FAO estimate of catch (where reported data incomplete or missing).
#	In column 6 (seagrass) indicates that pasture-forming species are present.
(S)	In column 15 (marine international conventions) indicates that the state is a signatory of the convention or agreement cited but has not ratified, absence of this annotation indicates that the state is a full party to the convention cited.

Note that further keys to abbreviated names are given in the column notes below.

Column 2, Coastline: Data from Table 22.6 in World Resources Institute (1994). A coastline does not have a finite length and the magnitude of any estimate of its length will depend heavily on the scale and projection of the map from which it is derived. Many island groups are represented by estimates for major islands only; as noted below. **Yugoslavia:** former Federal Republic of Yugoslavia. **Cook Islands:** Rarotonga only. **Federated States of Micronesia:** Babeldaob & Yap only. **French Polynesia:** Huahine, Lifou, Maré, Moorea, Raiatea, Tahaa, Tahuata & Tahiti only. **Tonga:** Niuafo'ou, Tongatapu & Vava'u only. **Vanuatu:** Ambae, Ambrym, Aneityum, Efete, Epi, Erromango, Espiritu Santo, Hiu, Maewo, Malakula, Pentecost, Santa Maria, Tanna & Vanua Lava. **Wallis & Futuna:** Uvea & Futuna only. **British Virgin Is:** Tortola Island. **Netherlands Antilles:** Bonaire & Curaçao. **St Vincent & the Grenadines:** Saint Vincent. **Turks & Caicos Is:** North Caicos. **USA:** coastline includes Hawaii. **St Helena:** data in parentheses for Tristan da Cunha & Gough. **UK subantarctic Is:** East Falkland only. **French subantarctic Is:** Amsterdam & Possession.

Column 3, EEZ: The figures indicate the approximate extent of the marine area of nations (together with their territories and dependencies). The marine area extends to a potential maximum of 200 nautical miles from the coast, but will be set at less than 200 nm where agreement has been reached over the intersection of marine areas of adjacent states. Data from Fenwick (1992). **Germany:** marine area as for former Federal Republic. **Yugoslavia:** EEZ for the former Federal Republic of Yugoslavia. **Yemen:** upper figure for former North Yemen, lower figure for South Yemen; national maritime legislation and claims not yet unified. **Eritrea:** marine area of former Ethiopia; following the secession of Eritrea, Ethiopia has no coastline although a July 1993 agreement gives the latter access to ports.

Column 4, Fisheries: Data from FAO (1991). *FAO Fishery Statistics Yearbook: catches and landings 1991. Vol. 72.* **USA:** Hawaii is included in both figures. **Eritrea:** data for the former Ethiopia.

Column 5, Mangroves: This column is an attempt to collate data estimating the area of mangrove vegetation. In several cases more than one estimate is provided in order to reflect existing uncertainties. Where two figures are given the upper, unless otherwise specified, is from Fisher & Spalding (1993). **Indonesia:** figure in parentheses from Soemodihardjo (1986). **Malaysia:** upper figure: Chan *et al.* 1993; lower figure: Fisher & Spalding 1993. **Pakistan:** lower figure, Fisher & Spalding (1993) based on LANDSAT images quoted in UNESCO (1992); upper figure, Ansari (1986). **Philippines:** lower figure, Technical Staff, Philippine National Mangrove Committee (1986). **Singapore:** lower figure, Corlett (1986); upper figure, Ming (1990). **Sri Lanka:** figure from Legg *in litt.*; data are based on analysis of satellite imagery as of early 1992. An additional 500-700 ha in stands <20 m wide may also exist. FAO (1981) give 120,000 ha. Jayewardene (1986) gives c 4000 ha. **Thailand:** upper figure, Klankamsorn & Charuppat (1982); lower figure, Aksornkoae (1993). **Fiji:** Watling (1985). **Northern Marianas:** Dahl (1980). **Vanuatu:** David (1986). **Anguilla:** Bacon (1993b). **Antigua and Barbuda:** upper figure, Putney (1982); lower figure, Bacon (1993a). **Bahamas:** lower figure Bacon (1993b). **Belize:** upper figure, Gray *et al.* (1990); lower figure, Saenger *et al.* (1983). **Cayman Islands:** lower figure, Bacon (1993b). **Cuba:** lower figure, Padron (1992). **Dominica:** Bacon 1993a. **Dominican Republic:** lower figure, Saenger *et al.* (1983). **El Salvador:** upper figure, Saenger *et al.* (1983); lower figure, Jimenez (1992). **Grenada:** Bacon (1993a) (49 ha for Grenada, 67 for Grenada Grenadines). Bacon (1993b) 149 ha for Grenada. One of these figures is clearly a typographical error. **Guadeloupe:** upper figure, Saenger *et al.* (1983); lower figure, Fisher & Spalding (1993). **Honduras:** upper figure, Jimenez (1992); lower figure, Fisher & Spalding (1993). **Jamaica:** upper figure, Fisher & Spalding (1993), believed questionable; lower figure, Bacon (1993). **Martinique:** lower figure, Saenger *et al.* (1983). **Mexico:** lower figure, Yáñez-Arancibia *et al.* (1993). **Monserrat:** Bacon (1993a). **Panama:** lower figure, D'Croz (1993). Snedaker (pers. comm., Fisher & Spalding) notes other estimates vary from 33,700 ha to 505,600 ha. **St Kitts-Nevis:** lower figure, Fisher & Spalding (1993); upper figure, Bacon (1993a). **St Lucia:** upper figure, CCA/IRF (1988); lower figure, Bacon (1993a). **St Vincent and the Grenadines:** Bacon (1993a). **Turks and Caicos Is:** Bacon (1993b). **Trinidad and Tobago:** lower figure, Bacon (1993b). Snedaker (*ibid.*) notes other estimates range from 5000 ha to 11,000 ha. **USA** (excluding Hawaii) lower figure, Odum *et al.* (1982). **Virgin Islands (British):** Bacon (1993b). **Brazil:** upper figure, Herz (1991); lower figure: Saenger *et al.* (1983). **Colombia:** lower figure, Alvarez-León (1993). **Ecuador:** lower figure, MAG (1991). **French Guiana:** lower figure, FAO (1981); upper figure, Anon. (1979). **Guyana:** upper figure, Saenger *et al.* (1983); lower figure: Fisher & Spalding (1993). **Peru:** lower figure, Echevarria & Sarabia (1993). **Venezuela:** lower figure, MARNR (1986). Snedaker (*ibid.*) notes that FAO/PNUMA give an estimate of 260,000 ha but this is believed to reflect only the larger areas of potentially commercial forest. **Mauritania:** Gowthorpe & Lamarche (1993). **Nigeria:** lower figure, FAO (1981), taken to represent the extent of closed-canopy mangrove. **Sierra Leone:** upper figure, from Johnson & Johnson (1993); lower figure, Snedaker (*ibid.*). **Kenya:** upper figure, NBU (1992); lower figure, Ruwa (1993).

Column 6, Seagrass: Information on seagrasses is sparse and incompletely collated at the global level, however, seagrass habitats are of considerable importance as a basis for fishery production, as a food source for certain threatened animals (eg. Green Turtle, Dugong), and for coastal stabilisation. The data in this column are primarily derived from the standard taxonomic monograph on seagrasses (Den Hartog, 1970; and see Phillips and Meñez, 1988) and relate to distribution records for specimens of species recognised by Den Hartog. If in italics, a number in this column is the number of species present according to UNEP/IUCN (1988). A # sign indicates that seagrass vegetation is present in the form of pastures. It must be emphasised that data in this column are known to be incomplete: although species richness for eg. Australia or Japan is likely to be fairly represented, comprehensive data on the seagrass flora and vegetation of small island states are not readily available. **Cook Islands:** UNEP\IUCN (1988) notes that seagrass vegetation is absent from the Cook Islands. It is unclear if this means that no species of seagrass are present. **Tonga:** Dahl (1980) notes beds of *Halodule uninervis* and *Syringodium isoetifolium*. **Western Samoa:** Dahl (1980) notes *Halophila* and *Syringodium* near Namu'a Island. **Dominica:** beds mainly of *Syringodium* with occasional *Thalassia*. **Dominican Republic:** *Thalassia* and *Syringodium*. **St Vincent** and the Grenadines: *Thalassia* and *Syringodium*.

Column 7, Coral Reefs: This column includes an edited version of information collated for WCMC (1992) by Caroline Harcourt, mainly derived from UNEP/IUCN (1988). The world distribution of coral reefs is shown in Figure 4.

Column 8, Inshore marine fishes: This column includes sample estimates of the number of fishes recorded in inshore marine waters; where coral reefs are present, a high proportion of these fishes are coral reef species. Data mainly from WCMC (1994), collated from two main sources: a draft version of FISHBASE, a database being developed by the International Center for Living Aquatic Resources Management (ICLARM), in collaboration with the Food and Agriculture Organisation (FAO) of the United Nations and the Commission of the European Communities; and also from the IUCN/SSC Coral Reef Fish Specialist Group, with J. Hawkins, Ocean Voice International at the University of the Virgin Islands. **Guam:** coral reef species only. **New Caledonia:** coral reef species only. **Ecuador:** species estimate in parentheses is for the Galápagos Islands. **UK subantarctic islands:** South Georgia only: benthic species (10 of which are endemic; Oldfield, 1987). **Kiribati:** fish species at Onotona Atoll, no country total is available.

Column 9, Marine turtles: This column indicates which species of sea turtles nest in each country; non-nesting records are not included. Data from multiple sources, including Bjorndal, K. (ed) (1982), Dodd (1988), Groombridge and Luxmoore (1989), Márquez, (1990). **St Helena:** *C. mydas* nests at Ascension only.

C. caretta	*Caretta caretta*, Loggerhead
C. mydas	*Chelonia mydas*, Green Turtle
D. coriacea	*Dermochelys coriacea*, Leatherback
E. imbricata	*Eretmochelys imbricata*, Hawksbill Turtle
L. kempii	*Lepidochelys kempii*, Kemp's Ridley
L. olivacea	*Lepidochelys olivacea*, Olive Ridley
N. depressus	*Natator depressus*, Flatback

Column 10, Inshore cetacea: This column indicates which inshore whales and dolphins are known or suspected to occur regularly in each country. "Inshore" species here comprise those which have very few pelagic records, or are unknown away from coastal waters. Data from a variety of sources, as collated in Groombridge (1993).

A. dioptrica	*Australophocaena dioptrica*, Spectacled Porpoise
C. commersonii	*Cephalorhynchus commersonii*, Commerson's Dolphin
C. eutropia	*Cephalorhynchus eutropia*, Black Dolphin
C. heavisidii	*Cephalorhynchus heavisidii*, Heaviside's Dolphin
C. hectori	*Cephalorhynchus hectori*, White Headed Dolphin, Hectors Dolphin
D. leucas	*Delphinapterus leucas*, White Whale, Beluga
L. australis	*Lagenorhynchus australis*, Peale's Dolphin
L. obscurus	*Lagenorhynchus obscurus*, Dusky Dolphin
M. monoceros	*Monodon monoceros*, Narwal
N. phocaenoides	*Neophocaena phocaenoides*, Finless Porpoise
O. brevirostris	*Orcaella brevirostris*, Irrawaddy Dolphin
P. dalli	*Phocoenoides dalli*, Dell's Porpoise
P. phocoena	*Phocoena phocoena*, Common Porpoise, Harbour Porpoise
P. sinus	*Phocoena sinus*, Vaquita
P. spinipinnis	*Phocoena spinipinnis*, Burmeister's Porpoise
S. chinensis	*Sousa chinensis*, Indo-Pacific Hump-backed Dolphin
S. fluviatilis	*Sotalia fluviatilis*, Tucuxi
S. teuzii	*Sousa teuzii*, Atlantic Hump-backed Dolphin

Column 11, Other marine mammals: This column includes otters, seals and sea lions, and sirenians restricted to coastal habitats. Of the three manatees, *Trichecus inunguis* appears restricted to freshwaters in Amazonia and is excluded from this list. Data mainly from Foster-Turley *et al.* (1990), Reijnders *et al.* (1993), Ridgway and Harrison (1981). *Monachus monachus:* **Italy**, Sardinia; **Portugal**, Madeira only; **Spain**, Chafarinas Islands only. **St Helena:** *A. tropicalis, M. leonina* found on the Tristan da Cunha group only. **USA: Hawaii & central Pacific depend.** *Monachus schuinslandi* present in Hawaii group only. **Otariidae, Odobenidae, Phocidae:** species are listed for the countries in which breeding populations are known except for species associated with arctic and antarctic pack ice, and *Phoca caspica*, which breeds on ice in the northern Caspian but occurs mainly in the southern Caspian during summer.

E. lutris	*Enhydra lutris*, Sea Otter
L. felina	*Lutra felina*, Marine Otter

A. australis	*Arctocephalus australis*, South American Fur Seal
A. forsteri	*Arctocephalus forsteri*, New Zealand Fur Seal
A. galapagoensis	*Arctocephalus galapagoensis*, Galapagos Fur Seal
A. gazella	*Arctocephalus gazella*, Antarctic Fur Seal
A. philipii	*Arctocephalus philipii*, Juan Fernandez Fur Seal
A. pusillus	*Arctocephalus pusillus*, South African Fur Seal, Australian Fur Seal
A. townsendi	*Arctocephalus townsendi*, Guadalupe Fur Seal
A. tropicalis	*Arctocephalus tropicalis*, Subantarctic Fur Seal
C. cristata	*Cystophora cristata*, Hooded Seal
C. ursinus	*Callorhinus ursinus*, Northern Fur Seal
E. barbatus	*Erignatus barbatus*, Bearded Seal
E. jubatus	*Eumetopias jubatus*, Steller's Sea Lion
H. grypus	*Halichoerus grypus*, Grey Seal
H. leptonyx	*Hydrurga leptonyx*, Leopard Seal

L. weddellii	*Leptonychotes weddellii*, Weddell Seal
L. carcinophagus	*Lobodon carcinophagus*, Crabeater Seal
M. angustirostris	*Mirounga angustirostris*, Northern Elephant Seal
M. leonina	*Mirounga leonine*, Southern Elephant Seal
M. monachus	*Monachus monachus*, Mediterranean Monk Seal
M. schauinslandi	*Monachus schauinslandi*, Hawaiian Monk Seal
N. cinerea	*Neophoca cinerea*, Australian Sea Lion
O. byronia	*Otaria byronia*, Southern See Lion
O. rosmarus	*Odobenus rosmarus*, Walrus
O. rossii	*Ommetophoca rossii*, Ross Seal
P. caspica	*Phoca caspica*, Caspian Seal
P. fasciata	*Phoca fasciata*, Ribbon Seal
P. groenlandica	*Phoca groenlandica*, Harp Seal
P. hispida	*Phoca hispida*, Ringed Seal
P. hookeri	*Phocarctos hookeri*, Hooker's Sea Lion
P. larghe	*Phoca larghe*, Larga Seal
P. vitulina	*Phoca vitulina*, Harbour Seal
Z. californianus	*Zalophus californianus*, Californian Sea Lion
U. maritimus	*Ursus maritimus*, Polar Bear
D. dugon	*Dugong dugon*, Dugong
T. manatus	*Trichechus manatus*, Caribbean Manatee
T. senegalensis	*Trichecus senegalensis*, West African Manatee

Column 12, PA N°; Column 13, PA total area: Number of coastal and marine protected areas. Source WCMC Protected Areas Database, 9 August 1994. **Norway:** second estimates for protected area number and size are those for Svalbard and Jan Mayen. **Eritrea:** data for pre-secession Ethiopia coast.

Column 14, Oc. Inst: This column provides an indication of the number of institutions working exclusively on, or having clear emphasis on, oceanographic issues and marine biodiversity research. No attempt is made to include all organisations having a major impact on the marine environment (eg. in the field of coastal engineering and planning), and the data are certainly not globally comprehensive. Data from Bartz *et al.*, (1992), Chua *et al.* (1989), Morcos and El-Sayed (1990), and UNEP/FAO, (1985).

Column 15, Conventions: This column indicates which countries have signed or are party to a number of major international conventions that are entirely marine in focus (eg. UNCLOS), or have a major marine component (eg. Convention on the Conservation of Migratory Species). Although the IWC is included, lack of space prevented inclusion of the large number of agreements covering finfish. Based on information in WCMC (1992), mainly as provided by the IUCN Environmental Law Centre, Bonn. We much appreciate the assistence of the following in providing more current information: Anholt Habr, P. (Editorial Assistant, Treaty Section, United Nations). Hunter, V. (International Whaling Commission), September 1994. Moutou, B. (Legal Counsel, South Pacific Regional Environment Programme). Secretariat of the Convention on the Conservation of Migratory Species of Wild Animals (CMS), Bonn, Germany

Key:
UNCLOS: United Nations Convention on the Law of the Sea. States Party to UNCLOS are shown graphically in Figure 4. This Convention entered into force on 16 November 1994. NB: the map shows the former Yugoslavia.
Liv. Res. High Seas: Convention on Fishing and Conservation of the Living Resources of the High Seas.
High Seas: Convention on the High Seas.
CMS: Convention on the Conservation of Migratory Species of Wild Animals.
CCAMLR: The Convention on the Conservation of Antarctic Marine Living Resources.
Mediterranean: Convention for the Protection of the Mediterranean Sea against Pollution.
Persian Gulf: Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution.
W & Cent. Africa: Convention for the Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region.
SE Pacific: Convention for the Protection of the Marine Environment and Coastal Areas of the South-East Pacific.
Red Sea: Regional Convention for the Conservation of the Red Sea and of the Gulf of Aden Environment.
Caribbean: Convention for the Protection and Development of the Wider Caribbean Region.
E. Africa: Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region.
SPREP: Convention for the Protection of the Natural Resources and Environment of the South Pacific Region.
IWC: International Convention for the Regulation of Whaling.

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
EUROPE						
Albania	418	~ 12	F 8.6 *55%*	Not present	-	Not present
Belgium	64	~ 3	39.4 *98%*	Not present	1	Not present
Bosnia and Herzegovina	c 20	-	-	Not present	-	Not present
Bulgaria	354	33	F 41.4 *83%*	Not present	-	Not present
Croatia	-	-	-	Not present	?	Not present
Denmark	3,379	~ 1,464	1,756.6 *98%*	Not present	2	Not present
Estonia	1,393	-	-	Not present	-	Not present
Finland	1,126	~ 98	75.5 *91%*	Not present	1	Not present
France	3,427	7,201	766.8 *94%*	Not present	#4	Not present
Germany	2,389	* ~ 41	253.4 *84%*	Not present	2	Not present
Gibraltar	-	see UK	0	Not present	-	Not present
Greece	13,676	~ 505	F 138.9 *93%*	Not present	#4	Not present
Iceland	4,988	887	1,050.7 *99%*	Not present	1	Not present
Ireland	1,448	~ 380	F 239.9 *99%*	Not present	-	Not present
Italy	4,996	~ 552	491.5 *90%*	Not present	#4	Not present
Latvia	531	-	-	Not present	-	Not present
Lithuania	108	-	-	Not present	-	Not present
Malta	140	~ 1,277	0.7 *100%*	Not present	-	Not present
Monaco	-	~ 1	-	Not present	-	Not present
Netherlands	451	~ 168	439.0 *99%*	Not present	2	Not present

Inshore marine fishes	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
-	-	-	*M. monachus?*	9	240	-	High Seas, Mediterreneen
-	-	*P. phocoena*	*P. vitulina*	-	-	-	UNCLOS (S), Liv. Res. High Seas, CMS, CCAMLR
-	-	-	-	-	-	-	UNCLOS, Liv. Res. High Seas, High Seas.
-	-	*P. phocoena*		2	15	1	UNCLOS (S), High Seas
-	-	-		19	2,000	-	High Seas
-	-	*P. phocoena*	*H. grypus* *P. vitulina*	39	2,800	-	UNCLOS (S), Liv. Res. High Seas, High Seas, CMS, IWC
-	-	-	*H. grypus* *P. hispida*	5	530	-	-
-	-	*P. phocoena*	*H. grypus* *P. hispida*	2	26	-	UNCLOS (S), Liv. Res. High Seas, High Seas, CMS, IWC
-	-	*P. phocoena*	*H. grypus* *P. vitulina*	114	10,000	1	UNCLOS (S), Liv. Res. High Seas, High Seas (S), CMS, CCAMLR, Mediterreneen, Ceribbeen, E. Africe, SPREP, IWC
-	-	*P. phocoena*	*H. grypus* *P. vitulina*	38	6,700	2	High Seas, CMS, CCAMLR, IWC
-	-	-	-	1	0.4	-	-
-	*C. caretta*	-	*M. monachus*	14	1,300	-	UNCLOS (S), CMS, CCAMLR, Mediterreneen
-	-	*M. monoceros* *P. phocoena*	*H. grypus* *P. vitulina*	8	5,000	-	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S)
-	-	*P. phocoena*	*H. grypus* *P. vitulina*	9	72	-	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), CMS, IWC
-	*C. caretta ?*	-	*M. monachus*	61	2,800	1	UNCLOS (S), High Seas, CMS, CCAMLR, Mediterreneen
-	-	-	*H. grypus* *P. hispida*	1	150	-	High Seas
-	-	-	*H. grypus*	-	-	-	-
118	-	-	-	1	0.1	-	UNCLOS, Mediterreneen
-	-	*P. phocoena*	-	2	1.0	1	UNCLOS (S), CMS, Mediterreneen, IWC
-	-	*P. phocoena*	*H. grypus* *P. vitulina*	12	2,100	4	UNCLOS (S), Liv. Res. High Seas, High Seas, CMS, CCAMLR, Ceribbeen, IWC

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	See-grass (spp.)	Coral reefs
EUROPE continued						
Norway	5,832	2,025	2,095.4 *99%*	Not present	1	Not present
Poland	491	29	409.4 *90%*	Not present	1	Not present
Portugal	1,693	1,774	322.8 *99%*	Not present	2	Not present
Romania	225	32	84.4 *68%*	Not present	2	Not present
Slovenia	-	-	-	Not present	-	Not present
Spain	4,964	1,219	1,320.9 F *98%*	Not present	#3	Not present
Swedan	3,218	~ 155	239.5 *98%*	Not present	#2	Not present
Ukraine	2,782	-	-	Not present	-	Not present
United Kingdom	12,429	~ 1,785	803.9 *98%*	Not present	2	Not present
former Yugoslavia	* 3,935	* ~ 53	23.6 *66%*	Not present	#3	Not present
ASIA						
Azerbaijan	-	*	-	Not present	-	Not present
Behrein	161	* 8	7.6 *100%*	-	#3	The only significant reefs are Fesht Adhm off the north-east coast and Fesht al Jarim in the north.
Bengladesh	580	77	258.9 *29%*	4,100	-	Not present
BIOT	-	see UK	0	-	#1	The territory comprises five atolls and two areas of raised reef covering c 21,000km² of shallow water; Great Chagos Bank may be the world's largest atoll.
Brunei	161	* 24	1.6 *94%*	70	-	There is negligible reef formation.
Cambodia	443	56	36.4 *33%*	100	1	Reefs may occur around some coastal islands.

Inshore marine fishes	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
-	-	*D. leucas* *M. monoceros* *P. phocoena*	*H. grypus* *P. vituline* *P. hispide* *C. cristata* *E. barbatus* *U. meritimus*	14 *5	590 *35,000	-	UNCLOS (S), CMS, CCAMLR, IWC
-	-	*P. phocoena*	*H. grypus*	6	730	2	UNCLOS (S), High Seas, CCAMLR
-	-	*P. phocoena*	*M. monachus*	20	1,600	4	UNCLOS (S), Liv. Res. High Seas, High Seas, CMS
-	-	*P. phocoena*	-	11	6,500	-	UNCLOS (S), High Seas
-	-	-	-	1	?	-	High Seas
-	-	*P. phocoena*	*M. monachus*	38	1,100	3	UNCLOS (S), Liv. Res. High Seas, High Seas, CMS, CCAMLR, Mediterranean, IWC
-	-	*P. phocoena*	*H. grypus* *P. vituline* *P. hispide*	45	1,600	1	UNCLOS (S), CMS, CCAMLR, IWC
-	-	*P. phocoena*	-	4	1,800	-	UNCLOS (S), High Seas
-	-	*P. phocoena*	*H. grypus* *P. vituline*	96	12,000	2	Liv. Res. High Seas, High Seas, CMS, CCAMLR, Caribbean, SPREP (S), IWC
-	-	-	*M. monachus?*	16	120	-	UNCLOS, Liv. Res. High Seas, High Seas, Mediterranean
-	-	-	*P. caspica*	3	1,200	-	-
133	-	*S. chinensis* *N. phocaenoides*	*D. dugon*	1	0.5	1	UNCLOS, Persian Gulf
-	*C. mydas* *E. imbricata* *L. olivacea*	*O. brevirostris* *S. chinensis* *N. phocaenoides*	*D. dugon*	8	460	-	UNCLOS (S)
702	*C. mydas* *E. imbricata*	-	-	-	-	-	-
-	-	*O. brevirostris* *S. chinensis* *N. phocaenoides*	*D. dugon*	5	170	2	UNCLOS (S)
-	*C. mydas* *E. imbricata*	*O. brevirostris* *S. chinensis* *N. phocaenoides*	*D. dugon*	-	-	-	UNCLOS (S), Liv. Res. High Seas, High Seas

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
ASIA continued						
China	14,500	• 964	7,606.8 *58%*	200	*#9*	There is patchy coral growth on tha mainland. Reefs principally found around the offshore islands and archipelagos in the Nan Hai; the most important area baing Xisha Qundao. South Heinan has fringing reefs.
Cyprus	648	• 99	2.6 *97%*	Not present	#2	Not present
Georgia	310	•	-	Not present	-	Not present
Hong Kong	733	see UK	225.0 *97%*	Present, no erea data.	1	There are no true reefs.
India	12,700	2,015	2,336.1 *58%*	3,565	#10	Reefs, meinly fringing, are present in a few scattered pieces: the Gulf of Kutch in the north-west; off the southern coast; and eround e few small islands opposite Sri Linka.
Indonesia	54,716	5,409	2,380.0 *75%*	42,510 (42,543)	#11	14,000 islands heve reefs, with the most prolific development in the eest of the country. Fringing, petch and berrier reefs are found; there are few etolls.
Iren	3,180	• 156	195.0 *70%*	237	#2	Substantiel reefs surround some islands along the eestemmost stretch of the Gulf coast. Reefs are also found eround the bays of Chah Baher end Pūzm in the Gulf of Omen.
Iraq	58	• 1	F 3.0 *25%*	?	-	-
Israel	273	• 23	3.4 *16%*	?	2	Most of the short coestline on the Gulf of Aqeba has either fringing reef or lerge offshore corel knolls.
Japen	13,685	• 3,861	9,102.9 *98%*	4	#11	Reefs of Okinawa Prefecture cover c 800km²; coral assemblages further north cover c 60km².
Jorden	27	• 1	2.0 *9%*	?	#	A fringing reef runs discontinuously along 13km of coest.
Kezakhstan	2,909	•	-	Not present	-	Not present
Korea OPR	2,495	130	1,600.1 F *94%*	-	-	-
Korea Republic	2,413	• 348	2,484.9 *99%*	-	1	-

Table 6. Marine resources

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
-	*C. mydas*	*S. chinensis* *N. phocaenoides* *P. phocoena*	*D. dugon*	39	9,200	-	UNCLOS (S), Liv. Res. High Seas, High Seas, IWC
96	*C. caretta* *C. mydas*	-	*M. monachus?*	9	100	-	UNCLOS, High Seas, Mediterreneen
-	-	*P. phocoena*	-	1	38	-	-
150	-	*S. chinensis* *N. phocaenoides*	-	15	280	-	-
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*O. brevirostris* *S. chinensis* *N. phocaenoides*	*D. dugon*	112	4,000	5	UNCLOS (S), CMS, CCAMLR, IWC
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*O. brevirostris* *S. chinensis* *N. phocaenoides*	*D. dugon*	92	94,000	17	UNCLOS, Liv. Res. High Seas (S), High Seas
-	*C. mydas* *E. imbricata*	*S. chinensis* *N. phocaenoides*	*P. caspica* *D. dugon*	7	6,800	-	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), Persian Gulf
-	-	*S. chinensis* *N. phocaenoides*	*D. dugon*	-	-	2	UNCLOS, Persian Gulf
-	*C. caretta* *C. mydas?*	*S. chinensis*	*D. dugon*	19	65	1	Liv. Res. High Seas (S), High Seas, CMS, Mediterranean
-	*C. caretta* *C. mydas* *E. imbricata*	*N. phocaenoides* *P. phocoena* *P. dalli*	*C. ursinus* *P. vitulina* *P. hispida* *P. fasciata* *E. barbatus* *D. dugon*	86	12,000	5	UNCLOS (S), High Seas, CCAMLR, IWC
-	-	-	*D. dugon*	-	-	1	Red Sea
-	-	-	*P. caspica*	1	180	-	-
-	-	*N. phocaenoides* *P. phocoena* *P. dalli*	-	-	-	-	UNCLOS (S)
-	-	*N. phocaenoides* *P. phocoena* *P. dalli*	-	5	3,400	-	UNCLOS (S), CCAMLR, IWC

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
ASIA continued						
Kuwait	499	* 12	1.9 *100%*	?	-	Thre is less than 4km² of reef, mostly eround offshore corel cays.
Lebenon	225	* 23	1.7 *94%*	-	-	-
Malaysie	4,675	476	605.5 *98%*	6,300 6,412	#7	Typically, shallow fringing reefs and isolated corel patches occur on the east coast of Peninsular Malaysie, including all offshore islands. There are fewer off the west coast. Islands off the west coast of Sabah have fringing reefs and Serawek hes some offshore coral communities.
Maldives	644	959	80.7 *100%*	Present, no aree data	#2	The 1300 islands all form parts of atolls and other corelline structures, end are surrounded by extensive reefs.
Myanmar	3,060	510	594.1 *77%*	5,175	2	Reefs are present around offshore islands, particularly the Mergui Archipelago. There are none known along the mainland coast.
Oman	2,092	562	117.8 *100%*	20	-	Major corel growth is restricted to four areas: the Musandam Peninsula in the Gulf; the Masqat area in the Gulf of Oman; west of Jazirat Masireh; end around the islands of Zufer end Kurie Muria in the Arebien See.
Pakistan	1,046	319	399.6 *78%*	2,617 2,830	-	Corel communities mey be present but few data are available.
Philippines	22,540	1,891	1,699.4 *74%*	2,321 4,000	#9	An estimated 27,000km² of coral reefs or coral communities are found throughout the archipelago, with the largest concentration in the south-west.
Qatar	563	* 24	8.1 *100%*	5	#1	There is extensive corel growth on the northern and eastern coasts.
Russia	37,653	*	-	Not present	3	Not present

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine International conventions
100	*C. mydas* *E. imbricata ?*	*S. chinensis* *N. phocaenoides*	*D. dugon*	3	260	3	UNCLOS, Persian Gulf
-	-	-		-	-	1	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), Mediterranean
-	*C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*O. brevirostris* *S. chinensis* *N. phocaenoides*	*D. dugon*	101	7,900	5	UNCLOS (S), Liv. Res. High Seas, High Seas
356	*C. mydas* *E. imbricata*	-	-	-	-	-	UNCLOS (S)
-	*C. mydas* *E. imbricata* *L. olivacea*	*O. brevirostris* *S. chinensis* *N. phocaenoides*	*D. dugon*	3	280	-	UNCLOS (S)
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea*	*S. chinensis* *N. phocaenoides*	*D. dugon*	19	7,200	2	UNCLOS, Persian Gulf, IWC
-	*C. mydas* *L. olivacea*	*S. chinensis* *N. phocaenoides*	*D. dugon*	3	350	-	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), CMS
c 2000	*C. mydas* *E. imbricata*	*O. brevirostris* *S. chinensis* *N. phocaenoides*	*D. dugon*	79	8,300	7	UNCLOS, CMS
-	*C. mydas ?* *E. imbricata*	*S. chinensis* *N. phocaenoides*	-	-	-	3	UNCLOS (S), Persian Gulf
-	-	*D. laucas* *M. monoceros* *P. phocoena* *P. dalli*	*E. lutris* *E. jubatus* *C. ursinus* *O. rosmarus* *H. grypus* *P. vitulina* *P. largha* *P. hispida* *P. caspica* *P. groenlandica* *P. fasciata* *E. barbatus* *U. maritimus*	11	29,000	1	UNCLOS (S), High Seas, IWC

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
ASIA continued						
Seudi Arabie	2,510	• 186	41.3 *95%*	204	#6	There are extensive fringing reefs along the Red Sea Coest and hundreds of patch reefs off the Gulf coast.
Singepore	193	• 1	13.0 *99%*	5 6	#9	Fringing reefs occur around islands to the south; only small coral communities are found off the mainland.
Sri Lenke	1,340	516	174.2 *88%*	88	#6	There are few purely coralline reefs, but extensive areas of coral are found around the coest, mainly close to shore and mostly in the east.
Syria	193	• 10	F 1.5 *27%*	-	-	-
Teiwen	-	536	-	2	#2	Corals ere present in all the waters around Teiwen except the sandy west coast. Main reef development is in the south and as fringing reefs around some offshore islands.
Thailend	3,219	325	2,795.2 *91%*	1,964 2,687	#4	There are few reefs off the mainlend coast; they ere better developed around offshore islands, perticulerly along the west coast in the Andemen See.
Turkey	7,200	• 237	317.4 *87%*	Not present	#4	Not present
Turkmenisten	1,786	•	-	Not present	-	Not present
United Arab Emiretes	1,448	59	92.3 *100%*	30	-	Petch reefs and submerged banks occur over broed ereas of the Gulf coast.
Viet Nem	3,444	722	F 610.0 *70%*	3,700 (S Viet Nem only)	#8	Reefs occur around several offshore islands but are sparse on the meinland.
Yemen	1,906	34 550	84.4 *99%*	Present, no erea dete	#8	There is little information elthough reefs ere expected to occur elong the Arebian Sea coast.
OCEANIA						
Americen Semoe	-	see U.S.A	0.05 *100%*	Present, no eree dete	-	Fringing reefs, mostly nerrow, ere widespread.

Table 6. Marine resources

Inshore marine fishes (app.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international convantions
-	*C. mydas* *E. imbricata*	*S. chinansis* *N. phocaenoidas*	*D. dugon*	3	5,100	2	UNCLOS (S), CMS, Persian Gulf, Red Sea
292	-	*O. brevirostris* *N. phocaenoidas*	*D. dugon*	3	1.7	3	UNCLOS (S)
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. chinansis* *N. phocaenoidas*	*D. dugon*	14	1,600	-	UNCLOS, Liv. Res. High Seas (S), High Seas (S), CMS
-	*C. caretta ?*	-		-	-	1	Mediterranean
-	*C. mydas ?* *E. imbricata ?*	*S. chinansis* *N. phocaenoidas*	*D. dugon*	12	3,100	-	-
-	*C. mydas* *E. imbricata* *D. coriacea*	*O. brevirostris* *S. chinansis* *N. phocaenoidas*	*D. dugon*	17	5,700	8	UNCLOS (S), Liv. Res. High Seas, High Seas
-	*C. caretta* *C. mydas*	*P. phocoena*	*M. monachus*	-	-	-	Mediterranean
-	-	-	*P. caspica*	-	-	-	-
-	*C. mydas ?* *E. imbricata ?*	*S. chinansis* *N. phocaenoidas*	*D. dugon*	-	-	2	UNCLOS (S), Persian Gulf
-	*C. mydas* *E. imbricata*	*O. brevirostris* *S. chinensis* *N. phocaenoidas*	*D. dugon*	-	-	1	UNCLOS
-	*C. mydas* *E. imbricata*	*S. chinansis*	*D. dugon*	-	-	2	UNCLOS, Red Sea
61	*C. mydas* *E. imbricata*	-	-	3	44	-	-

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangrovas (km²)	Sea-grass (spp.)	Coral reefs
OCEANIA continued						
Australia	25,760	6,357	222.9 *98%*	11,617	#25	The 2000km-long Great Barrier Reef along the northern half of the east coast is the world's largest reef system. There are extensive reefs east of this in the Coral Sea, and in the Torres Strait region. In Western Australia reefs occur along 3000km of coast; they include fringing and veneer reefs, continental shelf atolls, platform reefs and an extensive barrier/fringing reef tract.
Cook Islands	* 34	see New Zealand	1.1 *100%*	Not present	#	Several of the islands are coral atolls; there are fringing and barrier reefs around the volcanic and uplifted islands.
Federated States of Micronesia	* 237	2,600	1.4 *99%*	Present, no area data	-	There are atolls, almost-atolls and high islands with barrier and fringing reefs.
Fiji	1,129	1,145	27.0 *87%*	385	#3	Reefs are associated with all the island groups; many of the reefs are extensive and complex and include barrier, fringing and platform reefs. The Great Sea Reef is one of the world's major barrier reefs.
French Polynesia	* 855	see France	2.6 *99%*	Not present	1	The main reef formations are found around the atolls (84 of 130 islands) or are fringing and barrier reefs around the high volcanic islands; there are also several oceanic banks.
Guam	153	see USA	0.6 *76%*	Present, no area data	2	There are extensive fringing reefs and two barrier reef lagoons.
Kiribati	-	2,640	F 30.0 *99%*	Present, no area data	#3	All islands except one (a raised reef) are atolls, surrounded by living reefs.
Marshall Islands	-	see USA	0.2 *100%*	Present, no area data	#1	The country comprises 29 coral atolls and five low coral islands, surrounded by living reefs.
Nauru	-	~ 318	0.2 *100%*	0.02	-	There is no true reef, although a rich coral fauna is found in deeper waters around the intertidal platform which surrounds the island.
New Caledonia	1,249	see France	4.9 *100%*	200	#9	Grande Terre has an almost continuous barrier reef around it, over 1600km in length; most of the smaller islands are coral atolls or have extensive reefs around them.
New Zealand	15,134	6,148	607.7 *99%*	198	#1	There are no true reefs, although reef-forming corals form colonies on the Kermadec Islands.
Niue	66	see New Zealand	0.1 *100%*	?	-	The island is a raised atoll with no true reef although corals are present.

Table 6. Marine resources

Inshore marine fishes	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *N. depressus* *D. coriacea*	*D. bravirostris* *S. chinensis* *A. dioptrica*	*N. cinerea* *A. tropicalis* *A. gazella* *A. pusillus* *A. forstari* *H. laptonyx* *M. leonina* *D. dugon*	354	480,000	6	UNCLOS (S), Liv. Res. High Seas, High Seas, CMS, CCAMLR, SPREP, IWC
157	*C. mydas* *E. imbricata*	-	-	1	1.6	-	UNCLOS (S), SPREP
-	*C. mydas* *E. imbricata*	-	*D. dugon*	-	-	-	UNCLOS, SPREP
407	*C. caretta ?* *C. mydas* *E. imbricata* *D. coriacea*	-	-	6	46	3	UNCLOS, Liv. Res. High Seas, High Seas, SPREP
-	*C. mydas* *E. imbricata*	-	-	5	180	1	-
*151	*C. mydas* *E. imbricata*	-	*D. dugon*	6	74	1	-
*352	*C. mydas* *E. imbricata*	-	-	11	590	1	-
414	*C. mydas* *E. imbricata*	-	-	-	-	-	UNCLOS, SPREP
88	-	-	-	-	-	-	UNCLOS (S), SPREP (S)
*133	*C. caretta* *C. mydas* *E. imbricata*	-	*D. dugon*	7	550	2	-
-	-	*C. hectori* *L. obscurus* *A. dioptrica*	*P. hookeri* *A. forstari* *M. leonina*	76	16,000	3	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), CCAMLR, SPREP, IWC
150	-	-	-	-	-	-	UNCLOS (S)

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
OCEANIA continued						
Northern Marianas	-	see USA	0.1 *100%*	Present, no area data	-	There are barrier reefs and well-developed fringing reefs around Rota, Tinian and Saipan. Reefs are absent elsewhere.
Palau	-	see USA	4.1 *100%*	47	*#1*	All islands have extensive reef formation, including a large barrier reef around the main high island cluster.
Papua New Guinea	5,512	1,728	F 12.0 *47%*	2,000	#3	There are estimated to be 170,000km² of coralline shelf in depths of less then 20m and 40,000km² of reef and associated shallow water in depths of 30m or less. Milne Bay Province has the greatest concentrations.
Pitcairn Islands	-	see UK	0.005 *100%*	?	-	Oeno and Ducie are coral atolls; Henderson is a raised limestone island with fringing reefs; there are no reefs around Pitcairn.
Solomon Islands	5,313	1,526	69.3 *100%*	642	#1	Reefs are present but generally fairly poorly developed; several of the islands are atolls.
Tokelau	-	see New Zealand	0.2 *100%*	?	-	The territory comprises three reef-bounded coral atolls.
Tonga	* 262	543	1.9 *99%*	10	#2	Reefs are widespread.
Tuvalu	-	772	0.5 *100%*	0.47	-	The country comprises five atolls and four raised coral islands, all with reef development.
USA: Hawaii and central Pacific dependencies	-	see USA	-	Present, no area date	-	Fairly well developed fringing reefs occur around the high islands; all islands north-west of Gardner Pinnacles are atolls, coral islands or limestone reefs and shoals. The Central Pacific Dependencies (Baker, Howland, Jarvis, Johnston, Palmyra and Wake) are all raised reefs or atolls with coral development.
Vanuatu	* 2,214	638	3.2 *100%*	30±5	-	Reefs are mainly fringing and mostly in the western part of the chain; the best developed are probably those around Anatom.
Wallis and Futuna Islands	* 89	see France	F 1.0	Not at Futuna.	?	Uvea is surrounded by a barrier reef, and about 22 islets. Futuna is surrounded by reef flat. Alofi has a small patch of fringing reef.
Western Samoa	-	131	-	<10	#2	Reefs are found around both Upolu and Savai'i; there is an estimated 231km² of reef and lagoon in total.

Table 6. Marine resources

Inshore marine fishes	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
322	-	-	-	4	15	-	-
443	*C. mydas* *E. imbricata*	-	*D. dugon*	2	15	-	SPREP (S)
665	*C. caretta ?* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*O. brevirostris* *S. chinensis*	*D. dugon*	11	2,200	2	UNCLOS (S),SPREP
-	-	-	-	-	-	-	-
489	*C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*		*D. dugon*	1	83	1	UNCLOS (S), Liv. Res. High Seas, High Seas, SPREP, IWC
96	*C. mydas* *E. imbricata*	-	-	-	-	-	-
140	*C. mydas* *E. imbricata* *L. olivacea*	-	-	9	37	-	Liv. Res. High Seas, High Seas
150	*C. mydas* *E. imbricata*	-	-	-	-	-	UNCLOS (S), SPREP (S)
*87	*C. mydas* *E. imbricata*	-	*M. schauinslandi*	20	2,800	4	-
367	*C. mydas* *E. imbricata* *D. coriacea ?*	-	*D. dugon*	4	1.7	-	UNCLOS (S)
-	-	-	-	1	0.1	-	-
379	*C. mydas* *E. imbricata*	-	-	1	0.2	-	UNCLOS (S), SPREP

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
NORTH & CENTRAL AMERICA						
Anguilla	58	see UK	0	3	#2	The 17km stretch of reef along the south-east coast is one of the most important in the eastern Caribbean; others occur along the north.
Antigua and Barbuda	153	110	F 2.3 *100%*	12 15	#2	There is an estimated 25km² of reef, mostly fringing.
Aruba	76	see Neth.	F 0.8 *100%*	1	-	The island has a partly emerged reef.
Bahamas	3,542	759	9.2 *99%*	1,420 2,332	#f	There are extensive reef areas. An estimated 1832km² of Great Bahama Bank and 324km² of Little Bahama Bank are covered in reef. The reefs fringe most of the windward northern and eastern coasts and the bank edges.
Barbados	97	167	2.7 *100%*	0.12	3	Fringing reefs, generally poorly developed, are found around the west side.
Belize	386	28	1.6 *99%*	730 783	#	There is an almost continuous barrier reef 257km long, the largest in the Western Hemisphere. Three atolls also occur.
Bermuda	103	see UK	0.4 *100%*	0.17 0.2	4	Total reef area is estimated to be ca 190km² of which 101km² are offshore, 70km² are patch and 17km² fringing.
British Virgin Islands	60	see UK	1.4 *100%*	8	#	Most of the islands have reefs. Anegada has a continuous fringing reef.
Canada	90,908	2,939	1,479.4 *97%*	Not present	3	Not present
Cayman Islands	160	see UK	0.8 *100%*	73 117	#2	Fringing reefs largely encircle all three islands.
Costa Rica	1,290	259	15.9 *89%*	400 413	#2	On the Atlantic coast there is an estimated 10km² of living reef in three main areas. Coral development is poor along the Pacific coast.
Cuba	3,735	363	143.6 *87%*	5,297 6,260	#4	There is an estimated 2150km of almost continuous reef along the north coast and 1816km in the south.

Table 6. Marine resources

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
-	*C. mydas* *E. imbricata* *D. coriacea*	-	-	-	-	-	-
108	*C. mydas* *E. imbricata* *D. coriacea*	-	-	6	66	-	UNCLOS, Caribbean, IWC
394	*E. imbricata*	-	-	1	0.3	-	-
290	*C. caretta* *C. mydas* *E. imbricata*	-	*T. manatus*	25	1,300	1	UNCLOS
270	*E. imbricata*	-	-	1	2.5	-	UNCLOS, Caribbean
-	*C. carette* *C. mydes* *E. imbricata*	-	*T. manatus*	13	170	-	UNCLOS
-	-	-	-	14	5.7	1	-
-	*C. mydas* *E. imbricata* *D. coriacea*	-	-	26	50	-	-
-	-	*D. leucas* *M. monoceros* *P. phocoena* *P. delli*	*E. lutris* *E. jubatus* *Z. californianus* *O. rosmerus* *H. grypus* *P. vitulina* *P. hispide* *P. groenlendice* *C. cristate* *E. barbatus* *U. maritimus*	119	370,000	1	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), CCAMLR
-	*C. caretta*	-	-	28	85	-	-
-	*C. caretta* *C. mydas* *E. imbricata* *D. coriacea*	-	*T. manatus*	18	3,300	1	UNCLOS, Liv. Res. High Seas (S), High Seas, IWC
320	*C. carette* *C. mydas* *E. imbricata*	-	*T. manatus*	33	15,000	4	UNCLOS, Liv. Res. High Seas (S), High Seas (S), Caribbean

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
NORTH & CENTRAL AMERICA continued						
Dominica	148	15	0.6 *100%*	0.1	*#2*	There is only limited reef development, mainly on the west coast and the northern side of promontories.
Dominican Republic	1,288	269	16.1 *94%*	90 235	*#2*	c 166km of coast is bordered by reef. Patch, fringing and barrier reefs occur.
El Salvador	307	- 92	6.9 *61%*	352 450	-	-
Greenland	44,087	see Denmark	113.4 *100%*	Not present	1	Not present
Grenada	121	27	1.9 *100%*	1.16	1	Reefs occur patchily around all coasts of Grenada except the west. Carriacou has a large bank barrier reef complex on its windward side.
Guadeloupe	306	see France	8.4 *99%*	57 80	#5	Reef development is fairly patchy and mostly on the windward side.
Guatemala	400	99	3.7 *55%*	160	-	?
Haiti	1,771	161	F 4.8 *93%*	180	*#3*	Reefs are very little known, but there appear to be seven major areas of development. One is a barrier reef along the north coast.
Honduras	820	219	20.8 *99%*	1,170 1,213	-	The Bay Islands have well developed reefs. There is no information on mainland reefs.
Jamaica	1,022	298	F 7.2 *69%*	106 202	*#4*	The north coast has almost continuous narrow fringing reefs; the south has less continuous reefs but a greater variety.
Martinique	290	see France	F 3.5 *98%*	19 22	*#3*	Reefs are absent in the north and west. There is an extensive bank barrier reef system off the south-east coast and coral formations elsewhere in the south.
Mexico	9,330	2,851	1,257.7 *88%*	5,246 14,202	*#3*	True reefs are found off the coast of Veracruz and around the Yucatan Peninsula and Campeche Bank; coral communities are found on the Pacific coast particularly around Baja California.

Table 6. Marine resources

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
105	*C. mydas* *E. imbricata* *D. coriacea*	-	-	1	5.3	-	UNCLOS, Caribbean, IWC
269	*C. caretta* *C. mydas* *E. imbricata* *D. coriacea*	-	*T. manatus*	12	7,200	2	UNCLOS (S), Liv. Res. High Seas, High Seas
-	*C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	-	-	2	52	1	UNCLOS (S)
-	-	*D. leucas* *M .monoceros* *P. phocoena*	*O. rosmarus* *P. vitulina* *P. hispida* *P. groeniandica* *E. barbatus* *U. maritimus*	2	980,000	-	-
433	*C. caretta* *C. mydas* *E. imbricata*	-	-	-	-	-	UNCLOS, Caribbean, IWC
-	*C. caretta* *C. mydas* *E. imbricata*	-	-	1	37	-	-
-	*C. caretta* *C. mydas* *E. imbricata* *D. coriacea*	-	*T. manatus*	4	170	1	UNCLOS (S), High Seas, Caribbean
272	*C. mydas* *E. imbricata* *C. caretta*	-	*T. manatus*	-	-	1	UNCLOS (S), Liv. Res. High Seas, High Seas
-	*C. caretta* *C. mydas* *E. imbricata* *D. coriacea*	-	*T. manatus*	25	4,300	-	UNCLOS, Caribbean (S)
340	*C. caretta* *C. mydas* *E. imbricata*	-	*T. manatus*	3	15	3	UNCLOS, Liv. Res. High Seas, High Seas, CMS, Caribbean
-	*C. mydas* *E. imbricata* *D. coriacea*	-	-	8	720	1	-
-	*C. caretta* *C. mydas* *E. imbricata* *L. kampii* *L. olivacea* *D. coriacea*	*P. phocoena* *P. sinus* *P. dalli*	*Z. californianus* *A. townsendi* *M. angustirostris* *T. manatus*	44	40,000	2	UNCLOS, Liv. Res. High Seas, High Seas, Caribbean, IWC

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
NORTH & CENTRAL AMERICA continued						
Montserrat	49	see UK	F 0.1 *100%*	0.04	#	Small scattered patches of reef are present on all but the windward coast.
Netherlands Antilles	* 301	see Neth.	F 1.1 *100%*	14	#5	Bonaire and Curaçao are surrounded by fringing reefs; no major reefs are known in the Windward Group.
Nicaragua	910	~ 160	5.5 *96%*	600	#	Extensive reef formations are found on the Caribbean shelf; reefs are absent from the Pacific coast.
Panama	2,490	~ 307	147.1 *99%*	1,710 2,975	#4	The Caribbean coast has c 250km of fringing reef; there is a smaller area on the Pacific coast.
Puerto Rico	585	see USA	2.1 *92%*	65	#4	Corals are widespread but there is only localized reef formation, with greatest development in the south-west and very few on the north coast.
St Kitts-Nevis	-	11	F 1.8 *100%*	0.2 0.79	#	Bank barrier reefs with associated fringe or bench reefs occur along much of the coast of both islands.
St Lucia	156	16	F 0.9 *100%*	1.57 1.79	#	Reefs are widespread but are generally small and not well-developed.
St Vincent and the Grenadines	* 91	33	7.7 *100%*	0.5	#2	The southern, south-eastern and western coasts have several small fringing reefs.
Trinidad and Tobago	362	77	10.3 *100%*	76 90	#2	Trinidad has only small patches of coral, with the greatest development along the north coast; Tobago has more important but still not extensive reefs.
Turks and Caicos Is	* 84	see UK	F 1.0 *100%*	236	#1	The south sides of the Caicos Bank are fringed with patchy boulder coral heads; barrier and fringing reefs occur along the northern sides of the Caicos Islands. Patch and fringing reefs are found around most of the islands in the Turks group.

Table 6. Marine resources

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
-	*C. mydas* *E. imbricata*	-	-	1	0.1	-	-
118	*C. caretta* *C. mydas* *E. imbricata*	-	-	5	120	1	-
-	*C. caretta ?* *C. mydas* *E. imbricata*	-	*T. manatus*	4	1,200	1	UNCLOS (S), Caribbean (S)
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. fluviatilis*	*T. manatus*	12	14,000	1	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), CMS, Caribbean, SE Pacific
-	*C. caretta* *C. mydas* *E. imbricata* *D. coriacea*	-	*T. manatus*	16	220	3	-
62	*C. mydas* *E. imbricata* *D. coriacea*	-	-	1	26	-	UNCLOS, IWC
106	*C. caretta* *C. mydas* *E. imbricata* *D. coriacea*	-	-	27	6.7	1	UNCLOS, Caribbean, IWC
102	*C. caretta* *C. mydas* *E. imbricata* *D. coriacea*	-	-	21	39	-	UNCLOS, Caribbean, IWC
487	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. fluviatilis*	*T. manatus*	11	50	2	UNCLOS, Liv. Res. High Seas, High Seas, Caribbean
-	*C. caretta* *C. mydas* *E. imbricata*	-	-	13	92	-	-

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
NORTH & CENTRAL AMERICA/continued						
USA (excluding Hawaii)	19,924 •	10,654	5,198.3 • *95%*	1,900 2,806	#11	The reefs south of Floride ere the only significent corel assembleges; there ere over 6,000 petch reefs here.
US Virgin Islands	-	see USA	0.9 *100%*	3.1	*#4*	Fringing, barrier and petch reefs ere found. The most extensive are eround St Croix; off St Thomas most ere found in the south-east; those eround St John ere poorly developed.
SOUTH AMERICA						
Argentina	4,989	1,164	630.0 *98%*	Not present	-	Not present
Brazil	7,491	3,168	F 585.6 *73%*	2,500 10,124	1	Some 3,000km of coast hes reefs elthough not all ere true corel reefs.
Chile	6,435	2,288	5,996.0 *99%*	Not present	1	Eester Island has significent corel communities although no true reefs. There is no coral on the mainland coast.
Colombia	2,414	603	83.7 *77%*	3,580 5,013	2	Extensive corel growth eround offshore islands. Along most of the Pecific end Caribbean coestline, conditions are suboptimel for corel growth.
Ecuador	2,237	~ 1,159	381.2 *99%*	1,618 1,821	-	Smell corel reef formetions occur on the mainland; there is some reef development in the Galápagos.
French Guiana	378	see France	7.3 *99%*	550 947	-	-
Guyana	459	130	39.9 *98%*	800 1,500	-	-

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km^2)	Oc. Inst	Marine international conventions
-	*C. caretta* *C. mydas* *E. imbricata* *L. kempii* *D. coriacea*	*D. leucas* *M. monoceros* *P. phocoena* *P. dalli*	*E. lutris* *E. jubatus* *Z. californianus* *C. ursinus* *O. rosmarus* *H. grypus* *P. vitulina* *P. hispida* *P. fasciata* *E. barbatus* *M. angustirostris* *U. maritimus* *T. manatus*	262	510,000	24	Liv. Res. High Seas, High Seas, CCAMLR, Caribbean, SPREP, IWC
138	*C. mydas* *E. imbricata* *D. coriacea*	-	-	5	58	-	-
-	-	*C. commersonii* *L. australis* *L. obscurus* *A. dioptrica* *P. spinipinnis*	*O. byronia* *M. leonina*	32	5,500	2	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), CMS, CCAMLR, IWC
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. fluviatilis* *P. spinipinnis*	*O. byronia* *T. manatus*	82	40,000	-	UNCLOS, CCAMLR, IWC
-	*C. mydas*	*C. commersonii* *C. eutropia* *L. australis* *L. obscurus* *A. dioptrica* *P. spinipinnis*	*L. felina* *O. byronia* *A. philipii* *A. australis* *M. leonina*	32	120,000	1	UNCLOS (S), CMS, CCAMLR, SE Pacific, IWC
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. fluviatilis*	*T. manatus*	9	6,500	5	UNCLOS (S), Liv. Res. High Seas, High Seas (S), SE Pacific, Caribbean
419 * 306	*C. mydas* *E. imbricata* *D. coriacea*	*S. fluviatilis*	*Z. californianus* *A. galapagoensis*	4	88,000	-	SE Pacific
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. fluviatilis*	*T. manatus*	1	1.6	1	-
-	*C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. fluviatilis*	*T. manatus*	-	-	1	UNCLOS

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
SOUTH AMERICA continued						
Paru	2,414	~ 787	6,914.2 *99%*	48 64	-	-
Suriname	386	101	F 3.9 *96%*	1,150	-	-
Uruguay	660	~ 119	143.2 *99%*	-	-	-
Venezuela	2,800	364	331.5 *94%*	2,500 6,736	2	Comparetively few areas are optimal for reef growth, the best are around offshora islands.
AFRICA						
Algeria	1,183	~ 137	79.7 *96%*	Not present	#3	Not present
Angola	1,600	~ 606	68.1 *91%*	1,100	-	Faw corel species, no significant raef development.
Benin	121	~ 27	F 9.0 *22%*	30	-	-
Camaroon	402	~ 15	F 56.0 *72%*	3,060	-	Few corel species, no significant raaf davalopment.
Cape Verde	965	789	8.5 *100%*	?	-	Corel communities (up to six speciasl widaspread, with minor raaf development.
Comoros	340	249	6.5 *100%*	Present, no arae date	#1	Fringing reefs occur around the thraa islands.
Congo	169	~ 25	18.4 *40%*	20	-	-
Côte d'Ivoira	515	105	61.4 *72%*	20	-	Faw coral species, no significant raaf davalopment.
Djibouti	314	6	F 0.4 *100%*	Present, no arae data	#2	Generelly shallow raafs occur around tha Golfe de Tedjoura and outlying isands.
Egypt	2,450	174	82.1 *28%*	Prasant, no arae data	#9	Fringing raafs occur from Res Shukheir to Quseir; further south tha araa has been little studied. Significent reefs occur along the southern part of the Sinai Penninsula, extending within the Gulf of Aqabe, and the Gulf of Suez although reefs hera are lass well developed than in tha Gulf of Aqaba

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
-	*L. olivacea* *D. coriacea*	*L. obscurus* *S. fluvietilis* *P. spinipinnis*	*L. felina* *O. byronia*	4	7,100	-	CCAMLR, SE Pacific, IWC
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. fluvietilis*	*T. manatus*	5	1,200	1	UNCLOS (S)
-	-	*A. dioptrica* *S. fluvietilis*	*O. byronia* *A. australis*	4	200	-	UNCLOS, Liv. Res. High Seas (S), High Seas (S), CMS, CCAMLR
-	*C. caretta* *C. mydas* *E. imbricata*	*S. fluvietilis*	*T. manatus*	16	11,000	2	Liv. Res. High Seas, High Seas, Caribbean, IWC
-	-	-	*M. monachus*	8	920	1	UNCLOS (S), Mediterranean
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*C. heavisidii* *S. teuszii*	*T. senegalensis*	4	29,000	-	UNCLOS
-	-	*S. teuzii*	*T. senegalensis*	1	100	-	UNCLOS (S), CMS, W & Cent. Africa (S)
-	*C. mydas* *E. imbricata* *L. olivacea*	*S. teuzii*	*T. senegalensis*	2	4,600	-	UNCLOS, CMS, W & Cent. Africa
108	*C. caretta* *C. mydas* *E. imbricata*	*P. phocoena*	-	2	3.7	-	UNCLOS
339	*C. mydas* *E. imbricata*	-	*D. dugon*	-	-	-	UNCLOS
-	*C. caretta* *C. mydas* *L. olivacea*	*S. teuszii*	*T. senegalensis*	1	1,400	-	UNCLOS (S), W & Cent. Africa (S)
-	*C. mydas* *E. imbricata*	*S. teuszii*	*T. senegalensis*	3	330	-	UNCLOS, CMS (S), W & Cent. Africa
-	*C. mydas* *E. imbricata*	*S. chinensis*	*D. dugon*	2	?	-	UNCLOS
-	*C. caretta* *C. mydas* *E. imbricata*	*S. chinensis*	*D. dugon*	15	8,400	5	UNCLOS, CMS, Mediterranean, Red Sea

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
AFRICA continued						
Equatorial Guinea	296	283	3.2 *90%*	200	-	Coral communities (up to seven species) present in SE Bioko and mainland, some minor reef development.
Eritrea	1,094	* - 76	F 1.8 * *39%*	Present, no area data	#3	Shallow fringing reefs, probably occur along the mainland coast. Many reefs within the Dahlak Archipelago, the outer islands being better developed.
Gabon	885	214	F 20.0 *91%*	2,500	-	Few coral species, no significant reef development.
Gambia	80	- 20	21.2 *89%*	660	-	-
Ghana	539	218	307.9 *84%*	20	-	Few coral species, no significant reef development.
Guinea	346	71	F 34.0 *91%*	2,230	-	-
Guinea-Bissau	274	151	F 4.8 *96%*	2,366	-	-
Kenya	536	118	7.4 *4%*	530 616	#11	Fringing and patch reefs occur 0.5-2km offshore along most of coast.
Liberia	579	- 230	5.6 *58%*	200	-	Few coral species, no significant reef development.
Libya	1,770	- 338	7.8 *100%*	Not present	#1	Not present
Madagascar	4,828	1,292	73.3 *73%*	3,256	#11	Reef types are varied and extensive. Concentrated at Toliara in the southwest, at Nosy Bé in the northwest. There is a small amount of reef development in the northeast, although these are the least known.
Mauritania	754	154	F 84.0 *93%*	Very limited area	1	-
Mauritius	177	1,181	18.8 *99%*	0.07	#6	Mauritius has ca 150km (300km²) of almost continuous fringing reef; Agalega has ca 100km² fringing reef; Rodrigues has a 2-10km wide reef platform around 90km of coast; ca 190km² of reef occur around the Cargados Carajos Shoals.

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international convantions
-	*C. mydas* *E. imbricata*	*S. tauszii*	*T. senegalensis*	4	1,500	-	UNCLOS (S)
-	*C. mydas* *E. imbricata*	*S. chinensis*	*D. dugon*	* 1	* 2,000	-	-
-	*C. caretta* *C. mydas* *E.imbricata*	*S. teuszii*	*T. senegalensis*	4	6,600	-	UNCLOS (S), W & Cent. Africa
-	*C. mydas* *E. imbricata*	*S. teuszii*	*T. senegalensis*	6	230	-	UNCLOS, W & Cent. Africa
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. teuszii*	*T. senegalensis*	-	-	-	UNCLOS, Liv. Res. High Seas (S), High Seas (S), CMS, W & Cent. Africa
-	*C. mydas* *E. imbricata*	*S. teuszii*	*T. senegalensis*	-	-	-	UNCLOS, CMS, W & Cent. Africa
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. teuszii*	*T. senegalensis*	2	?	-	UNCLOS
-	*C. mydas* *E. imbricata* *L. olivacea*	*S. chinensis*	*D. dugon*	13	3,500	1	UNCLOS, Liv. Res. High Seas, High Seas, E. Africa, IWC
-	*C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. teuszii*	*T. senegalensis*	-	-	-	UNCLOS (S), Liv. Res. High Seas (S), High Seas (S), W & Cent. Africa (S)
-	*C. caretta*	-	*M. monachus*	4	970	1	UNCLOS (S), Mediterranean
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea*	*S. chinensis*	*D. dugon*	3	23	2	UNCLOS (S), Liv. Res. High Seas, High Seas, CMS (S), E. Africa (S)
-	*C. carettta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea ?*	*S. teuszii* *P. phocoena*	*M. monachus* *T. senegalensis*	5	15,000	-	UNCLOS (S), W & Cent. Africa (S)
313	-	-	*D. dugon*	15	90	1	UNCLOS (S), Liv. Res. High Seas (S), High Seas

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
AFRICA continued						
Mayotte	170	see France	-	Present, no area data	#2	There is a substantial barrier reef.
Morocco	1,835	278	591.5 *99%*	Not present	2	Not present
Mozambique	2,470	562	F 33.5 *99%*	850	#9	Fringing reefs are common along the northern coast; south of Mocambo Bay reefs are confined to offshore islands.
Namibia	1,489	500	204.5 *99%*	-	-	-
Nigeria	853	211	175.7 *66%*	9,700 33,280	-	-
Réunion (& Dep.)	207	see France	2.3 *99%*	Present et Europa.	#1	There is 10-12 km of discontinuous fringing reef along the south-west coast; all five dependencies are coral atolls.
Saint Helena (& Dep.)	60 * 78	see UK	0.6 *100%*	-	-	-
São Tomé and Príncipe	215	128	F 3.5 *100%*	-	-	Few coral species, no significant reef development.
Senegal	531	206	302.1 *95%*	1,690	1	Few coral species, no significant reef development.
Seychelles	491	1,349	5.9 *100%*	Present, no area data	#7	The reefs are among the most extensive in the world, spread over a very wide area. The granitic islands have many scattered fringing and patch reefs.
Sierra Leone	402	- 156	F 35.0 *70%*	1,000 1,710	-	Few coral species, no significant reef development.
Somalia	3,025	- 782	F 16.8 *98%*	100	#1	There is an interrupted barrier reef along the south coast from Cadale to the Kenyan border.
South Africa	2,881	- 1,017	496.6 *99%*	7	#3	There are no true reefs, but coral communities occur off the Maputaland coast in the north-east.
Sudan	853	- 92	1.5 *5%*	Present, no area data	#7	Much of the 750km coastline has fringing reefs paralleled by barrier reefs 1-14km wide.

Table 6. Marine resources

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine international conventions
-	*C. mydas* *E. imbricata*	-	-	2	?	-	-
-	*C. caretta* *C. mydas* *D. coriacea*	*P. phocoena*	*M. monachus*	10	970	2	UNCLOS (S), Mediterreneen, CMS
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. chinensis*	*D. dugon*	7	25,000	4	UNCLOS (S)
-	*C. caretta*	*C. heavisidii*	*A. pusillus*	4	74,000	-	UNCLOS
-	-	*S. teuszii*	*T. senegalensis*	-	-	-	UNCLOS, Liv. Res. High Seas, High Seas, High Seas, CMS, W & Cent. Africa
-	*C. mydas*	-	-	7	?	-	-
129	*C. mydas*	-	• *A. tropicalis* • *M. leonina*	4	65	-	-
77	*C. mydas* *E. imbricata*	-	-	-	-	-	UNCLOS
-	*C. caretta* *C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. teuszii* *P. phocoena*	*T. senegalensis*	6	840	1	UNCLOS, Liv. Res. High Seas, High Seas, CMS, W & Cent. Africa, IWC
379	*C. mydas* *E. imbricata*	-	-	8	380	1	UNCLOS, E. Africe, IWC
-	*C. caretta* *C. mydas* *E. imbricata*	*S. teuszii*	*T. senegalensis*	-	-	-	UNCLOS (S), Liv. Res. High Seas, High Seas
-	*C. mydas* *E. imbricata*	*S. chinensis*	*D. dugon*	2	3,300	-	UNCLOS, CMS, Red Sea, E. Africe
-	*C. caretta* *D. coriacea*	*C. heavisidii* *L. obscurus* *S. chinensis* *N. phocaenoides*	*A. tropicalis* *A. gazella* *A. pusillus* *M. leonina* *D. dugon*	26	4,800	1	UNCLOS (S), Liv. Res. High Seas, High Seas, CMS, CCAMLR, IWC
-	*C. mydas* *E. imbricata*	*S. chinensis*	*D. dugon*	1	260	3	UNCLOS, Red Sea

Table 6. Marine resources

	Coast-line (km)	EEZ (1,000 km²)	Marine Fisheries (1,000 mt) *% total fishery*	Mangroves (km²)	Sea-grass (spp.)	Coral reefs
AFRICA continued						
Tanzania	1,424	223	55.3 *14%*	total area: 1,336 mainland: 1,155 Unguja: 61 Pemba: 120	#8	Reefs, mainly fringing and patch, occur along c 600km (80%) of the coast. Many islands, including Zanzibar and Pemba are surrounded by fringing reefs.
Togo	56	2	12.1 *97%*	Present, no area data	-	-
Tunisia	1,143	86	90.7 *100%*	Not present	#3	Not present
Western Sahara	-	131	0	-	-	-
Zaire	37	1	F 2.0 *1%*	530	-	-
ANTARCTICA						
Antarctica	-	-	-	Not present	-	Not present
UK subantarctic islands	* 1,669	see UK	0.5	Not present	-	Not present
French subantarctic islands	* 111	see France	F 0.5 *100%*	Not present	-	Not present
Norwegian subantarctic islands	-	see Norway	-	Not present	-	Not present

Table 6. Marine resources

Inshore marine fishes (spp.)	Marine turtles	Inshore cetacea	Other marine mammals	PA N°	PA total area (km²)	Oc. Inst	Marine International conventions
-	*C. mydas* *E. imbricata* *L. olivacea* *D. coriacea*	*S. chinensis*	*D. dugon*	8	300	4	UNCLOS
-	*C. mydas* *E. imbricata* *D. coriacea*	*S. tauszii*	*T. senegalensis*	-	-	-	UNCLOS, W & Cent. Africa
-	*C. caretta*	*P. phocoena*		3	170	2	UNCLOS, Liv. Res. High Seas, High Seas, CMS(S), Mediterranean
-	*E. imbricata*	-	*M. monachus*	-	-	-	-
-	*C. mydas* *L. olivacea* *D. coriacea*	*S. tauszii*	*T. senegalensis*	1	1,000	-	UNCLOS, CMS
-	-	-	*L. weddellii* *O. rossii* *L. carcinophagus* *H. leptonyx*	38	350	-	-
• 33	-	*C. commersonii* *L. australis* *L. obscurus* *A. dioptrica*	*O. byronia* *A. australis* *A. gazella* *L. weddellii* *H. leptonyx* *M. leonina*	7	105	-	-
-	-	*C. commersonii* *L. obscurus* *A. dioptrica*	*A. tropicalis* *A. gazella* *H. leptonyx* *M. leonina*	1	367	-	-
-	-	-	*A. gazella* *H. leptonyx* *M. leonina*	1	59	-	-

Table 7. Forests in the tropics

Forests in the tropics, particularly moist forests or rainforests, are widely held to be the most biologically diverse habitats on earth. Correspondingly, loss of these habitats through deforestation or degradation is considered one of the most important conservation problems today.

Needless to say, the true picture is far more complicated than this. Tropical forests vary enormously in their composition, complexity and diversity. Classifying, categorising and measuring them is an extremely difficult task. There is not even a single, universally accepted definition of what constitutes a forest, let alone a 'swamp forest' or 'cloud forest' or 'monsoon forest' or any of the many other types and classes of forests that have been named. These problems are further compounded when attempts are made to measure changes to forests. It is also apparent that the biological diversity of dry forests has often been under-estimated.

What is a forest?

FAO, who have carried out the most comprehensive analysis of tropical forests (FAO/UNEP 1981, FAO, 1988, 1993), have defined natural and semi-natural forests as 'ecological systems with a minimum of 10% crown cover of trees and/or bamboo, generally associated with wild flora and fauna and natural soil conditions and not subject to agricultural practices'. This is an extremely wide definition, and includes many open vegetation formations which would not normally be regarded as forests.

A more rigorous definition which accords much more closely with wider perceptions of what constitutes a forest is that of 'closed-canopy forest', ie. predominantly woody formations with a minimum crown-cover of 40%. However, this definition can only be applied with confidence to formations mainly composed of broad-leaved trees. This is because the growth form of many coniferous species means that a significant number of coniferous formations, which would be widely regarded as forests, have crown cover of less than 40%.

FAO have elaborated on their definition of closed broad-leaved forests as follows: "those which cover with their various storeys and undergrowth a high proportion of the ground and do not have a continuous dense grass layer allowing grazing and spreading of fires. They are often but not always multi-storeyed. They may be evergreen, semi-deciduous, wet, moist or dry".

Classifying forests

It is generally recognized that some form of forest classification is necessary for purposes of monitoring change and assessing the relative importance of different forest areas, particularly in terms of how species-rich they are.

Climate is the chief factor which determines the type of forest growing in any given area, but soil type (determined largely by underlying geology) and degree of disturbance are also important. The most important components of climate are rainfall and temperature, although neither of these is straightforward to describe. In particular, degree of seasonality is often as important as annual totals (for rainfall) or averages (for temperature); daily temperature range can be as significant as daily average temperature.

Markedly seasonal climates generally have predominantly deciduous or semi-deciduous broadleaved formations. However, most forests in the tropics, including those generally classified as evergreen, have a notable number of tree species which lose their leaves seasonally or periodically; similarly most deciduous forests will have a number of evergreen species. Hence determining at what point a forest changes from evergreen to semi-deciduous and from semi-deciduous to deciduous will always be to some extent an arbitrary decision.

Monitoring change

Measuring and assessing changes to forests self-evidently depends on continued monitoring and on consistent application of categories and definitions throughout the course of the study. This is difficult to achieve over a wide area. Measuring degradation and change in forest quality are particularly difficult, as no satisfactory and widely applicable measures have yet been developed.

Deforestation is the most drastic form of forest degradation. It is defined by FAO as "change of land-use or depletion of crown cover to less then 10%". Some very marked degradation (eg. a decrease of crown cover from 80% to 15%) would not be classified as deforestation according to this definition.

Forest degradation which is not deforestation will normally involve some or all of:

- Change in species composition (loss or gain of species and changes in the relative abundance of those present);
- Changes in canopy cover;
- Changes in age-structure of particular species.

NOTES TO TABLE 7

The following table summarises information on forests in most of the world's tropical countries.

Key:
- Indicates lack of data.

The emphasis is on moist forests, and only those countries with some closed-canopy moist broadleaved forest have been included. For these countries, however, the figures and discussion generally include other forest formations. Figures for both total forest and woodland area (ie. over 10% canopy cover, Column 3) and closed forest (generally canopy cover over 40%, Column 5) are included. As discussed above, the latter is much closer to what is generally understood as forest, but comparative figures for deforestation are only available for the former.

Most information is derived from two sources: the FAO Tropical Forest Assessment and follow-ups (FAO, 1981, 1989, 1993) and the three-volume *The Conservation Atlas of Tropical Forests* (Collins *et al.*, 1991; Sayer *et al.*, 1992; Harcourt and Sayer, in press). Fuller discussion of the issues involved will be found in these sources and in *Global Biodiversity* (WCMC, 1992). Countries covered are generally those included in *The Conservation Atlas of Tropical Forests* along with a number of Pacific island states and dependencies omitted from volume 1 of the Atlas but identified in Dahl (1980) as having either lowland or montane rainforest. Statistics for forest cover and deforestation are missing for several of these.

Column 2, Country size: Size of country is land area as defined by FAO.

Column 3, Forest and woodland: Forest and woodland area is also from FAO and includes all areas with a canopy cover of greater than 10%. Source is generally Table 4a in FAO (1993), figures marked with [1] are from FAO (1988). All figures are rounded as appropriate. The figure for China, marked with [4], is for the whole country including temperate and sub-tropical areas.

Column 4, Annual deforest.: Annual deforestation rates are taken from Table 4a in FAO (1993) and indicate change to canopy cover of less than 10% or change in land use. Percentage change refers to the area given in column 3 (ie. all forest and woodland). Figures are for average deforestation over the period 1981-1990. For some of the Caribbean islands, deforestation rates are very low in absolute terms but still significant as a percentage of forest and woodland cover. For these area deforested is given as 'e', indicating a very small, non-zero number. In a few cases FAO consider that forest cover is increasing. For these deforestation is given as negative. All figures are rounded as appropriate.

Column 5, Forest cover: Measures of forest area are taken from FAO and, where available, from the WCMC Biodiversity Map Library. The first figure is generally from Table 5a in FAO (1993) and refers to the situation in 1990. Figures marked with [1] are taken from FAO (1988) and refer to 1980. The second figure (in italics) is that derived from the WCMC Biodiversity Map Library (BML) as quoted in *The Conservation Atlas of Tropical Forests*. The map in Figure 6 shows the distribution of forests in the tropics according to this source, as compiled in the BML. For Africa, Asia and Oceania, figures from the BML generally refer to closed broad-leaved forest. For South and Central America and the Caribbean, these figures also include pine formations and dry forests, which comprise a significant proportion of forest cover in many Neotropical countries. This discrepancy should be borne in mind, however, when comparing figures for the two regions. Full discussion of the sources of data for the figures from the BML is provided in the relevant volume of the forest atlas. It should be noted that the quality of data and date of the original source are both very variable, although almost all source maps are from the period 1980-1990. Figures marked with [2] include at least 30% mangroves. Mangroves are discussed in more detail in

Table 6 and are not discussed further in this table. The wide divergence between some of the figures from FAO and their equivalents from the BML is generally a result of different forest classification systems being used in the two cases and clearly illustrates the difficulty in establishing a reliable and consistent global data set for forest cover.

Column 6, FI: FI = Fragmentation Index is the Perimeter Area Index (PAI) used by FAO, determined by:

$$PAI = 0.282095 * \frac{P_e}{\sqrt{A} * \sqrt{N}}$$

Where A = total area of all patches
N = number of patches
P_e = total length of perimeter of all patches

Because this index is dependent (in a non-linear way) on the scale of the map from which it is derived, the latter is given in each case. From the data given, it is legitimate to compare fragmentation indices for countries with the same original map scale but not those with different map scales (Column 7).

Column 7, Map scale: Indicates the scale of the map from which data for the fragmentation index were derived. The figure is in millions (ie. 0.5 represents a scale of 1:500,000). Entries marked 1* (some African countries) are 1 km resolution NOAA/AVHRR-LAC satellite data (taken as equivalent to 1:1,000,000 map scale) generalized to 2 x 2 km sq.

Column 8, Description of forests: Data are generally summarized from the relevant account in *The Conservation Atlas of Tropical Forests*. The descriptions therefore generally apply to the area delimited in column 5, that is closed broadleaved forest and, for the Americas, dry and coniferous forest. For Pacific countries not included in volume 1 of the atlas, the description is mainly taken from Dahl (1980).

Column 9, Biodiversity: Information is from multiple sources. This section should be taken as only a very superficial indicator of the relative importance for biodiversity of the forests in the countries concerned. In particular, little attempt has been made to differentiate between different types of diversity (eg. a country may be considered to have high diversity because its forests are intrinsically rich in species, or because it covers a wide geographic area and has a wide range of different forests, each of which has different species in it but with no individual forest type necessarily intrinsically very rich).

Column 10, Factors affecting forests: An attempt has been made here to indicate what percentage of original forest cover has been cleared or heavily degraded. Defining and estimating 'original forest cover' is extremely difficult, as discussed in more detail in *Global Biodiversity* and in the forest atlases. For this reason figures quoted here should be treated extremely circumspectly. A brief overview of factors currently affecting the forests is also presented.

Column 11, Area prot.: This is an estimate of the absolute area of forest within protected areas of IUCN management categories I-V (see Table 8) as calculated by overlaying digitised maps of protected areas with those of forest cover and measuring the degree of overlap (analysis by WCMC Biodiversity Map Library [BML]).

Column 12, % prot: Gives the area recorded in Column 11 as a percentage of total forest measured in the BML (ie. the second figure in Column 5). The BML does not yet include all protected areas in IUCN categories I-V.

Column 13, % cover in BML: Indicates what percentage of a given country's total protected area is included in the BML and therefore gives an indication of the reliability of the figures in columns 10 and 11. Countries which have no protected areas in IUCN categories I-V are so indicated. For a few countries figures have been derived from a source other than the BML. These are indicated in italics. IUCN protected area categories are described in the notes to Table 8.

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	FI	Map Scale	Description of forests
		(thousand square kilometres)					
ASIA							
Bangladesh	130	7.7	0.4 3.9%	6[2] *9.7*	1.1	0.5	There are patches of rainforest in the east, in the Chittagong and Sylhet regions, and vestiges of monsoon forest in the north.
Brunei	5.3	4.6	0.02 0.4%	4.6 *4.7*	1.8	-	The country is largely covered with a mosaic of lowland rainforest and inland swamp forest. There is a small amount of montane forest in the south-east.
Cambodia	177	122	1.3 1.0%	62 *113*	-	-	There are lowland and montane monsoon and rain forests and inland swamp forests. The main rainforest areas are in the Cardemom and Elephant Ranges in the west.
China	9,326	1,555[4]	-	- *26*	-	-	Most moist forest is lowland monsoon in Hainan and southern Guangxi; patches of lowland rainforest occur in southern parts of Hainan, Guangxi and Yunnan and montane forest in Yunnan.
India	2,973	517	3.4 0.6%	287 *228*	1.8	1	Tropical moist forest is found in the Andaman and Nicobar Islands, the Western Ghats and the greater Assam region with small remnants in Orissa. More than half is semi-evergreen.
Indonesia	1,812	1,095	12 1.0%	864 *1,179*	1.3	2.5	Most forests are evergreen rainforests, except for those of eastern Java, Madura, Bali, the Lesser Sundas, southern Sulawesi and southern Irian Jaya which are monsoon forests. There are also extensive swamp forests and montane forest particularly in Sumatra and Irian Jaya.
Laos	231	132	1.3 0.9%	104 *125*	1.5	1	There are evergreen rainforests and monsoon forests, both lowland and montane. The most extensive mature moist forests are now mainly in southern and central parts.
Malaysia	329	176	4.0 2.0%	176 *200*	1.1	1	In Peninsular Malaysia most forest is lowland rainforest; there is also montane forest, swamp forest and some semi-deciduous forest in the extreme north-west. Sabah and Sarawak also have extensive lowland rainforest; Sarawak has large areas of swamp forest and montane forest, the latter principally in the east.
Myanmar	658	289	4.0 1.3%	287 *312*	-	-	Lowland and montane rainforest, mostly semi-evergreen, occurs on west-facing mountain slopes in the east, west and north. More centrally there are monsoon forest, many degraded.
Philippines	298	78	3.2 3.3%	76 *66*	1.2	2	The eastern part of the country has lowland and montane rainforest, the western side lowland and montane monsoon forests. The most extensive remaining areas are in Luzon and Mindanao.
Singapore	0.6	0.04	0 0	- *0.02*	-	-	A 70ha area of lowland rainforest remains on Bukit Timah, along with another 50ha of fragments in the central catchment area. Remaining forest is secondary and abandoned plantation.

Table 7. Forests in the tropics

Biodiversity	Factors affecting forests	Area prot.	% prot.	% cover in BML
		(thousand hecteres)		
Diversity wes formerly high but is now reduced. Endemism is low.	Over 95% of originel forest cover hes been cleared. Shifting agriculture is the main ceuse of forest loss.	31	3%	32%
Diversity is very high; regionel endemism is fairly high, with meny Bornean endemics. Nationel endemism is low.	The forests ere reletively little disturbed. There is some locel demand for timber.	49	10%	40%
The forests ere little studied. Diversity cen be expected to be high, as cen regionel endemism. Nationel endemism is probably low as species ere shared with other countries, perticulerly Vietnam.	1986 estimetes of three-quarters of the original forest cover cleared end only 10% of primery forest remeining. The central plein is mostly deforested. Shifting cultivetion is the mejor ceuse of forest loss.	-	-	-
Diversity in the forests is high; endemism is moderate.	Over 90% of originel forest is believed to heve been lost. Clearance for shifting end settled egriculture are the mein ceuses of forest loss, although unsustainable logging is also important.	-	-	-
Diversity is high; endemism is high in the Western Ghets, perticulerly among amphibians end reptiles. Meny regionel endemics shared between W Ghets end Sri Lenke. Regionel endemism in NE Indie is high emongst some groups.	Between 50% end 75% of forests have been lost. Shifting egriculture, logging, over-grezing and hydroelectric projects ere the mejor ceuses of forest loss.	820	4%	39%
Diversity end endemism ere both extremely high. The country contains some of the most diverse forests in the world and spens two major biogeographic realms; meny of the islends have lerge numbers of endemic species.	An estimeted 30% of originel forest hes been lost. Shifting egriculture is the mejor ceuse of forest loss. Uncontrolled logging demeges the forest structure and in some ereas mekes them vulnerable to fire. Transmigretion from Jeve and Bali has had a major effect in some ereas.	10,657	9%	87%
The forests ere incompletely known, but ere believed to have high diversity end moderete endemism with feirly high regionel endemism.	Between 45% end 55% of moist forest has been cleered or degreded. Shifting cultivetion is the mejor ceuse of forest loss although uncontrolled logging has recently become significent.	-	-	-
Diversity is very high with moderete endemism; west Meleysie hes e significent number of Bornean endemics, shered with Kelimentan (Indonesie) end Brunei.	In peninsuler Meleysie nearly 50% of the forest has been cleered; the mejor ceuse of forest loss is cleerence for lerge-scele egriculture. In Sebeh over helf the forest and in Serewek eround 30% has been cleered; in the letter shifting cultivetion is the mejor problem while in Sebeh both settled and shifting egriculture following logging ere importent.	1,118	6%	79%
Diversity is very high; netionel endemism is generelly low, although there is significent regionel endemism, particulerly in the northern forests.	Around helf the forest hes been cleered; current deforestetion retes ere extremely high, lergely owing to shifting cultivetion end unsustainable logging.	134	0.4%	87%
Diversity is very high and endemism is extremely high.	65-70% of originel forest cover hes been cleered; shifting egriculture end unsusteineble logging practices ere the mejor ceuses of forest loss.	56	1%	38%
Diversity is impoverished but otherwise typicel of lowlend Melesien dipterocerp reinforest. Endemism is very low.	Over 95% of forest cover hes been cleered. Less than 0.2% of primery forest remeins. Encroechment for building end increesed recreetionel use ere the mein threets.	*2*	*100%*	0

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	FI	Map Scale	Description of forests
	(thousand square kilometres)						
ASIA continued							
Sri Lanka	65	17	0.3 1.4%	14 *12*	1.5	0.5	Reinforests, both lowland and montene, are restricted to the south-west; there are extensive degraded monsoon forests in the north and east.
Teiwen	36	-	-	1.7	-	-	Remnents of lowland reinforest remain in the fer south end on Orchid Island.
Theiland	511	127	5.2 3.3%	82 *107*	1.2	1	Remaining forests, both rainforest end monsoon, ere found mainly in the north end west, with some in the south end south-east. They ere both lowland end montene.
Vietnem	325	83	1.4 1.5%	49 *57*	1.0	4	Remaining scattered reinforests and monsoon forests, both lowland end montene, ere concentreted in the centrel two-thirds of the country.
OCEANIA							
Americen Semoe	0.2	-	-	-	-	-	There is lowland and montene rainforest, mostly secondery, and cloud forest.
Austrelia	7,618	-	-	- *11*	1.2	0.5	Smell patches of reinforest ere found in the north-eest, meinly elong the Queensland coast; most is lowland.
Cook Is	0.2	-	-	-	-	-	There is some montene reinforest in centrel Rarotonge.
Fed. States Micronesia	0.7	-	-	-	-	-	There is lowlend rainforest on volcanic end limestone rock and some montane rainforest on Truk, Ponepe end Kosree.
Fiji	18	8.6[1]	0.02 0.3%	8.1[1] *7.0*	-	-	Lowland reinforest is found in the southern end eestern perts of the larger islands. There is a small emount of montene forest.
French Polynesie	3.9	1.2[1]	-	-	-	-	Lowlend reinforest is generally much disturbed. Montane rainforest is present in the interiors of many of the high islands.
Guam	0.4	-	-	-	-	-	There is some lowlend reinforest and possibly e limited erea of cloud forest on Mt Lamlam.
New Celedonie	19	13.4[1]	-	4.8[1]	-	-	There is lowlend rainforest on basic and limestone substrete, submontene reinforest, mid-eltitude dry coniferous forest end some cloud forest end swamp forest.
Niue	0.3	-	-	-	-	-	There is e smell erea of lowland rainforest on limestone.
Northern Meriane Is	0.5	-	-	-	-	-	There is lowland rainforest, some riverine forest end probably cloud-forest.

Biodiversity	Factors affecting forests	Area prot.	% prot.	% cover in BML
		(thousand hectares)		
Diversity and endemism are moderately high.	Between 35% and 55% of forest has been cleared. Major threats are fuelwood gathering; permanent agriculture; shifting cultivation; tree plantations; fire; gemstone mining; urbanisation and logging.	336	28%	96%
Diversity is moderate; endemism is low.	Remaining vestiges of rainforest are reportedly protected.	-	-	0
Diversity is very high; endemism is moderate.	55-65% of forest has been cleared; clearance for permanent and shifting agriculture and tree plantations, often following logging, are the major threats.	2,591	24%	62%
Diversity is very high; regional endemism is high, national endemism is moderately high.	Around 85-90% forest cover has been lost, and only 1% remains largely untouched. War from 1945-75 and intensive reconstruction since the are the major causes of loss.	291	5%	62%
Diversity is fairly low; there is notable regional endemism, with most species also present on Western Samoa.	Clearance of forests for shifting cultivation is a major factor. The forests are also susceptible to hurricane damage.	-	-	-
Diversity is lower than in the main S.E Asian forest blocks; regional endemism is very high, with many species shared with New Guinea, but there is also significant national endemism.	Probably less than 20% has been cleared, mostly for commercial agriculture and cattle ranching. There is little clearing or disturbance at present.	234	21%	65%
Diversity is low. There is some endemism.	Lowland forest has mostly been cleared for cultivation. Inland forest is relatively undisturbed although is threatened by introduced species	*0*	*0%*	-
Diversity is fairly low, although higher than most Pacific islands, with a significant number of national and regional endemics (many species are shared with Palauniue).	Lowland forest has mostly been cleared for cultivation or is heavily disturbed. Montane forest is less seriously affected.	There are no protected areas in IUCN categories I-V.		
Diversity is low; endemism is moderate to high.	It is estimated that over half the forest area has been lost. Conversion of land to agriculture, excessive logging and planting with mahogany and other exotics are threats.	-	-	-
Diversity is low; endemism is moderate to high.	Deforestation through urbanisation and clearance for agriculture and invasion by introduced species are the major threats.	-	-	-
Diversity is fairly low; regional endemism is fairly high, with many species shared with the Northern Mariana Islands.	Logging and clearance for development have destroyed most reinforest; previously slash-and-burn was the major factor affecting forests. Introduced species are a major threat.	-	-	-
Diversity is moderately high, endemism is extremely high. New Caledonia has one of the world's most distinctive floras with significant numbers of endemic genera and families as well as species.	Only around 10% of the country is now covered in dense forest. Virtually all coastal forest has been destroyed. Excessive logging and strip-mining are major threats.	-	-	-
Diversity and endemism are both low.	Most forest has been degraded, apart from that in the tapu (traditionally protected) region.	-	-	-
Diversity is fairly low; regional endemism is fairly high, with many species shared with Guam.	Tourist development on Saipan is a major factor.	-	-	-

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	FI	Map Scale	Description of forests
	(thousand square kilometres)						
OCEANIA continued							
Palau	0.4	-	-	-	-	-	There is extensive lowland rainforest, with 75% of Babeldoab (the largest island) covered with forest.
Papua New Guinea	453	360	1.1 0.3%	318 *367*	1.2	1	There are lowland and montane rainforests over much of the country with swamp forests and a small amount of monsoon forest in the lowlands.
Solomon Islands	28	25[1]	0.01[1] 0.04%	24 *26*	-	-	Most forest is lowland rainforest, with small areas of montane rainforest, particularly on Guadalcanal.
Tonga	0.7	-	-	-	-	-	Lowland limestone moist forest is still present, with the best examples on 'Eua.
Vanuatu	12	-	0.04 1.7%	2.4	-	-	Most forest is lowland rainforest with some montane rainforest.
Western Samoa	2.9	1.7[1]	0.02[1] 1.1[1]	1.4[1]	-	-	Lowland and montane rainforest and cloud forest are all present. Most lowland rainforest is disturbed.
CENTRAL AMERICA							
Antigua and Barbuda	0.4	0.3[1]	e 0.2%	0.1 -	-	-	There are small patches of humid forest in the south-west.
Belize	23	20	0.05 0.2%	19 -	1.0	0.5	Forests are mostly lowland subtropical moist forest, including some *Pinus caribaea*, merging with tropical moist forest in the south; there is also some lower montane moist forest.
Costa Rica	51	14	0.5 2.9%	13 -	1.1	0.2	Tropical moist forest is found discontinuously in the north, east and south-east. There are small areas of lower montane and montane forest and vestiges of dry forest in the north-west.
Cuba	110	17	0.2 1.0%	17[2] -	0.8	1	Natural forest is largely confined to the extreme east and west, the Zapata peninsula, the north central coastal region and associated islands, and the Isle de Juventud. Most remaining forest is lowland moist (mostly seasonal) and inland swamp forest; there is also pine and sub-montane forest and a smaller amount of montane forest.
Dominica	0.8	0.6[1]	0 0.7%	0.4 -	-	-	There is extensive lowland and lower montane rainforest with some montane and semi-evergreen forest.
Dominican Republic	48	11	0.4 2.8%	9 -	-	-	Most forest cover is in the west. There is a mosaic of evergreen rainforest, cloud forest, dry lowland forest, semi-deciduous forest, pine forest and mixed pine and broadleaved.
El Salvador	21	4.6[1]	0.03 2.2%	1.2 -	1.4	0.2	Remnant deciduous forests, montane pine-oak formations and cloud forests occur, most extensively in the northernmost parts of the country.

Biodiversity	Factors affecting forests	Area prot. (thousand hectares)	% prot.	% cover in BML
Diversity is fairly low, although higher than most Pacific islands, with a significant number of national and regional endemics (many species are shared with the Federated States of Micronesia).	Pressure on forests is fairly low, owing to a low human population density.	-	-	-
Diversity is very high as is regional endemism (much of the fauna and flora are shared with Irian Jaye); there is also notable national endemism.	Between 15% and 25% of original forest cover has been cleared. Shifting cultivation and logging are the main causes of forest loss and degradation with fuelwood collection locally important.	37	0.1%	63%
Diversity and endemism are generally poor to moderate, except for the avifauna which is rich in endemics.	Only 10-20% of the land has been cleared. Excessive logging is the major threat although much of the land area is inaccessible.	There are no protected areas in IUCN categories I-V.		
Diversity is low; there is moderate endemism.	Much of the forest has been degraded.	*0*	*0%*	-
Diversity is low; endemism is low to moderate.	Three-quarters of the land still has natural vegetation. Pressure on the land has been low but is increasing. Most valuable accessible timber has been logged out.	There are no protected areas in IUCN categories I-V.		
Diversity is relatively low; regional endemism is high, with many species shared with American Samoa.	Logging and conversion to agriculture have affected much accessible land.	-	-	-
Diversity and endemism are low.	Virtually all forest cover has been destroyed or degraded. Shifting cultivation, overgrazing and fire are the major threats.	-	-	-
Diversity is very high; endemism is low as almost all species are shared with Guatemala and Mexico.	The country is believed to have been extensively deforested under the Mayas, 1000 years ago, but much has regrown. Deforestation is at a low rate but recent influx of immigrants is changing this. Virtually all forests have been selectively logged.	220	12%	76%
Diversity is extremely high, because of varied topography and the presence of biotic elements from northern South America and Central America; endemism is moderate.	60% of forest cover has been cleared in the past 50 years, mostly for conversion to beef-cattle pasture. Most remaining forest is now protected.	409	31%	92%
Diversity is moderate; endemism is very high.	Natural forest originally covered 60-90% of the island and now covers under 20%. Clearance was mainly for cattle-ranching and sugar plantations. There is considerable reafforestation at present, mostly as plantations, so that net deforestation rate is very low. Remaining natural forest is very poor in mature trees.	139	8%	32%
Diversity is fairly low. Regional (Lesser Antillean) endemism is high, national endemism fairly low.	Around 45% of the island has been cleared, mostly since 1945 and mostly for agriculture, particularly banana plantations.	-	-	-
Diversity is moderate. Regional endemism is high, with many species shared or formerly shared with Haiti. National endemism is moderate.	80-90% of forest has been cleared; much of the remainder is degraded. Clearance is mostly for agriculture and pasture-land and collection of forest products, especially fuelwood.	-	-	-
Biota are relatively impoverished with low endemism.	Over 90% of the forests have been cleared, for agriculture, cattle-ranching and coffee plantations. Population density is very high and land pressure great.	5.0	-	??

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	FI	Map Scale	Description of forests
		(thousand square kilometres)					
CENTRAL AMERICA continued							
Grenada	0.3	0.07[1]	e -4%	0.06 -	-	-	Forest, mostly lowland, sub-montane and montane rainforest, is concentrated in the interior of the island. There is some dry woodland in the south and east.
Guadeloupe	1.7	0.9	e 0.3%	0.9 -	-	-	Forest is confined to Basse-Terre, mostly above 400m, and is largely rainforest.
Guatemala	108	42	0.8 1.7%	39 -	2.0	0.5	Coniferous, broadleaved and mixed forests are found. Broadleaved forests are moist lowland and montane, tropical and subtropical. Most cover is in the northern part of the country.
Haiti	28	0.2	0.01 4.8%	0.2 -	-	-	There are scattered vestiges of forest, mostly pine and mostly in the southern part of the country.
Honduras	112	48	1.1 2.1%	24 -	1.4	0.5	Most forests are pine forests, distributed throughout the highland regions; there are montane moist forests mostly in the east and lowland moist forests east of these.
Jamaica	11	2.3	0.3 7.2%	2.3 -	0.8	0.25	There are wet limestone forests mainly in the Cockpit Country and John Crow Mountains and lower montane rainforest, montane forest and elfin woodland on the Blue Mountains; there are also small areas of swamp forest and dry limestone forest.
Martinique	1.1	0.4	e 0.5%	0.4 -	-	-	Most forest is rainforest, with apperently some areas of more-or-less pristine forest in the Plateau de la Concorde region.
Mexico	1,909	486	6.8 1.3%	82 -	-	-	Lowland tropical rainforests are found mainly in the Yucatan peninsula, tropical seasonal forests mainly in the Sierra Madre del Sur and along the Pacific edge of the Sierra Madre Occidental. Conifer and oak forests occur widely in the three main sierres (Madre del Sur, Madre Occidental, Madre Oriental) and in Chiapas. There is a small amount of montane rain forest in the Sierra Madre Oriental.
Nicaragua	119	60	1.2 1.9%	47 -	1.4	1	Most forest is lowland tropical broadleaved found in the east; there are areas of montane moist forest and pine forest, mainly in the north, and fragmented dry forests in the west.
Paname	76	31	0.6 1.9%	31 -	-	-	Forests are mainly lowland tropical broadleaved and are found mostly in the northern and eastern parts of the country. There is some montane moist forest in the west.
Puerto Rico	8.9	3.2	-0.04 -1.4%	- -	-	-	Forest is subtropical; most of the island was originally covered with moist forest with some wet forest and small areas of rainforest and montane forest in the central montane regions; there is dry forest in the south.

Table 7. Forests in the tropics

Biodiversity	Factors effecting forests	Area prot.	% prot.	% cover in BML
		(thousand hectares)		
Diversity is relatively low; regional (Lesser Antillean) endemism is high, national endemism low.	80-90% of the forest was cleared, mainly for cash crops and later for shifting agriculture. Forests are degraded by fuelwood collection. Some are now regenerating.	-	-	-
Diversity is reletively low; regional (Lesser Antillean) endemism is high, national endemism low.	Clearance of forest was mostly for cash crops. Current deforestation rate is relatively low.	3.1	3%	42%
Diversity is high and endemism is relatively high, because of the veried topography in the country.	Agricultural colonization is the major threat to the moist forests in the north; overharvest of firewood is the main cause of destruction of the coniferous forests.	22	0.6%	17%
Biota are now impoverished. Formerly diversity was moderate and regional endemism high with most species also occurring in the Dominican Republic.	Over 98% of forest has been destroyed; major causes of destruction are tree-cutting for fuel and timber and clearance of land for agriculture.	-	-	-
Diversity is high; endemism is moderate.	Most deforestation is in the broadleaved forests and is as a result of agricultural expansion, particularly cattle-ranching over the last thirty years.	110	5%	30%
Diversity is moderate; endemism is very high.	Over 90% of the forest has been cleared or degraded. Clearing for settlement and agricultural land is the main cause of deforestation.	-	-	0
Diversity is relatively low; regional (Lesser Antillean) endemism is high, national endemism low.	50-60% of the forest has been cleared; most remaining forest is secondary. Current deforestation rate is fairly low.	-	-	0
National diversity is extremely high, largely because of the wide range of habitats and the fact that Mexico straddles two biogeographic realms; national and regional endemism are both high.	Most deforestation is in the tropical forests; 90% of mature tropical forests have been destroyed, most owing to the expansion of cattle-ranching; colonisation and agricultural development schemes are also important.	1,037	13%	15%
Diversity is fairly high, although generally lower than other Central American countries, largely because of limited altitudinal range. Endemism is low.	Around 40% of forest cover has been cleared in the past 40 years, generally for conversion to agricultural land.	-	-	-
Diversity is extremely high as the country has biota typical of northern South America as well as of Central America; endemism is relatively low.	Around 60% of forest cover has been cleared. Government assisted and spontaneous colonisation and clearance for agriculture are the main pressures.	885	29%	76%
Diversity and endemism are both moderate; the island has suffered notable extinctions, especially of large terrestrial vertebrates, since human settlement.	Over 99% of virgin forest has been cleared; however reforestation is occurring, both naturally and artificially, so that nearly 40% of the island now has some form of woody cover.	-	-	-

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	FI	Map Scale	Description of forests
	(thousand square kilometres)						
CENTRAL AMERICA continued							
Trinidad and Tobago	5.1	2	0.04 2.1%	2 -	1.6	-	On Trinidad most forests are seasonal and found in the east; lowland evergreen forest is the most widespread, particularly in the south, with submontane prevalent in the north; there are small patches of dry, swamp and montane forest.
St Kitts - Nevis	0.4	0.2[1]	e -0.2%	0.1 -	-	-	There are roughly equal areas of wet forest (including cloud forest), moist forest and dry forest.
St Lucia	0.6	0.4[1]	e 5.2%	0.05 -	-	-	Most remaining forest is moist forest on the steep montane slopes.
St Vincent & the Grenadines	0.4	0.1	e 2.1%	0.1 -	-	-	Most remaining forest is moist forest on inaccessible inland slopes.
SOUTH AMERICA							
Bolivia	1,084	493	6.3 1.2%	408 *451*	1.1	-	The forests are structurally very diverse. There are evergreen montane, and both evergreen and semi-deciduous mid-altitude and lowland forests. Lowland forests are in the north and east, montane and mid-altitude run from the north-west to the south-central.
Brazil	8,457	5,611	37 0.6%	3,871 *3,415*	1.1	5	The major forest classes are *Araucaria*, Atlantic and Amazon including both dryland and flood plain (várzea and igapó). Amazon forest in the north-western half of the country comprises over 95% of remaining forest.
Colombia	1,039	541	3.7 0.7%	498 *511*	1.2	1.5	Submontane and montane forests run along both sides of the Andes. Lowland rainforest is mostly found in the Amazon basin in the south-east and in the Chocó along the Pacific coast.
Ecuador	277	120	2.4 1.8%	118 *142*	1.2	1	Lowland rainforest occupies much of the eastern, Amazonian region and parts of the western lowlands. Montane forest is found along both sides of the Andes and dry forests occur in the southern part of the coastal plains.
French Guiana	88	80	0	79 *81*	0.7	1	Apart from open formations, savanna and swamps on the narrow coastal plain, the entire country is covered with lowland rainforest and some swamp forest.
Guyana	197	184	0.2 0.1%	182 *183*	0.7	1	Apart from areas in the south-west and north-east the whole country is covered in forest, mostly lowland rainforest.
Paraguay	397	129	4.0 2.7%	26 *47*	1.6	0.5	The only moist tropical forests are along the Paraná river on the eastern border.
Peru	1,280	679	2.8 0.4%	663	-	-	Moist forest is confined to the Andean sierres and the Amazonian basin or selva to the east of this. There is some dry seasonal forest on the coastal plain.

Table 7. Forests in the tropics

Biodiversity	Factors affecting forests	Area prot. (thousand hectares)	% prot.	% cover in BML
Diversity is high and endemism is moderately high, although the majority of species also occur in adjacent parts of Venezuela.	Probably 50-60% of the forests have been cleared. Management of much remaining forest is reasonable, although there is extensive deforestation in the Northern Range of Trinidad owing to shifting cultivation and fires.	2.7	1%	26%
Diversity is relatively low; regional (Lesser Antillean) endemism is high, national endemism low.	Virtually all accessible forest was cleared for cash crops. Current deforestation is at a low rate; there is much fallow land on Nevis but reforestation is hampered by uncontrolled livestock grazing.	-	-	-
Diversity is relatively low; regional (Lesser Antillean) endemism is high, national endemism low.	Primary forest now covers around 13% of the land. Deforestation is relatively high and mostly caused by conversion for agricultural land.	-	-	0
Diversity is relatively low; regional (Lesser Antillean) endemism is high, national endemism low.	Around 60% of the island has been deforested; less than 10% primary forest remains. Deforestation is largely for agricultural land and fuelwood.	-	-	-
Diversity is very high with a moderate number of endemics.	Main causes of deforestation are agricultural expansion, colonisation and logging. Collection of fuelwood is important at high altitudes.	6,238	14%	92%
Overall diversity is extremely high. Endemism is very high, particularly in the Atlantic forests.	90% of the Atlantic forests and 80% of the *Araucaria* forests have been cleared; 10% of the Amazon has been cleared, mostly for cattle ranching but also for mining and hydroelectric schemes.	6,718	2%	39%
Diversity is extremely high, with the forests of the Andean foothills in the Amazon basin in southern Colombia and adjacent Peru perhaps floristically the world's most diverse. Endemism is high.	Something under half the forest has been lost, mostly in the last 50 years. Shifting cultivation and human settlement are the major causes of forest loss, followed by cutting for fuelwood and logging.	4,272	8%	75%
Diversity is extremely high. Regional endemism is very high, with many species shared with adjacent Colombia and Peru.	Forests in the Andes and in the western lowlands have been largely destroyed. The major causes of deforestation are land clearance for colonisation and the production of fuelwood and charcoal.	1,411	10%	68%
Diversity is high; endemism is low as fauna and flora are largely shared with Guyana, Suriname and north-eastern Brazil.	Rainforest still covers 90% of the country; there is currently little deforestation pressure.	There are no protected areas in IUCN categories I-V.		
Diversity is high; endemism is low as fauna and flora are largely shared with Suriname, Venezuela and northern Brazil.	Most of the forest is still undisturbed; however, deforestation pressures are likely to increase.	58	0.3%	0[3]
The forests are generally little- studied but appear to have moderately high diversity and low endemism.	Deforestation is extremely high. Indiscriminate clearing for agriculture is the main cause of forest loss. Collection of fuelwood is also important.	109	2.3%	13%
Diversity is extremely high; the forests of the Andean foothills around the Amazon basin may be floristically the most diverse in the world. Endemism is high.	The major cause of deforestation is the invasion of forests in the selva by campesinos migrating from the Sierras in search of land for settlment.	2,031	3%	62%

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	FI	Map Scale	Description of forests
	(thousand square kilometres)						
CENTRAL AMERICA continued							
Suriname	156	148	0.1 0.1%	146 *133*	0.6	1	Apart from part of the coastal plain, virtually the whole country is forested, mostly with lowland seasonal moist forest. There is some submontane forest and extensive areas of swamp forest in the north.
Venezuela	882	457	6.0 1.2%	406 *542*	1.1	2	Humid evergreen forests are found in the Amazonas-Guayan region in the south and east, in the Orinoco Delta (swamp forest) and in the area south and south-east of Lake Maracaibo in the north-west. Most forest is lowland, but there are also extensive montane forests and some dry forests.
AFRICA							
Angola	1,247	231	1.7 0.7%	23 -	-	-	Moist forest is restricted to the interior of the Cabinda enclave and as an extended but fragmented series of forest areas along the Angolan escarpment from Dondo south to Quilengues; there are tiny fragments of montane forest.
Benin	111	49	0.7 1.3%	0.5 *0.4*	1.4	0.5	Small forest fragments are found in the south, one (Lama Forest) is c.50km^2, the others are all <5km^2.
Burundi	26	2.3	0.01 0.6%	0.5 *0.4*	-	-	Remaining forests are virtually all montane and found in the east. One tiny patch of Guineo-Congolean forest remains in the south-east at Kigwena.
Cameroon	465	204	1.2 0.6%	74 *155*	0.9	0.5	Montane, submontane, lowland evergreen and semi-deciduous forests are present in the southern two-thirds of the country.
Central African Republic	623	306	1.3 0.4%	78 *52*	1.4	1	Rainforests are lowland and confined to the south-east and south-central parts of the country.
Comoros (forest figs. include Mayotte)	1.7	(0.4)[1]	(0.01) (5%)[1]	(0.2)[1] -	-	-	Rainforest is confined to steep and inaccessible mountain slopes above 400-500m; much of it is secondary.
Congo	342	199	0.3 0.2%	195 -	1.0	1	Swamp forest is found in the north-east in the Cuvette Congolaise; semi-deciduous lowland forest occurs in the Sangha region in the north-west and the Mayombe and Chaillu massifs in the south.
Côte d'Ivoire	318	109	1.2 1.0%	11 *27*	1.0	1*	Fragmented evergreen moist forest is found in the south-east and south-west, grading into semi-deciduous forest and savannah in the centre and north.

Table 7. Forests in the tropics

Biodiversity	Factors affecting forests	Area prot. (thousand hectares)	% prot.	% cover in BML
Diversity is high. Endemism is low as the fauna and flora are largely shared with French Guiana, Guyana and north-eastern Brazil.	Outside the coastal plain, deforestation rates are very low.	456	3%	70%
Diversity is extremely high; endemism is also high.	At least 15% of forest has been lost in the past forty years. Most clearance appears to be for settled agriculture, initiated by the construction of roads through new areas.	8,645	16%	45%
The highland and escarpment zones are rich in endemic birds and almost certainly in other taxa but are little-studied.	The fragmented nature of the escarpment forests places them at risk from exploitation, modification and clearance. Their present status remains largely unknown.	-	-	-
Somewhat impoverished but otherwise typical West African forest biota.	Around 98% of the forest has been cleared. The small size of the remaining fragments makes them extremely vulnerable. There is strong demand for timber and other forest products within the country and from Nigeria.	0	0%	100%
The montane forests are rich in regional endemics and are considered to have an unusually high overall species diversity.	96-98% of the forest has been cleared. Human population density is extremely high. Forests are threatened by encroachment for agriculture and gold-mining, and collection of fuelwood and timber.	23	58%	95%
Montane forests and coastal lowland forests have high regional or national endemism; the latter are probably the most diverse in Africa. Elsewhere diversity is also high but endemism fairly low.	Perhaps 50-60% of the forest has been cleared, although degradation is believed to be more important than deforestation. Montane and coastal lowland forests are highly threatened. Logging is economically important.	1,106	7%	100%
The flora is very poorly known. Fauna is typical of the Central African rainforests and is unlikely to be rich in endemics.	Deforestation rates are low, chiefly because human population density is relatively low; high costs of transportation mean that commercial logging is limited but may increase with the building of the '4th parallel road'.	113	2%	93%
The fauna and flora are depauperate but reasonably rich in regional endemics (many species are shared with Mayotte).	Only remnants of primary forest remain. Secondary forest has re-grown on some islands. There is very heavy pressure for agricultural land and high demand for firewood.	There are no protected areas in IUCN categories I-V.		
The forests are little studied, although species richness is evidently high. There is insufficient information to assess levels of endemism accurately.	There has been relatively little forest clearance overall. Forest degradation through rapid cycle shifting agriculture and over-hunting is a major problem in the south.	660	3%	94%
The forests have a rich West African flora and fauna, including an important number of regional endemics.	80-90% of the forest has been cleared and current deforestation is rampant. Commercial logging has opened up forests which are then converted to agriculture, particularly cocoa and coffee.	552	20%	100%

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	FI	Map Scale	Description of forests
		(thousand square kilometres)					
AFRICA							
Djibouti	23	0.2	0.0 0	- -	-	-	There are remnant forests, principally of Juniper, on the Goda Massif, mainly on the Plateau du Day.
Equatorial Guinea	28	18	0.07 0.4%	18 *17*	1.7	1	Rio Muni is largely covered with a mosaic of lowland rainforest and degraded lowland rainforest. Bioko has patches of primary forest between 600 and 800m and montane forest between 800 and 1400m. Annobon has some moist forest above 500m.
Ethiopia (inc. Eritrea)	1,101	142	0.4 0.3%	52 -	1.5	-	All moist forest is montane and is concentrated in the south-west.
Gabon	258	182	1.2 0.6%	181 *227*	-	-	Forest is virtually all lowland rainforest with some inland swamp forest.
Gambia	10	1.0	0.01 0.8%	0.4[2] *0.5*	1.5	1	There are scattered remnants of riparian forest.
Ghana	230	96	1.4 1.3%	16 *15*	1.2	1*	Fragmented forest is found in the south-west and along the eastern border. Wet evergreen is confined to the extreme south-west; forests become progressively drier east and north.
Guinea	246	67	0.9 1.2%	16 *7.7*	1.3	0.7	Evergreen forests are largely confined to the extreme south-east where there are lowland and submontane forests; there are scattered sub-montane and semi-deciduous forests elsewhere.
Guinea-Bissau	28	20	0.2 0.8%	8.0 -	1.4	1	Closed broadleaved forests occur in patches on the lowland plain and along the coast, particularly in the south.
Kenya	567	12	0.07 0.6%	4.1 -	1.5	1	Montane forest is found in the south-west and central part of the country and there are lowland forest areas along the coast and in the south-west.
Liberia	97	46	0.3 0.5%	46 *41*	1.2	1*	Evergreen moist forest is found in the east and south-east and moist semi-deciduous forest in the north-west. There is a small amount of montane forest on Mt Nimba.
Madagascar	582	158	1.4 0.8%	72 *42*	1.4	1	Lowland rainforest is found along the eastern escarpment and in the Sambirano region in the north-west. Montane rainforest is found at higher altitudes in the same areas and on scattered massifs elsewhere. There is some seasonal semi-deciduous forest in the west.
Malawi	94	35	0.5 1.4%	12 *0.3*	-	-	There are small, scattered patches of montane, mid-altitude and lowland forest.

Table 7. Forests in the tropics

Biodiversity	Factors affecting forests	Area prot.	% prot.	% cover in 8ML
		(thousand hectares)		
Diversity and endemism are low, although one bird species is confined to the forests and one palm nearly so.	Forest is estimated to have covered 400,000 ha 2000 years ago compared with less than 1,400 ha of primary forest now; climatic desiccation, overgrazing and fuelwood collection are the major threats.	*1.4*	*100%*	-
Although little studied, diversity and regional endemism are expected to be very high; the coastal forests, along with those in adjacent Gabon and Cameroon are probably the most diverse in Africa. National endemism is likely to be low.	35-50% of forest is believed to have been cleared. Shifting agriculture is the main cause of forest disturbance in Rio Muni. On Bioko most forest was felled for cacao production. The collapse of the industry led to considerable regeneration of forests although this may now be being reversed.	0	0%	100%
The forests are diverse, although less so than those of the main Guineo-Congolean block. National endemism is relatively high.	It is thought that 90-95% of original forest cover has been cleared. Fuelwood collection is a major pressure.	-	-	-
The coastal forests in the region are probably the most diverse in Africa with high levels of regional endemism.	Less than 20% of the forest has been cleared. Human population density is very low and pressure on the forests is therefore not great.	891	4%	100%
Diversity is moderate, although the fauna is now impoverished. Endemism is extremely low.	80-90% of the forest is believed to have been cleared. Bushfires, overgrazing and a declining water-table appear to be the major problems.	2	4%	100%
The wet forests are rich in species with significant numbers of regional (West African) endemics.	Around 90% of the forest has been cleared. The major causes of deforestation are fire damage, over-logging, shifting cultivation and an ever increasing demand for fuelwood.	19	1%	100%
The south-eastern forests, particularly those on Mt Nimba, are rich in species with significant numbers of regional endemics.	Substantial areas of forest have been cleared. The major cause of forest loss is the traditional agricultural and pastoral practice in which land is cleared by fire.	97	13%	78%
There is very little information on biological diversity; the forests may be expected to be reasonably rich but to have little national endemism.	Probably over 80% of the forest has been cleared. Bushfires and clearance of land for cashew and groundnut cultivation, fruit farming, rice culture and timber exploitation as well as subsistence agriculture are the major threats.	There are no protected areas in IUCN categories I-V.		
Inland lowland forests are moderately diverse but low in endemics. Montane and coastal forests are less diverse but have significant numbers of national or regional endemics.	Perhaps as much as 90% of forest has been cleared. Unsustainable forestry practices, including illegal logging, fuelwood collection and encroachment for agriculture are the principal threats.	119	29%	93%
Forests are typically West African, and are rich in species, with a reasonable level of regional endemism and some national endemics.	60-80% of forest has been cleared. Subsistence agriculture is the major cause of deforestation.	93	23%	75%
Diversity is very high and national endemism is extremely high in all major plant and animal groups. There are significant numbers of endemic genera and families as well as species.	60-85% of forest has been destroyed. Unsustainable shifting subsistence cultivation is the major threat. In some areas burning to create cattle pasture is also important.	231	6%	60%
Diversity is moderate and there are a reasonable number of regional endemics. National endemism is low.	At least 80% of forest has been cleared. Illegal felling and conversion for subsistence agriculture are threats.	-	-	-

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	Fi	Map Scale	Description of forests
	(thousand square kilometres)						
AFRICA							
Mauritius	2	0.5[1]	0.02 3.3%[1]	0.03[1] -	-	-	Most remaining forest is montane.
Mayotte	0.4		included in Comoros		-	-	There is some secondary forest in the highest areas.
Mozambique	784	173	1.0 0.7%	44 -	-	-	There are small patches of forest along the coast and at the base of the mountainous region and a few montane forests in the west.
Nigeria	911	156	1.2 0.7%	56 *39*	1.1	1*	Lowland forests are found in the south in more or less isolated blocks. There are some small areas of montane forest in the south-east.
Rwanda	25	1.6	0 0.3%	1.4 *1.6*	-	-	Remaining forests are all montane and in the east.
Réunion	2.5	1.3[1]	-	0.8[1]	-	-	Almost all remaining forest is montane.
São Tomé & Príncipe	1	0.6[1]	-	0.6[1] *0.3*	-	-	Undisturbed rainforest occurs in the wettest areas of the south-west of each island on inaccessible terrain.
Senegal	193	75	0.5 0.7%	4.5 *2.0*[2]	1.5	1	There are small remnants of lowland forest in the far south.
Seychelles	0.3	0.04[1]	-	0.03[1]	-	-	Native woodland only persists in inaccessible inland and upland localities.
Sierra Leone	72	19	0.1 0.6%	6.8 *5.0*	1.1	1*	Lowland evergreen moist forest is found in the south-east; semi-deciduous forest is scattered elsewhere, mostly in the east.
Somalia	627	7.5	0.03 0.4%	1.2 -	-	-	There is coastal mosaic forest in the extreme south, some riparian forest along rivers and small areas of montane forest in the northern hills.
Sudan	2,376	430	4.8 1.1%	15 -	-	-	There are small patches of lowland and montane moist forest in the south and south-west.
Tanzania	886	336	4.4 1.2%	11 -	1.2	2	The main closed forests are montane rainforests in the east; there are also small areas of swamp forest in the west and lowland forest mosaic along the coast.
Togo	54	14	0.2 1.5%	2.5 *1.0*	1.3	1	Lowland forest is found along the southern part of the western border.

Table 7. Forests in the tropics

Biodiversity	Factors effecting forests	Area prot. (thousand hectares)	% prot.	% cover in 8ML
Diversity is reletively low; endemism is high. Significent numbers of species, particularly vertebretes, heve become extinct since the arrival of humens.	Virtually ell (over 98%) primary forest hes been destroyed. Logging, clearing for agriculture end the collection of fuelwood ere the main ceuses of forest loss.	-	-	-
Diversity is low; there is e reesonable number of regional (i.e. Comorean) endemics.	The islend was reportedly completely deforested in the 19th century.	There are no protected arees in IUCN categories I-V.		
The forests are little known but mey be expected to heve reesoneble diversity and regionel endemism.	Little information is eveilable on current threats to the forests.	*0*	*0%*	-
The forests ere rich and heve significent numbers of regionel endemics, perticulerly in the east.	Between 85 end 90% of forest has been cleered. Deforestation is the result of en increese in eree devoted to subsistence farming end the spreed of cash cropping by peesants.	310	8%	78%
The forests ere rich in regionel endemics end are considered to heve en unusually high overell species diversity.	80-90% of forest hes been cleered. Humen population density is extremely high. Forests are threatened by encroechment for agriculture end gold-mining, end collection of fuelwood end timber. The long term effects of recent upheevels ere unclear.	25	16%	85%
The forests ere relatively depauperete but rich in regionel endemics; e lerge number of species, perticulerly vertebretes, heve become extinct since the arrival of humens.	Around 60-65% of forest has been cleered. Logging, clearing for agriculture end the collection of fuelwnod ere the mein ceuses of deforestetion. Invesion by introduced species is e mejor ceuse of degradation.	-	-	-
The forests ere reletively depauperete but have significent numbers of endemics, particularly birds.	Estimetes of forest eree cleered vary from 40% to 60%. Forest elsewhere on the islands has been cleered for agriculture. Existing forest is relatively undisturbed elthough fuelwood collection hes sterted.	There ere no protected areas in IUCN categories I-V.		
Diversity is moderete, elthough the feuna is now impoverished. Endemism is extremely low.	Moist forest has been largely reduced to degraded copses of mature trees. Demend for egricultural lend ere firewood ere major threets, as is fire, leading to replecement of forests by grassland.	5.2	3%	100%
The forests are very depeuperete but endemism is high.	Forest wes cleered for logging and agriculture end hes largely been repleced by introduced species.	-	-	-
Forest biote are typicel West Africen, with high diversity and significent regionel endemism.	Over 90% of forest has been cleered or degreded. Slesh end burn egriculture is the mejor ceuse of forest deterioretion end loss.	0	0%	90%
The forest ere not well documented but there is probebly moderete diversity and some regionel endemism.	There is no relieble information on the emount of forest destroyed or current rates of deforestation.	-	-	-
The forests ere little studied but may have notable numbers of regionel endemics.	There is little information, elthough conversion for cash crops, especielly tee, hes occurred.	-	-	-
Diversity is high elthough lower then in the main Guineo-Congolean reinforests; regionel endemism is very high.	It is uncleer how much forest hes been cleered in historicel times. Encroechment, illegel herveeting and burning are all major problems.	193	18%	93%
The forests are little known but may be expected to be diverse with reesonable regionel endemism, but very little netionel endemism.	It is thought thet 85-95% of the forest hes been cleered. Logging, conversion to egriculture end burning are all important.	0.1	0.1%	76%

Table 7. Forests in the tropics

	Country Size	Forest and wood-land	Annual deforest.	Forest cover	FI	Map Scale	Description of forests
	(thousand square kilometres)						
Uganda	200	63	0.7 1.0%	8.1 *7.0*	1.7	0.5	There is lowland rainforest along the north-western shore of Lake Victoria and on the eastern rim of the rift valley escarpment in the west; montane forest is found on Mt Elgon in the east and in the south-west (chiefly Rwenzori and Bwindi).
Zaire	2,268	1,133	7.3 0.6%	1,035 *1,191*	0.5	1	Most of the forests are semi-evergreen; swamp and riverine forests and Guineo-Congolean lowland rainforests occur in the Cuvette Centrale and montane forests in the eastern highlands.
Zimbabwe	387	89	0.6 0.7%	0.7 *0.08*	-	-	There is some montane forest and a very small amount of lowland forest in the eastern ranges.

Table 7. Forests in the tropics

Biodiversity	Factors affecting forests	Area prot.	% prot.	% cover in BML
		(thousand hectares)		
The forests are diverse and have significant numbers of regional endemics.	Three-quarters of forest area has been lost in the present century. Encroachment and logging are problems.	69	10%	94%
Zaire has the highest species diversity of eny African country. The Albertine rift (eastern highland) forests in the east are rich in regional endemics.	Around 40% of forest has been cleared. Clearance for agricultura is the major threat; commerciel logging is inhibited by poor transport network but is locally important (e.g. in the east).	5,151	4%	84%
Diversity is relatively low and endemism is believed very low.	The great majority (probably over 95%) of closed forest hes been cleered. Most remaining forests are in erees unsuiteble for egriculture. There is some minor exploitetion for fuelwood and other forest products.	-	-	-

Table 8. National protected areas

Most countries have developed systems of protected areas and these make a vital contribution to the conservation of the world's natural and cultural resources. Protected areas can allow maintenance of representative samples of natural habitats and biological diversity; they can, in watershed areas for example, promote environmental stability in adjacent regions; they can allow opportunities for rural development, scientific research and monitoring, conservation education, and for recreation and tourism.

The nature and effectiveness of protected area systems vary considerably from one country to another, depending on needs and priorities, and on differences in legislative, institutional and financial support. The *United Nations List of National Parks and Protected Areas* is prepared as a standardised listing of protected areas which on the basis of available information meet certain criteria; the latest edition contains data for 1993 (IUCN, 1994). This list is based on collaboration between IUCN/CNPPA, WCMC and national agencies concerned with the establishment and management of protected areas. The table below is produced from the WCMC protected areas database from which the UN List is also created.

Protected areas vary enormously in size, from tiny areas of a few tens of square metres to vast regions covering thousands of square kilometres. There has been much debate about the optimal size and configuration of reserves and reserve networks. For the purposes of species conservation it is becoming increasingly evident that larger does not necessarily mean better, in that a number of small reserves may protect more species overall than one large reserve of the same total size. Smaller reserves may in some cases also be easier to manage and protect. Conversely, small reserves may not be big enough to support viable populations of species (almost always animals) which have large home ranges. They also have high perimeter length in relation to their area, and thus may be susceptible to environmental degradation through edge effects and to human encroachment if they are not adequately protected. This last consideration is likely to be one of increasing importance in parts of the world with high and increasing human population densities. In such areas, it seems likely that long-term maintenance of at least some natural and semi-natural ecosystems will depend on very large protected areas. These are also of fundamental importance in the maintenance of "wilderness", a concept which has become of major conservation concern in developed countries.

Figure 7 shows the 111 protected areas in the world whose individual area is greater than 2,000,000 ha (categories I-V, data from WCMC protected areas database). A significant number of these are at high latitudes, particularly in northern boreal and Arctic regions of relatively low species diversity, and are evidently of greater importance in wilderness preservation than in the maintenance of global biological diversity. However, a gratifying number are situated in tropical regions, including northern South America, which appears to have highest known level of regional biological diversity in the world (see Fig. 2). If these protected areas can be adequately managed in the long-term they will undoubtedly play an extremely important role in the maintenance of the global biodiversity estate.

Three important types of area have not been included in the UN List. These are those managed for forestry, those managed by or on behalf of indigenous peoples, and those in private ownership.

Managed areas in the forestry sector cover over 10% of the tropics. Throughout the tropics, forestry policy is undergoing substantial change, with increased emphasis being placed on a balanced approach to sustainable production and conservation. However, there is still much to be achieved, and in many countries the conservation value of the forest estate has not been assessed. Areas managed by or on behalf of indigenous peoples are frequently of great importance for nature conservation. Collectively, they cover over seven million square kilometres and their distribution tends to correlate strongly with areas of biological richness. Colombia, for example, has ceded over 25% of its territory to indigenous peoples, and most of this is in biologically diverse tropical forest regions. Private protected areas are not usually significant in terms of the area they cover, but they are important because of the quality of management and degree of protection afforded to them. Private areas include those areas administered by foundations and private enterprise, as well as those established and run by

communities themselves. Many private initiatives usefully support and complement state systems, and they tend to assume greater significance where state resources are very limited.

NOTES TO TABLE 8

This table provides data on the number and area of national protected areas in each of the categories I-V, and an indication of the total country area under such protection.

Three criteria determine whether a site is included in the UN List and is thus accounted for in this table:

Size: only protected areas of more than 1,000 hectares are included, with the exception of offshore or oceanic islands of at least 100 hectares where the whole island is protected (one thousand hectares is equivalent to 10 square kilometres or 2,471 acres or 3.86 square miles).
Management objectives: a series of protected area management categories, defined by management objectives, are identified by IUCN/CNPPA. Definitions of each category are provided below. The 1993 edition of the list includes sites in IUCN Management Categories I through V. The management categories used are outlined below. In mid-1993, a new protected areas management category system was approved by the IUCN Council, on the advice of CNPPA.
Authority of the management agency: sites managed by the highest appropriate level of government and sites managed by state authorities within federal systems have been included.

Protected area management categories I-III imply more complete protection than categories IV (where resource extraction is permitted) and V (where traditional land uses are maintained). The data are obtained with the cooperation of protected area managers and agencies around the world, and in collaboration with IUCN/CNPPA, and are maintained in the Protected Areas database at WCMC.

Columns 2-11: For each of the management categories I-V two columns contain data on the number of protected areas and their combined area per country. See note on different management of categories I-III and IV-V.

Columns 12-13: These two columns give the combined total number of protected areas in categories I-V for each country, and their combined area.

Columns 14-16: These refer to percent of country land area that is protected 'strictly' (categories I-III) or partially (categories IV-V), and overall (I-V). It is important to note a source of bias in these data columns: in several cases the protected area total includes marine areas but because land area is used to calculate the percent protected figure, this last will be inflated significantly where in countries with relatively large marine protected areas (eg. Kiribati, Panama, St Vincent, Australia - Great Barrier Reef Marine Park and Ecuador - Galápagos Marine Resource Reserve).

1978 Protected Areas Management categories

I - STRICT NATURE RESERVE/SCIENTIFIC RESERVE
To protect nature and maintain natural processes in an undisturbed state in order to have ecologically representative examples of the natural environment available for scientific study, environmental monitoring, education, and for the maintenance of genetic resources in a dynamic and evolutionary state.

II - NATIONAL PARK
To protect outstanding natural and scenic areas of national or international significance for scientific, educational, and recreational use. These are relatively large natural areas not materially altered by human activity where extractive resource uses are not allowed.

III - NATURAL MONUMENT/NATURAL LANDMARK
To protect and preserve nationally significant natural features because of their special interest or unique characteristics. These are relatively small areas focused on protection of specific features.

IV - MANAGED NATURE RESERVE/WILDLIFE SANCTUARY
To assure the natural conditions necessary to protect nationally significant species, groups of species, biotic communities, or physical features of the environment where these may require specific human manipulation for their perpetuation. Controlled harvesting of some resources can be permitted.

V - PROTECTED LANDSCAPES AND SEASCAPES
To maintain nationally significant natural landscapes which are characteristic of the harmonious interaction of man and land while providing opportunities for public enjoyment through recreation and tourism within the normal life style and economic activity of these areas. These are mixed cultural/natural landscapes of high scenic value where traditional land uses are maintained.

Table 8. National protected areas

	Category I		Category II		Category III	
	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
EUROPE						
Albania	0	0	6	9,600	0	0
Austria	0	0	1	5,773	0	0
Belgium	0	0	0	0	0	0
Belarus	1	63,458	1	81,023	0	0
Bosnia and Herzegovina	0	0	1	17,250	0	0
Bulgaria	26	61,824	3	221,253	2	4,424
Croatia	4	19,784	5	46,331	1	1,100
Czech Republic	4	12,876	2	74,820	0	0
Denmark	9	23,838	0	0	2	6,290
Estonia	6	68,428	1	176,922	0	0
Finland	15	150,820	22	393,990	0	0
France	7	43,680	8	288,797	0	0
Germany	0	0	1	13,100	0	0
Greece	0	0	8	60,392	2	18,000
Hungary	0	0	5	159,139	0	0
Iceland	1	270	3	180,100	5	38,604
Ireland	0	0	5	36,798	0	0
Italy	0	0	11	471,918	1	1,500
Latvia	4	38,443	0	0	1	2,520
Liechtenstein	0	0	0	0	0	0
Lithuania	4	20,784	5	132,950	0	0
Luxembourg	0	0	0	0	0	0
Macedonia	0	0	3	108,338	5	47,515
Moldova	2	6,200	0	0	0	0
Netherlands	3	4,211	6	21,370	23	226,195
Norway	55	2,726,383	20	2,328,110	0	0
Poland	1	1,592	15	148,326	0	0
Portugal	2	13,072	1	21,100	1	2,730
Romania	12	60,741	11	841,561	0	0
Slovakia	1	1,193	5	199,724	1	1,517
Slovania	0	0	1	84,805	0	0
Spain	0	0	10	132,478	0	0
Sweden	38	949,101	15	495,028	0	0
Switzerland	1	16,887	0	0	0	0
United Kingdom	8	23,018	4	20,272	0	0
Yugoslavia	1	1,124	7	148,775	1	1,600
ASIA						
Afghanistan	0	0	1	41,000	0	0
Armenia	3	63,900	1	150,000	0	0
Azerbaijan	12	190,860	0	0	0	0
Bangladesh	0	0	0	0	0	0
Bhutan	1	64,400	4	660,600	0	0
Brunei	9	66,274	1	48,859	0	0

Table 8. National protected areas

Category IV		Category V		Total I-V		Percent country area protected		
No.	Area (ha)	No.	Area (ha)	No.	Total Area (ha)	Totally I-III	Partially IV-V	I-V
5	24,400	0	0	11	34,000	0.33	0.85	1.18
47	372,046	122	1,627,656	170	2,005,475	0.07	23.85	23.92
1	3,988	2	73,150	3	77,138	0.00	2.53	2.53
0	0	8	98,007	10	242,488	0.70	0.47	1.17
1	1,434	3	6,375	5	25,059	0.34	0.15	0.49
13	50,748	2	31,641	46	369,890	2.59	0.74	3.34
5	15,418	14	302,711	29	385,344	1.19	5.63	6.82
4	6,361	24	972,751	34	1,066,808	1.11	12.42	13.53
61	1,165,143	41	193,479	113	1,388,750	0.70	31.54	32.24
28	138,823	4	55,978	39	440,151	5.44	4.32	9.76
45	2,183,835	0	0	82	2,728,645	1.62	6.48	8.10
58	253,634	37	5,015,375	110	5,601,486	0.61	9.69	10.30
88	262,640	415	8,919,962	504	9,195,702	0.04	25.73	25.77
6	11,483	8	133,178	24	223,053	0.59	1.10	1.69
6	13,815	42	401,060	53	574,014	1.71	4.46	6.17
5	51,950	8	645,000	22	915,924	2.13	6.78	8.91
7	10,033	0	0	12	46,831	0.53	0.15	0.68
86	221,922	74	1,579,485	172	2,274,825	1.57	5.98	7.55
23	62,177	17	871,584	45	774,724	0.64	11.52	12.16
0	0	1	6,000	1	6,000	0.00	37.50	37.50
37	99,615	30	381,370	76	634,719	2.36	7.38	9.73
0	0	1	36,000	1	36,000	0.00	13.93	13.93
5	46,894	3	13,771	16	216,518	6.06	2.36	8.42
0	0	0	0	2	6,200	0.18	0.00	0.18
47	136,765	0	0	79	388,541	6.12	3.32	9.44
8	17,645	31	464,374	114	5,536,512	15.61	1.49	17.09
21	67,967	74	2,845,668	111	3,063,553	0.48	9.32	9.80
10	108,616	11	437,102	25	582,620	0.40	5.91	6.31
11	22,788	5	159,815	39	1,084,905	3.80	0.77	4.57
15	41,990	18	771,085	40	1,015,509	14.42	57.93	72.36
0	0	9	23,282	10	108,087	4.19	1.15	5.34
86	1,736,920	119	2,376,232	215	4,245,630	0.26	8.15	8.41
135	1,254,205	26	290,711	214	2,989,045	3.28	3.50	6.78
48	241,198	60	472,622	109	730,707	0.41	17.29	17.70
64	292,186	115	4,792,490	191	5,127,966	0.18	20.76	20.94
1	16,133	11	179,334	21	346,966	1.48	1.91	3.40
5	177,438	0	0	6	218,438	0.06	0.27	0.33
0	0	0	0	4	213,900	7.18	0.00	7.18
0	0	0	0	12	190,860	2.20	0.00	2.20
6	83,332	2	13,458	8	96,790	0.00	0.67	0.67
4	241,100	0	0	9	968,100	15.55	5.17	20.72
0	0	0	0	10	115,133	19.97	0.00	19.97

Table 8. National protected areas

	Category I		Category II		Category III	
	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
ASIA continued						
China	3	98,425	0	0	1	30,000
Cyprus	0	0	1	9,337	0	0
Georgia	14	167,186	1	19,700	0	0
India	2	196,043	64	3,677,580	0	0
Indonesia	73	7,143,310	28	7,253,936	0	0
Iran	18	1,904,503	7	1,075,300	2	6,150
Israel	0	0	1	3,090	0	0
Japan	22	214,484	15	1,299,148	0	0
Jordan	1	1,200	0	0	0	0
Kazakhstan	8	845,972	1	45,500	0	0
Korea, P.D.R.	0	0	1	43,890	0	0
Korea, Republic	5	19,346	0	0	0	0
Kuwait	1	2,000	0	0	0	0
Kyrgyzstan	4	264,668	1	19,400	0	0
Lebanon	0	0	1	3,500	0	0
Malaysia	28	90,070	16	814,009	0	0
Mongolia	12	224,280	2	5,393,560	0	0
Myanmar	0	0	1	160,580	0	0
Nepal	0	0	8	1,014,400	0	0
Oman	0	0	1	46,000	0	0
Pakistan	0	0	6	882,195	0	0
Philippines	0	0	10	247,050	5	19,715
Qatar	0	0	0	0	0	0
Russia	75	37,649,408	23	4,545,515	4	8,990
Saudi Arabia	2	279,000	0	0	0	0
Singapore	0	0	0	0	0	0
Sri Lanka	3	31,575	22	436,339	0	0
Taiwan	0	0	4	303,486	0	0
Tajikistan	3	85,700	0	0	0	0
Thailand	0	0	74	4,336,026	0	0
Turkey	4	20,903	19	395,977	0	0
Turkmanistan	8	1,111,637	0	0	0	0
Ukraina	13	179,197	3	169,803	0	0
Uzbakistan	9	212,686	1	31,503	0	0
Viet Nam	0	0	9	202,427	0	0
OCEANIA						
Australia	80	3,816,022	415	27,849,176	71	262,416
Fiji	5	18,922	0	0	0	0
Kiribati	2	20,130	0	0	0	0
New Zealand	102	1,693,285	30	4,214,581	7	23,545
Northern Marianas	4	1,541	0	0	0	0
Palau	0	0	0	0	1	1,200
Papua New Guinea	0	0	3	7,323	0	0

Table 8. National protected areas

Category IV		Category V		Total I-V		Percent country area protected		
No.	Area (ha)	No.	Area (ha)	No.	Total Area (ha)	Totally I-III	Partially IV-V	I-V
421	55,590,538	38	2,347,800	463	58,066,583	0.01	6.04	8.05
3	68,000	0	0	4	75,337	1.01	7.14	8.14
0	0	0	0	15	186,886	2.68	0.00	2.68
307	10,458,515	1	18,600	374	14,350,738	1.22	3.31	4.53
46	3,649,132	28	518,914	175	18,565,292	7.50	2.17	9.67
4	1,144,918	37	4,188,695	68	8,299,566	1.81	3.22	5.04
13	296,345	1	8,400	15	307,835	0.15	14.67	14.82
30	492,342	13	752,252	80	2,758,226	4.09	3.37	7.46
6	79,200	3	209,900	10	290,300	0.01	3.01	3.02
0	0	0	0	9	891,472	0.33	0.00	0.33
1	14,000	0	0	2	57,890	0.36	0.11	0.47
3	27,148	20	647,304	28	693,798	0.20	6.85	7.05
0	0	1	25,000	2	27,000	0.08	1.03	1.11
0	0	0	0	5	284,068	1.43	0.00	1.43
0	0	0	0	1	3,500	0.34	0.00	0.34
9	579,745	1	1,011	54	1,484,835	2.72	1.74	4.46
0	0	1	550,000	15	8,167,840	3.59	0.35	3.94
0	0	1	12,691	2	173,271	0.24	0.02	0.26
4	94,100	0	0	12	1,108,500	7.17	0.67	7.84
27	3,688,650	1	1,600	29	3,736,250	0.17	13.57	13.74
45	2,718,693	4	122,051	55	3,720,939	1.10	3.53	4.63
8	321,243	4	17,919	27	605,927	0.89	1.13	2.02
1	1,619	0	0	1	1,619	0.00	0.14	0.14
95	23,279,636	2	53,210	199	65,536,759	2.47	1.37	3.84
7	5,472,400	1	450,000	10	6,201,400	0.12	2.47	2.58
1	2,796	0	0	1	2,796	0.00	4.54	4.54
31	328,039	0	0	56	795,953	7.13	5.00	12.13
8	79,024	2	44,087	14	426,597	8.21	3.33	11.54
0	0	0	0	3	85,700	0.60	0.00	0.60
36	2,671,150	1	13,100	111	7,020,276	8.44	5.22	13.66
14	300,650	7	101,911	44	819,441	0.53	0.52	1.05
0	0	0	0	8	1,111,637	2.28	0.00	2.28
4	173,367	0	0	20	522,367	0.58	0.29	0.87
0	0	0	0	10	244,189	0.55	0.00	0.55
50	1,127,361	0	0	59	1,329,788	0.61	3.42	4.03
294	13,344,479	32	48,273,364	892	93,545,457	4.16	8.02	12.18
0	0	0	0	5	18,922	1.03	0.00	1.03
1	6,500	0	0	3	26,630	29.43	9.50	38.93
67	216,383	0	0	206	6,147,794	22.37	0.82	23.19
0	0	0	0	4	1,541	3.23	0.00	3.23
0	0	0	0	1	1,200	2.44	0.00	2.44
2	74,693	0	0	5	82,016	0.02	0.16	0.18

Table 8. National protected areas

	Category I		Category II		Category III	
	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
OCEANIA continued						
Western Samoa	0	0	1	2,857	0	0
NORTH AND CENTRAL AMERICA						
Antigua and Barbuda	0	0	2	8,128	0	0
Aruba						
Bahamas	1	1,813	4	121,576	0	0
Belize	3	44,401	4	115,565	0	0
Canada	100	1,481,114	251	32,940,384	2	2,693
Costa Rica	4	15,169	13	488,337	0	0
Cuba	9	39,978	9	116,942	0	0
Dominica	0	0	1	6,872	0	0
Dominican Republic	0	0	8	563,934	0	0
El Salvador	0	0	1	3,222	0	0
Greenland	1	1,050,000	1	97,200,000	0	0
Guatemala	0	0	6	768,400	5	10,975
Haiti	0	0	2	7,500	0	0
Honduras	0	0	16	469,453	0	0
Jamaica	0	0	1	1,520	0	0
Mexico	6	316,498	33	1,597,788	3	9,558
Nicaragua	2	345,000	3	25,327	1	18,930
Panama	0	0	12	1,318,674	1	5,400
Saint Kitts and Nevis	0	0	1	2,610	0	0
Saint Lucia	0	0	0	0	0	0
Saint Vincent	0	0	0	0	0	0
Trinidad and Tobago	1	1,800	0	0	0	0
United States	455	14,365,978	178	22,013,247	70	8,138,507
SOUTH AMERICA						
Argentina	32	1,330,184	32	1,675,539	2	19,500
Bolivia	1	135,000	7	3,638,520	0	0
Brazil	53	3,940,314	97	16,483,686	0	0
Chile	0	0	30	8,361,367	2	13,606
Colombia	5	45,365	33	7,020,690	2	1,947,000
Ecuador	4	658,280	6	2,428,457	0	0
Guyana	0	0	1	58,559	0	0
Paraguay	0	0	12	1,362,811	1	2,500
Peru	0	0	8	2,413,718	7	1,629,908
Suriname	0	0	2	86,570	0	0
Uruguay	0	0	0	0	2	15,250
Venezuela	0	0	42	13,093,019	11	1,121,753
AFRICA						
Algeria	4	36,800	8	11,764,543	0	0
Angola	0	0	1	790,000	0	0
Benin	0	0	2	777,500	0	0

Catagory IV		Catagory V		Total I-V		Percent country area protected		
No.	Area (ha)	No.	Area (ha)	No.	Total Area (ha)	Totally I-III	Partially IV-V	I-V
2	7,215	0	0	3	10,072	1.01	2.54	3.55
0	0	0	0	2	6,128	13.86	0.00	13.86
5	975	0	0	10	124,364	8.90	0.07	8.97
7	163,155	0	0	14	323,121	6.97	7.10	14.07
176	38,676,635	111	9,444,666	640	82,545,492	3.47	4.85	8.32
9	129,387	3	5,671	29	638,564	9.89	2.65	12.55
15	183,161	20	572,676	53	892,757	1.37	6.43	7.80
0	0	0	0	1	6,872	9.15	0.00	9.15
6	440,140	3	44,210	17	1,048,284	11.64	10.00	21.64
1	2,000	0	0	2	5,222	0.15	0.09	0.24
0	0	0	0	2	98,250,000	44.95	0.00	44.95
5	52,591	1	1,000	17	832,966	7.16	0.49	7.65
0	0	1	2,200	3	9,700	0.27	0.08	0.35
28	393,330	0	0	44	862,783	4.19	3.51	7.70
0	0	0	0	1	1,520	0.13	0.00	0.13
12	3,886,725	11	3,918,183	65	9,728,732	0.98	3.96	4.93
53	514,193	0	0	59	903,450	2.63	3.47	6.10
2	2,258	0	0	15	1,326,332	16.86	0.03	16.89
0	0	0	0	1	2,610	10.00	0.00	10.00
1	1,494	0	0	1	1,494	0.00	2.41	2.41
2	8,284	0	0	2	8,284	0.00	21.30	21.30
5	13,928	0	0	6	15,728	0.35	2.72	3.07
402	47,277,905	389	12,442,379	1,494	104,238,016	4.75	6.37	11.12
18	1,327,691	2	20,140	86	4,373,054	1.09	0.49	1.57
16	5,446,199	1	13,300	25	9,233,019	3.43	4.97	8.40
49	4,453,098	74	7,312,739	273	32,189,837	2.40	1.38	3.78
34	5,350,152	0	0	66	13,725,125	11.14	7.12	18.26
1	2,045	38	342,911	79	9,358,011	7.91	0.30	8.22
2	7,994,613	3	32,543	15	11,113,893	6.69	17.39	24.08
0	0	0	0	1	58,559	0.27	0.00	0.27
1	30,000	5	87,695	19	1,483,006	3.36	0.29	3.65
2	75,347	5	57,217	22	4,176,190	3.15	0.10	3.25
11	649,400	0	0	13	735,970	0.53	3.96	4.49
1	8,000	5	8,836	8	32,086	0.08	0.09	0.17
5	96,448	42	12,011,086	100	26,322,306	15.59	13.28	28.86
6	41,507	1	76,438	19	11,919,288	4.95	0.05	5.00
3	891,200	2	960,000	6	2,641,200	0.63	1.48	2.12
0	0	0	0	2	777,500	6.90	0.00	6.90

Table 8. National protected areas

	Category I		Category II		Category III	
	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
AFRICA continued						
Botswana	0	0	6	9,731,450	0	0
Burkina Faso	0	0	3	489,300	0	0
Burundi	0	0	0	0	0	0
Cameroon	0	0	7	1,031,800	0	0
Central African Republic	1	86,000	4	3,102,000	0	0
Chad	0	0	2	414,000	0	0
Congo	0	0	1	126,600	0	0
Côte d'Ivoire	2	128,000	8	1,762,500	0	0
Djibouti	0	0	1	10,000	0	0
Egypt	3	37,000	1	61,500	0	0
Ethiopia	0	0	12	3,040,200	0	0
Gabon	1	15,000	0	0	0	0
Gambia	0	0	3	18,440	0	0
Ghana	1	38,570	6	1,058,430	0	0
Guinea	2	125,300	1	38,200	0	0
Kenya	0	0	32	3,451,383	0	0
Lesotho	0	0	0	0	0	0
Liberia	0	0	1	129,230	0	0
Libya	0	0	3	51,000	0	0
Madagascar	10	568,802	6	171,307	0	0
Malawi	0	0	5	696,200	0	0
Mali	0	0	1	350,000	0	0
Mauritania	1	310,000	2	1,186,000	0	0
Mauritius	0	0	0	0	0	0
Morocco	5	55,320	0	0	0	0
Mozambique	0	0	0	0	0	0
Namibia	0	0	5	8,975,751	1	24,462
Niger	0	0	1	220,000	0	0
Nigeria	0	0	6	2,228,400	0	0
Rwanda	0	0	2	327,000	0	0
Senegal	0	0	6	1,012,450	0	0
Seychelles	1	35,000	2	2,893	0	0
Sierra Leone	0	0	0	0	0	0
Somalia	0	0	0	0	0	0
South Africa	1	39,000	53	4,200,111	0	0
Sudan	0	0	8	8,499,000	1	15,000
Swaziland	0	0	0	0	0	0
Tanzania	0	0	12	4,099,975	0	0
Togo	0	0	3	357,290	0	0
Tunisia	1	450	8	44,417	0	0
Uganda	0	0	7	876,187	0	0
Zaire	0	0	8	9,916,625	0	0
Zambia	0	0	19	6,358,500	2	5,138
Zimbabwe	0	0	10	2,701,900	1	2,000
ANTARCTICA	19	242,535	0	0	0	0

Table 8. National protected areas

Catagory IV		Category V		Totel I-V		Percent country eree protected		
No.	Area (he)	No.	Area (he)	No.	Total Area (he)	Totelly I-III	Partially IV-V	I-V
4	931,830	0	0	9	10,863,280	16.92	1.62	18.54
9	2,172,600	0	0	12	2,661,900	1.78	7.93	9.71
0	0	3	88,865	3	88,865	0.00	3.19	3.19
7	1,018,625	0	0	14	2,050,425	2.17	2.14	4.31
8	2,918,000	0	0	13	6,106,000	5.10	4.67	9.77
7	11,080,000	0	0	9	11,494,000	0.32	8.63	8.95
9	1,050,794	0	0	10	1,177,394	0.37	3.07	3.44
2	102,350	0	0	12	1,992,850	5.86	0.32	6.18
0	0	0	0	1	10,000	0.43	0.00	0.43
8	694,700	0	0	12	793,200	0.10	0.69	0.79
11	2,982,400	0	0	23	6,022,600	2.75	2.70	5.45
5	1,030,000	0	0	6	1,045,000	0.06	3.85	3.90
2	4,500	0	0	5	22,940	1.72	0.42	2.15
2	6,620	0	0	9	1,103,620	4.60	0.03	4.63
0	0	0	0	3	163,500	0.87	0.00	0.87
4	52,373	0	0	36	3,503,756	5.92	0.09	6.01
1	6,805	0	0	1	6,805	0.00	0.22	0.22
0	0	0	0	1	129,230	1.16	0.00	1.16
3	122,000	0	0	6	173,000	0.03	0.07	0.10
21	375,190	0	0	37	1,115,299	1.25	0.63	1.88
4	362,300	0	0	9	1,058,500	7.40	3.85	11.25
10	3,661,989	0	0	11	4,011,989	0.28	2.95	3.24
1	250,000	0	0	4	1,746,000	1.45	0.24	1.69
3	4,023	0	0	3	4,023	0.00	2.16	2.16
3	237,000	2	69,800	10	382,120	0.12	0.67	0.79
1	2,000	0	0	1	2,000	0.00	0.00	0.00
4	434,664	2	782,900	12	10,217,777	10.92	1.48	12.40
4	8,196,240	0	0	5	8,416,240	0.19	6.91	7.09
13	744,869	0	0	19	2,971,269	2.41	0.81	3.22
0	0	0	0	2	327,000	12.42	0.00	12.42
4	1,168,259	0	0	10	2,180,709	5.15	5.94	11.09
0	0	0	0	3	37,893	93.79	0.00	93.79
2	82,013	0	0	2	82,013	0.00	1.13	1.13
1	180,000	0	0	1	180,000	0.00	0.29	0.29
183	2,689,147	0	0	237	6,928,258	3.58	2.27	5.85
6	752,500	1	116,000	16	9,382,500	3.40	0.35	3.74
4	45,920	0	0	4	45,920	0.00	2.64	2.64
18	9,790,000	0	0	30	13,889,975	4.36	10.42	14.78
8	289,616	0	0	11	646,906	6.29	5.10	11.39
0	0	0	0	7	44,867	0.27	0.00	0.27
22	1,026,020	2	6,539	31	1,908,746	3.70	4.36	8.07
0	0	0	0	8	3,916,625	4.23	0.00	4.23
0	0	0	0	21	6,363,638	8.46	0.00	8.46
4	18,280	10	345,643	25	3,067,823	6.93	0.93	7.86
0	0	0	0	19	242,535	0.02	0.00	0.02

Table 9. Systematics collections

Systematics - the discovery, description and classification of species - is a discipline with low public profile yet fundamental to human understanding, use and management of biological diversity.

Systematics is important for many reasons. The correct identification of experimental material is essential in order to allow results to be corroborated by other researchers. Identification of pests and pathogens to species or strain is essential before control measures can be planned. Identification of discrete fishery stocks allows management to be tuned appropriately. Information on the phylogeny of species allows properties known to exist in one species to be sought after in related species, or permits related species to be investigated for hitherto unknown but possibly useful properties; such phylogenetic information is the basis for much agricultural improvement (and is one reason why data on wild relatives are given in Tables 4 and 5 above). Recent literature provides an abundance of concrete examples of the significance of systematics to biomedical research, healthcare, agricultural development, forestry and fisheries management, and to general understanding of the biosphere (eg. *Systematics Agenda 2000*; NERC, 1992, *The New Taxonomy*; Hawksworth and Ritchie, 1993, *Biodiversity and Biosystematic Priorities: microorganisms and invertebrates*).

Systematics collections, eg. preserved plant or animal material, living collections of fishes, trees, or microorganisms, perform several functions. They are a material record of human inventory and understanding of biodiversity; museum specimens are essential if known species are to be classified and new species recognised as new; collections provide material or research guidance for all kinds of applied biology, including medical science and biotechnology; and they serve to raise public awareness of and interest in the living world.

Because of their fundamental importance, systematics collections support a wide variety of pure and applied studies and also serve as foci of public interest and concern. A corollary of this relationship is that biodiversity research and concern tends to be greatly restricted wherever systematics collections are sparse or non-existent; this appears to be the case even though both biological specimens and systematic expertise can to a degree be distributed.

Figure 8 shows the 20 countries having most systematics collections in relation to their national level of biodiversity (see Note below for explanation). These resources are here represented by the sum of the number of natural history museums, zoos, and botanic gardens. Countries most rich in biodiversity (see Figure 2) are relatively poor in systematics collections; with the exception of USA, all countries with a large number of systematics collections are not rich in biodiversity. Correcting this degree of imbalance, or at least the implied differential availability of expertise, will be necessary if the goals of the Convention on Biodiversity are to be met at a satisfactory level.

NOTES TO TABLE 9

This table provides estimates of the number of various kinds of systematics collections present in each country.

Key:
- Indicates lack of data.

The data tabulated are not definitive; collections will certainly be incompletely and unevenly reported in the source compilations and databases. However, the figures overall are probably indicative of the relative distribution of collections and expertise available as a basis for systematics research and education. It is important to note that data are not additive across columns; eg. the same institution may be counted in both the botanic garden and herbarium columns.

We thank Diane Wyse Jackson of Botanic Gardens Conservation International (BGCI) for a listing of botanic gardens from the BGCI database (current at 24 August 1994) and Hideaki Sugawara of the World Data Centre on Microorganisms (WDCM) for data on number of collections of live microorganisms registered with WDCM in 1993.

Column 2, Natural history museums: The figure for each country is the sum of the number of institutions indexed under botany, natural history and zoology in Bartz *et al.* (1992).

Column 3, Insect and spider museum collections: These figures indicate the number of public collections of preserved insect and spider specimens as collated by Arnett and Samuelson (1986). The insects comprise around 90% of the world's species and many are of great economic significance. Data gathering for the source used ended in December 1984; there is no more recent compilation known to us. Lack of a figure in this column means that no insect collection was known to Arnett and Samuelson in 1984; further collections may have existed at that time and others will have been started.

Column 4, Herbaria: Number of herbaria (together with botanic gardens that include herbaria) per country. Some data refer to former countries now divided. Derived from Table 3 in Holmgren *et al.* (1990) with later additions from Holmgren and Holmgren (1991, 1993, 1994).

Column 5, Zoos: These figures are from the most complete and recent published listing of captive animal collections (Swengel, 1993). Some of the institutions included are small private collections, some are major research centres.

Column 6, Aquaria: These estimates include specialist aquaria and zoos that have live fish collections. These figures are intended to provide some indication of the interest shown in fishes. See previous notes and source. These figures are for all captive animal collections that are recorded in Swengel (1993) as keeping fishes; no data are available for many institutions, but it appears likely that details will have been made available by most specialist aquaria. Some collections comprise one or two species, a few specialist aquaria hold more between 100 and 500 species.

Column 7, Botanic Gardens: Information derived from the database of Botanic Gardens Conservation International provided by Diane Wyse Jackson, current at 24 August 1994.

Column 8, Microorganisms: Collections of living cultures of microorganisms registered with the World Data Centre on Microorganisms (WDCM) in 1993. Information kindly provided by Hideaki Sugawara, 7 October 1994 (and see Sugawara *et al.* 1993).

NOTES TO FIGURE 8

This map shows the 20 countries which have the greatest number of systematics collections per 'unit' of biodiversity. The number of such collections is here represented by the sum of the number of natural history museums, zoos and botanic gardens. Biodiversity richness is estimated according to e form of national biodiversity index: see text under Table 1 (Notes to Figure 2) for an outline of the derivation of this index.

Table 9. Systematics collections

	Natural History Museums	Insect & spider museum collections	Herbaria (& botanic gardens with herbaria)	Zoos	Aquaria (& zoos with fish collections)	Botanic Gardens	Microorganisms
EUROPE							
Albania	2	1	-	-	-	1	-
Andorra	-	-	-	-	-	-	-
Austria	11	18	20	20	3	11	1
Belarus	1	-	-	1	1	8	-
Belgium	8	5	12	8	3	16	5
Bosnia & Herzegovina	-	1	-	-	-	-	-
Bulgaria	5	2	3	3	2	9	3
Croatia	6	1	-	3	-	7	-
Czech Republic	26	5	-	13	7	26	-
former Czechoslovakia	40	6	63	-	-	-	16
Danmark	3	2	3	16	4	8	2
Estonia	-	1	-	1	1	3	-
Finland	12	2	20	4	1	8	2
France	50	5	55	40	7	68	15
Germany	66	30	59	215	38	75	14
Gibraltar	-	-	-	-	-	1	-
Greece	3	1	5	-	-	4	4
Hungary	6	3	8	6	4	17	6
Iceland	5	1	2	-	-	2	-
Ireland	3	1	18	2	0	8	2
Italy	71	14	56	32	10	48	9
Latvia	-	-	-	1	1	2	-
Liechtanstain	-	-	-	-	-	-	-
Lithuania	-	-	-	2	2	5	-
Luxembourg	1	1	1	-	-	-	-
Mecadonia	-	-	-	-	-	7	-
Malta	1	-	1	-	-	1	-
Moldova	-	-	-	1	1	2	-
Monaco	-	-	-	1	1	1	-
Netherlands	28	7	14	13	7	39	8
Norway	7	2	7	7	2	6	2
Poland	26	5	28	9	8	25	5
Portugal	3	3	20	3	2	12	1
Romania	9	5	14	3	-	10	1
San Marino	-	-	-	-	-	-	-
Slovakia	13	1	-	3	1	7	-
Slovenia	1	1	-	2	1	3	1
Spain	12	4	47	19	6	13	2
Sweden	7	4	13	15	5	9	4
Switzerland	31	6	15	35	4	22	1
Ukraine	14	2	-	8	5	33	-
United Kingdom	40	23	556	104	31	64	25
former Yugoslavia	7	3	9	2	-	16	2

Table 9. Systematics collections

ASIA	Natural History Museums	Insect & spider museum collections	Herbaria (& botanic gardens with herbaria)	Zoos	Aquaria (& zoos with fish collections)	Botanic Gardens	Microorganisms
Afghanistan	1	-	1	1	-	-	-
Armania	-	1	-	1	1	3	-
Azerbaijan	-	-	-	1	0	3	-
Bahrain	-	-	-	1	1	-	-
Bangladesh	-	1	1	1	-	3	-
Bhutan	-	1	-	-	-	-	-
BIOT	-	-	-	-	-	-	-
Brunei	-	1	1	2	1	-	-
Cambodia	-	-	-	-	-	-	-
China	7	9	336	131	54	69	13
Cyprus	-	1	1	1	-	-	-
Georgia	2	-	-	3	2	5	-
Hong Kong	-	1	1	2	1	4	-
India	33	23	51	72	3	72	12
Indonesia	2	2	6	13	3	5	14
Iran	2	1	5	1	-	3	1
Iraq	1	1	9	1	-	1	-
Israel	6	1	6	5	-	7	2
Japan	26	12	47	160	31	54	23
Jordan	-	-	-	-	-	-	-
Kazakhstan	-	-	-	3	3	8	-
Korea, D.P.R.	-	-	-	1	-	1	-
Korea, Republic	2	3	8	4	2	5	2
Kuwait	1	1	1	1	0	-	-
Kyrgyzstan	-	-	-	-	-	3	-
Laos	-	-	-	-	-	-	-
Lebanon	1	1	1	-	-	-	-
Malaysia	1	2	7	6	1	9	3
Maldives	-	-	-	-	-	-	-
Mongolia	1	-	2	-	-	1	-
Myanmar	1	1	5	1	0	2	-
Nepal	1	1	1	1	-	1	-
Oman	1	-	1	1	-	-	-
Pakistan	8	2	9	3	-	5	1
Philippines	4	6	9	4	-	9	8
Qatar	-	-	-	2	0	-	-
Russia	10	3	-	18	10	74	10
Saudi Arabia	-	-	3	3	-	2	-
Singapore	-	2	2	3	1	1	2
Sri Lanka	1	1	2	1	1	5	4
Syria	-	-	-	-	-	-	-
Taiwan	-	-	9	3	-	3	-
Tajikistan	-	-	-	1	1	5	-
Thailand	2	1	4	6	1	5	59
Turkey	2	1	22	3	1	6	2

Table 9. Systematics collections

	Natural History Museums	Insect & spider museum collections	Herbaria (& botanic gardens with herbaria)	Zoos	Aquaria (& zoos with fish collections)	Botanic Gardens	Microorganisms
ASIA continued							
Turkmenisten	-	-	-	1	1	1	-
United Arab Emirates	-	-	1	2	2	-	-
former USSR	-	7	104	-	-	-	7
Uzbakistan	-	-	-	2	2	4	-
Viet Nem	-	1	3	1	-	3	-
Yemen	-	-	-	-	-	-	-
OCEANIA							
American Samoa	-	-	-	-	-	-	-
Australia	3	9	38	21	8	63	50
Cook Islands	-	-	-	-	-	-	-
Federated States of Micronesia	-	-	-	-	-	-	-
Fiji	-	2	1	-	-	2	-
French Polynesia	-	1	1	-	-	-	-
Guam	-	-	1	-	-	-	-
Kiribati	-	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-
Nauru	-	-	-	-	-	-	-
New Celedonia	-	1	1	2	-	-	-
New Zealand	5	17	16	8	4	17	9
Niue	-	-	-	-	-	-	-
Northern Merianes	-	-	-	-	-	-	-
Pelau	-	-	-	-	-	-	-
Papua New Guinee	-	-	-	2	-	4	1
Pitcairn Islands	-	-	-	-	-	-	-
Solomon Islands	-	1	1	-	-	1	-
Tokelau	-	-	-	-	-	-	-
Tonga	-	-	-	-	-	-	-
Tuvalu	-	-	-	-	-	-	-
USA Pacific Islands	-	-	-	-	-	-	-
Vanuatu	-	-	1	-	-	-	-
Wallis & Futuna	-	-	-	-	-	-	-
Western Samoa	-	-	-	-	-	1	-
NORTH & CENTRAL AMERICA							
Anguilla	-	-	-	-	-	-	-
Antigua & Barbuda	-	-	-	-	-	-	-
Aruba	-	-	-	-	-	-	-
Bahamas	-	-	-	4	-	-	-
Barbedos	-	2	1	2	1	2	-
Belize	-	-	1	1	0	1	-
Bermuda	1	1	-	1	1	1	-
Canada	26	94	110	57	16	18	28

	Natural History Museums	Insect & spider museum collections	Herbaria (& botanic gardens with herbaria)	Zoos	Aquaria (& zoos with fish collections)	Botanic Gardens	Microorganisms
NORTH & CENTRAL AMERICA continued							
Cayman Islands	-	-	-	-	-	1	-
Costa Rica	-	2	3	1	-	2	-
Cuba	3	2	15	5	3	8	-
Dominica	-	-	-	-	-	1	-
Dominican Republic	-	1	3	2	-	1	-
El Salvador	-	3	3	1	-	1	-
Greenland	-	-	1	-	-	-	-
Grenada	-	-	-	1	-	1	-
Guadaloupe	-	2	1	-	-	2	-
Guatemala	2	2	4	3	-	1	1
Haiti	-	-	1	-	-	1	-
Honduras	-	3	2	1	-	3	-
Jamaica	-	2	2	1	-	4	-
Martinique	-	-	-	-	-	3	-
Mexico	4	9	46	16	1	35	10
Montsarrat	-	-	-	-	-	-	-
Netherlands Antillas	-	-	-	3	-	-	-
Nicaragua	-	2	3	1	-	1	-
Panama	2	3	3	1	-	1	-
Puerto Rico	-	1	7	-	-	4	-
Saint Kitts-Nevis	-	-	-	-	-	-	-
Saint Lucia	-	-	-	1	-	-	-
Saint Vincent	-	-	-	-	-	1	-
Trinidad & Tobago	-	4	1	2	1	1	-
Turks & Caicos Islands	-	-	-	-	-	-	-
USA	182	232	633	396	114	270	31
Virgin Islands (British)	-	-	-	-	-	1	-
Virgin Islands (US)	-	-	1	-	-	1	-
SOUTH AMERICA							
Argentina	41	6	41	8	2	9	7
Bolivia	-	2	4	4	-	4	-
Brazil	16	66	88	73	2	24	44
Chile	6	9	10	3	-	8	1
Colombia	9	7	22	6	-	13	1
Ecuador	3	5	10	2	-	3	-
French Guiana	-	1	1	-	-	2	-
Guyana	-	2	2	1	0	2	-
Paraguay	4	1	3	3	-	1	-
Paru	1	8	11	1	0	6	-
Surinama	1	2	1	-	-	1	-
Uruguay	4	2	6	3	0	1	-
Vanezuala	2	5	15	13	2	7	1
AFRICA							
Algaria	1	1	1	2	-	3	-

Table 9. Systematics collections

	Natural History Museums	Insect & spider museum collections	Herbaria (& botanic gardens with herbaria)	Zoos	Aquaria (& zoos with fish collections)	Botanic Gardens	Microorganisms
AFRICA continued							
Angola	2	1	3	-	-	1	-
Benin	1	1	1	-	-	1	-
Botswana	-	1	3	-	-	-	-
Burkina faso	-	-	-	-	-	-	-
Burundi	1	-	1	-	-	1	-
Cameroon	-	1	4	-	-	2	-
Cape Verde	-	-	-	-	-	2	-
Central African Republic	2	-	1	-	-	-	-
Chad	1	1	-	-	-	-	-
Comoros	-	-	-	-	-	-	-
Congo	1	-	2	1	-	-	-
Côte d'Ivoire	-	-	2	1	-	1	-
Djibouti	-	-	-	-	-	-	-
Egypt	3	5	7	2	1	6	1
Equatoriel Guinea	-	-	-	-	-	-	-
Eritrea	-	-	-	-	-	-	-
Ethiopie	1	1	3	-	-	1	-
Gabon	-	-	1	1	-	1	-
Gambia	-	-	-	-	-	-	-
Ghana	-	1	5	1	0	3	-
Guinea	1	1	-	-	-	-	-
Guinea-Bisseu	-	1	-	-	-	-	-
Kenya	1	3	2	4	1	6	1
Lesotho	-	-	2	-	-	-	-
Liberia	-	-	1	1	0	-	-
Libya	1	1	2	2	-	1	-
Madegascar	1	1	2	3	-	1	-
Malawi	-	4	3	1	0	4	-
Mali	1	-	-	-	-	-	-
Mauritania	-	-	-	-	-	-	-
Meuritius	2	1	1	1	0	2	-
Meyotte	-	-	-	-	-	-	-
Morocco	1	1	2	5	1	2	-
Mozembique	1	1	5	-	-	2	-
Namibia	3	2	1	-	-	1	-
Niger	-	-	1	-	-	-	-
Nigerie	2	-	7	7	-	5	3
Réunion	1	1	1	-	-	4	-
Rwanda	-	-	-	-	-	1	-
Saint Helena & depend.	-	-	-	-	-	1	-
São Tomé & Principe	-	-	-	-	-	-	-
Senegal	1	-	2	1	-	3	2
Seychelles	1	1	1	-	-	1	-
Sierre Leone	-	-	4	-	-	1	-
Somalia	-	-	1	-	-	-	-

	Natural History Museums	Insect & spider museum collections	Herbaria (& botanic gardens with herbaria)	Zoos	Aquaria (& zoos with fish collections)	Botanic Gardens	Microorganisms
AFRICA continued							
South Africa	8	13	37	16	9	19	3
Sudan	2	1	3	1	-	1	-
Swaziland	-	-	-	-	-	-	-
Tanzania	5	1	4	-	-	3	-
Togo	-	-	1	-	-	1	-
Tunisia	-	1	1	2	2	1	-
Uganda	5	3	4	-	-	2	1
Western Sahara	-	-	-	-	-	-	-
Zaire	-	1	3	2	-	2	-
Zambia	-	1	4	-	-	-	-
Zimbabwe	1	3	4	1	-	4	2
ANTARCTICA							
Falkland Islands	-	-	-	-	-	-	-
French S & Antarctic Territories	-	-	-	-	-	-	-

Figure 1. States Party to the Convention on Biological Diversity

96 states at 28 October 1994. Data from the CBD Interim Secretariat. The EC is a Party but is not represented on map.

Figure 2. Countries with highest species diversity

These are the 20 countries with the highest species diversity as estimated by the WCMC national biodiversity index. Data from an earlier version of Table 1 (multiple sources). See Text (and notes) to Table 1 for explanation.

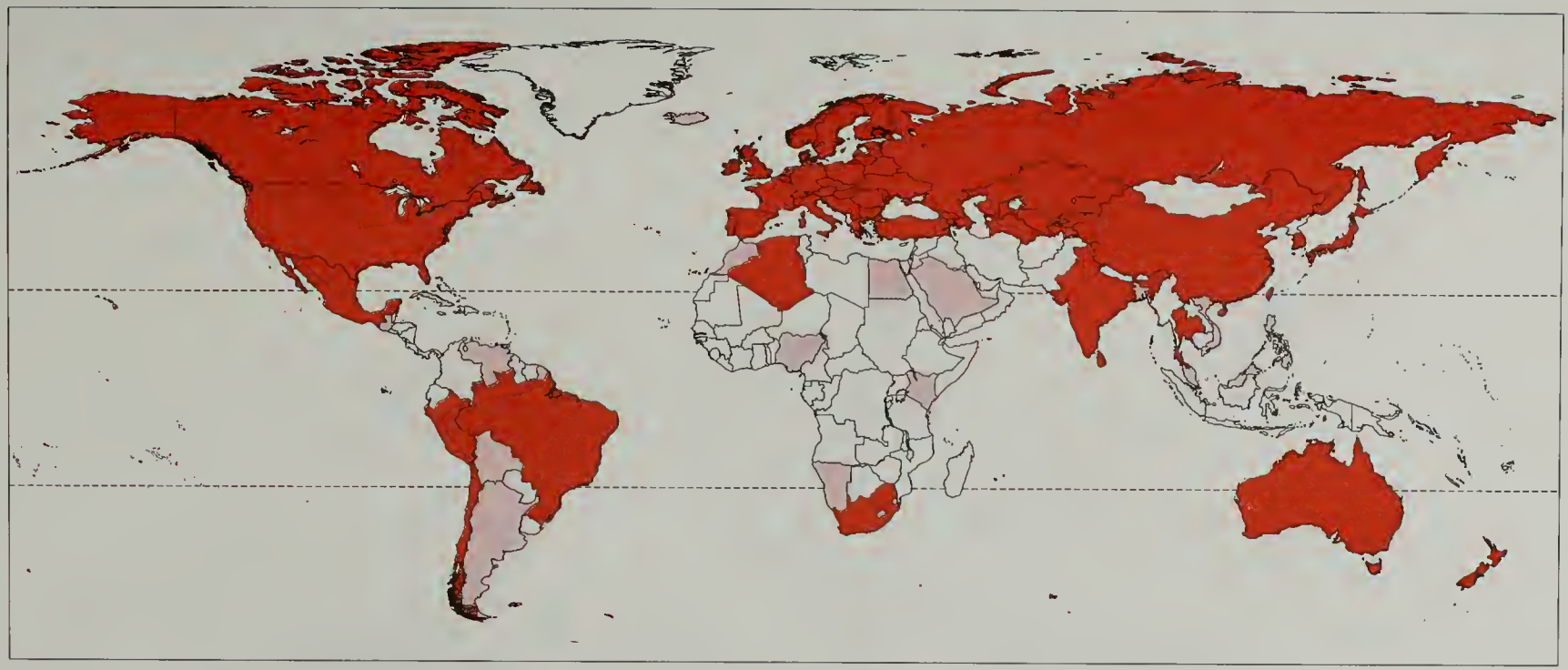

Figure 3. Countries with national Red Data Books

Data from Table 3. Preliminary literature search. Solid fill indicates coverage of plants and animals (any vertebrate group), lighter tone indicates either plants or animals alone.

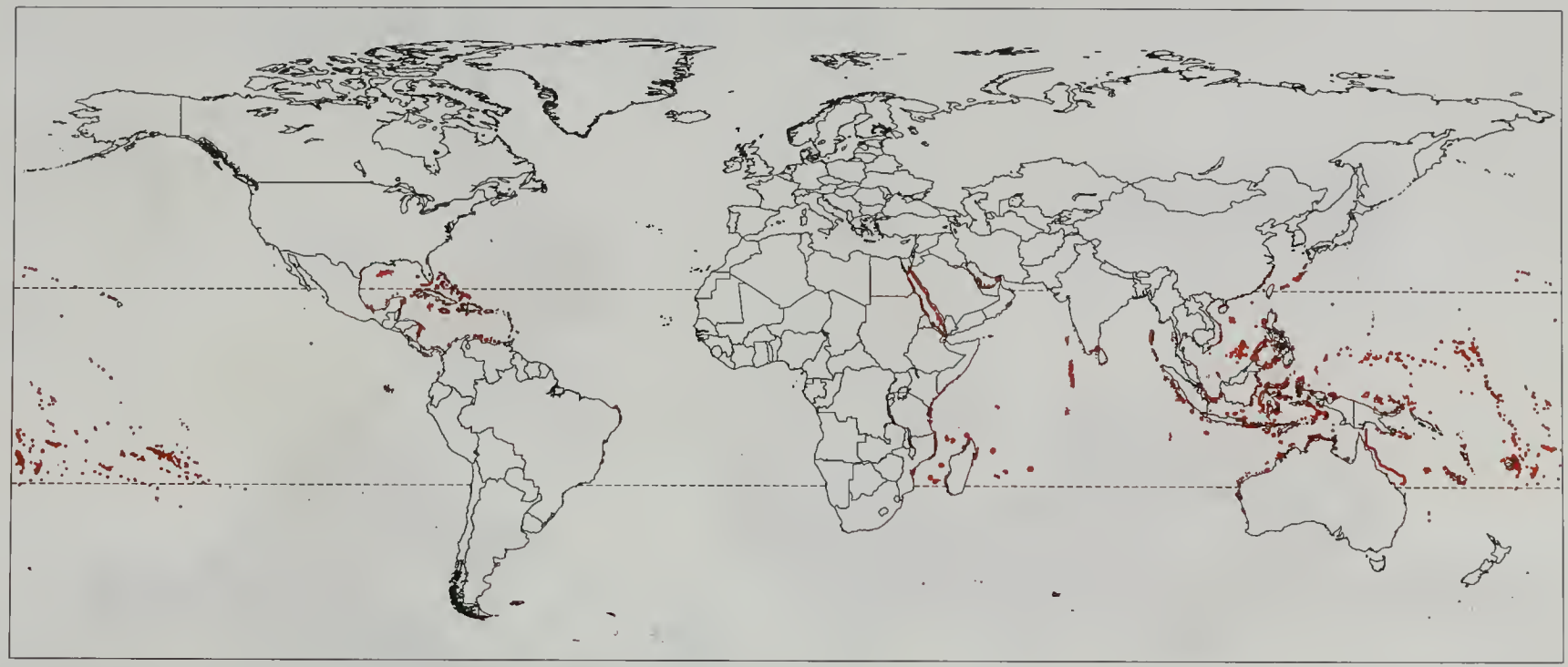

Figure 4. World distribution of coral reefs.
Data from WCMC Biodiversity Map Library (mostly from UNEP/IUCN, 1988).

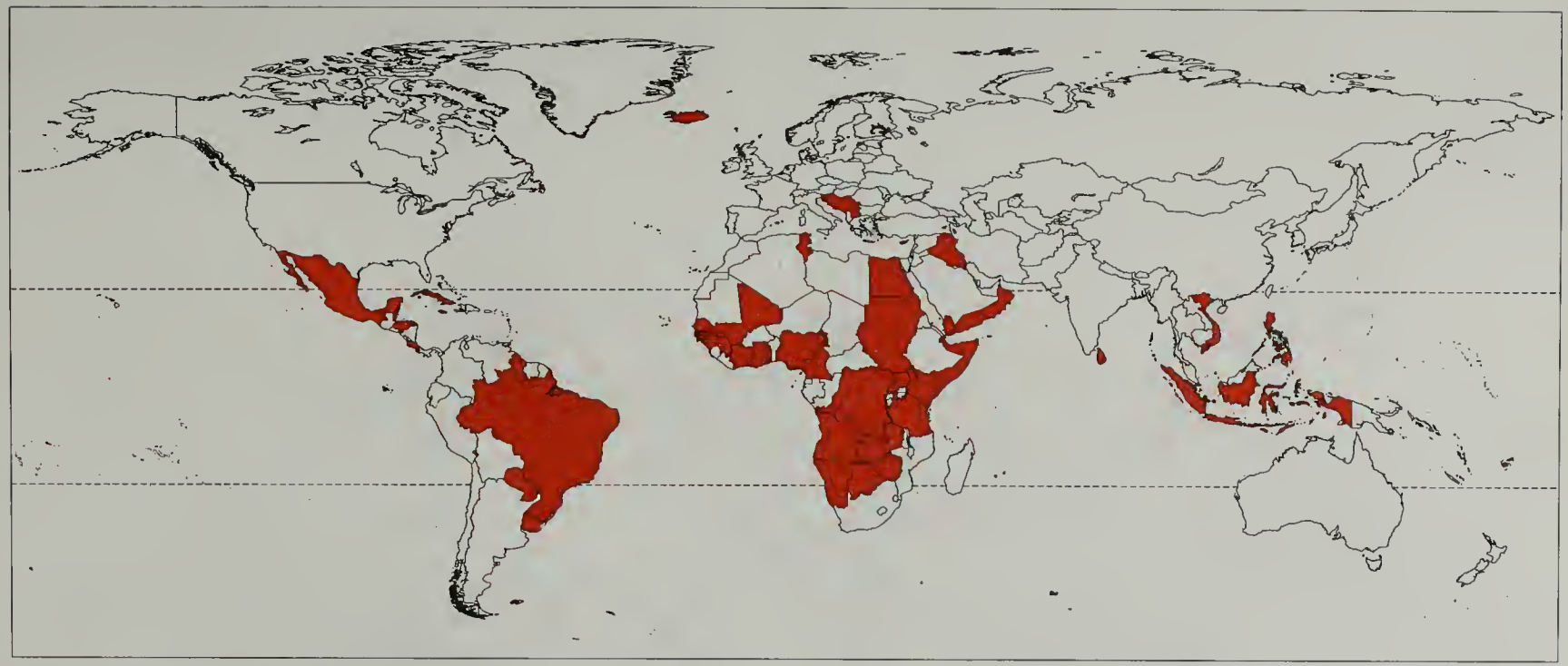

Figure 5. States Party to the UN Convention on the Law of the Sea.
Data from Treaty Section, OLA, UN. 9 September 1994

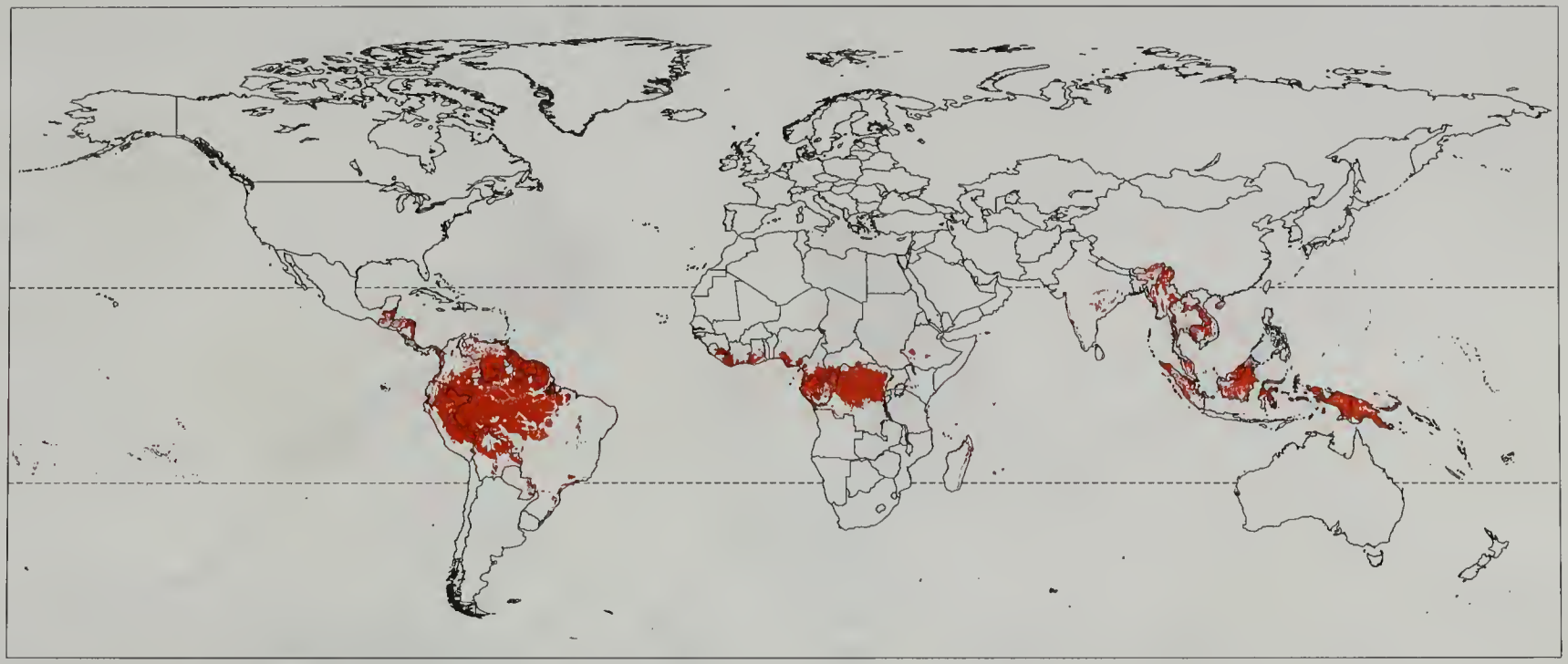

Figure 6. World distribution of forests in the tropics

Data from WCMC Biodiversity Map Library (multiple sources). 21 September 1994.

Figure 7. World distribution of protected areas larger than 2 million ha.

Data from WCMC protected areas database and Biodiversity Map Library (multiple sources). 21 September 1994.
Where PA boundary is not mapped the PA is represented by a proportional circle.

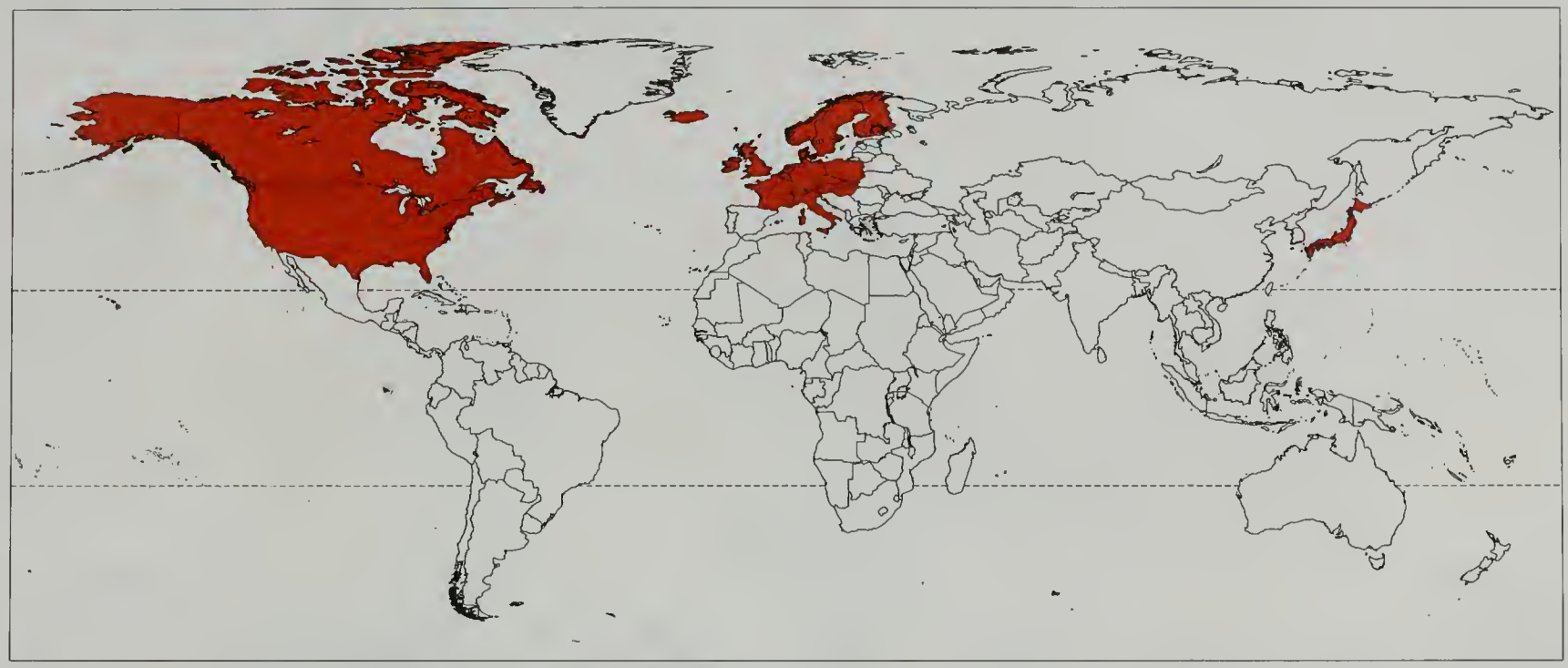

Figure 8. Countries with most systematics collections in relation to national biodiversity

Data from Tables 8 and 1 (multiple sources). Levels of biodiversity assessed by WCMC national biodiversity index; seeText (and Notes) to Table 1 for explanation.

References

Abdusaliamov, I.A. (Ed.) 1988. *Krasnaia kniga Tadzhikskoi SSR (Red data book of Tadjik SSR).* Izd-vo Donish, Dushanbe, Tajikistan.

Abeywickreme, B.A. 1987. *The Threatened Plants of Sri Lanka.* Natural Resources, Energy and Science Authority of Sri Lanka (NARESA), Colombo, Sri Lanka.

Adegbehin, J.O. 1993. Mangroves in Nigeria. In: Diop, E.S., Field, C.D. and Vannucci, M. 1993. *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions.* Mangrove Ecosystems Proceedings: 2. ISME/ITTO. pp.12-13.

Ahlen, I. and Tjernberg, M. 1988. Hotade och sallsynta ryggradsdjur i Sverige. (Threatened and Rare Vertebrates in Sweden). *Sveriges Natur* 79 (2): 33-42.

Ahlen, I. and Tjernberg, M. 1992. *Artfakta. Sveriges hotade och sällsynta ryggradsdjur 1992.* Databanken för hotade arter, Uppsala. 346pp.

Aksornkoae, S., Paphavasit, N. and Wattayakorn, G. 1993. Mangroves of Thailand: Present status of conservation, use and management. In: Clough, B.F. (Ed.) 1993. *The Economic and Environmental Values of Mangrove Forests and their Present State of Conservation in the South-east Asia\Pacific Region.* ITTO/ISME/JIAM Project PD71/89 Rev.1 (F). pp.83-133.

Alvarez-León, R. 1993. Mangrove Ecosystems of Colombia. In: Lacerda, L.D. 1993. *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions. Part I. Latin America.* Mangrove Ecosystems Technical Reports Vol. 3. ISME/ITTO. pp.75-115.

Andrusaitis, G. (Ed.) 1985. *Latvijas PSR sarkana gramata: retas un iznikstosas dzivnieku un augu sugas (Red Data Book of the Latvian SSR).* Zinatne, Riga, Latvia. 525 pp.

Anon. 1979. Végétation, La Guyane: Plance 12. Atlas des Départements d'Outre Mer, Centre d'Etudes de Géographie Tropical, ORSTOM, cited in Harcourt and Sayer (in press).

Anon. 1986. *Uhanalaisten eläinten ja kasvien suojelutoimikunnan mietintö. I Yleinen osa.* Piirrokset: Helsinki, Finland. 431pp.

Anon. 1988. *Truede virveldyr i Norge.* Rapport nr. 2 - 1988. Direcktoratet for Naturforvaltning, Trondheim.

Anon. 1991a. *Draft Red List of Threatened Animals of Turkey.* Prime Ministry Undersecretariat for Environment. Unpublished.

Anon. 1991b. *List of endangered vertebrate fauna.* Australian National Parks and Wildlife Service, Canberra. 12pp.

Anon. 1991c. *Livro Vermelho dos Vertebrados de Portugal. Vol. I - Mammíferos, Aves, Répteis e Anfibios.* Serviço Nacional de Parques, Reservas e Conservação da Natureza, Secretaria de Estado dos Recursos Naturais, Lisbon, Portugal.

Anon. 1991d. *Livro Vermelho dos Vertebrados de Portugal. Vol. II - Peixes Dulciaquícolas e Migradores.* Serviço Nacional de Parques, Reservas e Conservação da Natureza, Secretaria de Estado dos Recursos Naturais, Lisbon, Portugal. 55pp.

Anon. 1991e. *Red Data Book of Japan.* 2 volumes: vertebrates, invertebrates. Japanese Wildlife Research Centre.

Anon. 1992. *Endangered and Threatened Wildlife and Plants.* US Fish and Wildlife Service, Department of the Interior.

Anon. 1994. Lista Roja de Fauna Silvestre para Guatemala (mammiferos, aves, reptiles y anfibios). *Diario de Centro America.* No. 82. pp.2400-2403.

Ansari, T.A. 1986. Pakistan. In: Umali, R.M., Zamora, P.M., Gotera, R.R., Jara, R.S. and Camacho, A.S. 1986. *Mangroves of Asia and the Pacific: status and management. Technical report of the UNDP/UNESCO research and training pilot programme on mangrove ecosystems in Asia and the Pacific.* Ministry of Natural Resources, Natural Resources Management Center and National Mangrove Committee, Quezon City, Metro Manila, Philippines. pp.151-174.

Argus, G. and Pryer, K. 1990. *Rare vascular plants in Canada.* Our natural heritage. Ottawa: Canadian Museum of Nature. 191pp. Maps.

Arnett, R.H. and Samuelson, G.A. 1986. *The insect and spider collections of the world.* E.J. Brill and Fauna and Flora Publications, Gainesville, Florida. 220pp.

Babaev, A.G. (Ed.) 1985. *Turkmenistan SSR-ning Gyzyl kitaby: khaivanlaryng ve osumliklering selcheng dush gelian khem iitip gitmek khovpy astyndaky gornushleri (Red Data Book of Turkmen SSR).* Turkmenistan SSR Tokai khojalyk ministrligi, Ashgabat, Turkmenistan.

Bacon, P.R. 1993a. Conservation and Utilisation of Mangrove Forests in Trinidad and Tobago and the Lesser Antilles. In: Lacerda, L.D. and Field, C.D. (Eds) *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions.* Mangrove Ecosystems Proceedings: 1. ISME/ITTO. pp.5-7.

Bacon, P.R. 1993b. Mangroves in the Lesser Antilles, Jamaica and Trinidad and Tobago. In: Lacerda, L.D. (Ed.) 1993. *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions.* ITTO/ISME Project PD114/90 (F) Vol.2(1) - Latin America. pp.5-7.

Baitenov, M.S. 1985. *V mire redkikh rastenii (The World of Rare Plants).* Kainar, Alma Ata, Kazakhstan. 175pp.

Barre, N. 1988. Une Avifaune Menacée, les Oiseaux de la Reunion. In: Thibault, J.C. and Guyot, I. (Eds) *Livre Rouge des Oiseaux menacés des Regions Françaises d'Outre-mer.* ICBP, Monograph 5. pp.167-196.

Bartz, B., Opitz, H. and Richter, E. 1992. *Museums of the World*. 4th revised edition. K.G. Saur Verlag, Munich. Handbook of international documentation and information, Vol. 16. 642pp.

Barus, V., Donat, P., Trpak, P., Zavazal, V. and Zima, J. 1988. Red data list of vertebrates of Czechoslovakia. *Prirodovedne prace ustavu ceskoslovenske akademie ved v brne*. 22 (3). 1988. pp.1-33.

Batten, LA., Bibby, C.J., Clement, P., Elliot, G.D. and Porter, R.F. 1990. *Red Data Birds in Britain*. T & AD Poyser Academic Press, London. 349pp.

Bell, B.D. 1986. *The Conservation Status of New Zealand Wildlife*. NZWS Occasional Publication No. 12. New Zealand Wildlife Service, Wellington.

Benito-Espinal, E. and Hautcastel, P. 1988. Les Oiseaux Menaces de Martinique et de Guadeloupe. In: Thibault, J.C. and Guyot, I. (Eds) *Livre Rouge des Oiseaux menacés des Regions Françaises d'Outre-mer*. ICBP, Monograph 5. pp.37-60.

Bernardes, A., Machado, A. and Rylands, A. 1990. *Brazilian Fauna Threatened with Extinction*. Fundaçao Biodiversitas para a Conservaçao da Diversidade Biológica. 62pp.

Bertonatti, C. and González, F. 1993. *Lista de Vertebrados Argentinos Amenazados de Extinctión (Segunda Edición)*. Boletin Tecnico No. 8. de la Fundacion Vida Silvestre Argentina. FVSA, Buenos Aires, 35pp.

Bjorndal, K. (Ed.). *Biology and Conservation of Sea Turtles*. Proceedings of the World Conference on Sea Turtle Conservation, Washington D.C. 26-30 November 1979. Smithsonian Institution Press, Washington D.C.

Blanco, J. C. and González, J. L. (Eds) 1992. *Libro Rojo de los Vertebrados de España*. ICONA, Madrid, Spain. 714pp.

Botev, B. and Peshev, T. (Eds) 1985. *Red Data Book of the People's Republic of Bulgaria. Vol.2. Animals*. Bulgarian Academy of Sciences, Sofia, Bulgaria. 184pp.

Branch, W.R. (Ed.) 1988. *South African red data book of reptiles and amphibians*.

Bratton, J.H. (Ed.) 1991. *British Red Data Books: 3. Invertebrates other than Insects*. Joint Nature Conservation Committee, Peterborough, UK

Briggs, J. and Leigh, J. 1988. *Rare or threatened Australian plants*. Australian National Parks and Wildlife Service. 277pp. Illus., map.

Broggi, M.F. and Willi, G. 1985. *Rote Liste der gefährdeten und seltenen Vogelarten des Fürstentums Liechtenstein*. Ber. Bot. Zool. Ges. Liechtenstein - Sargans - Werdenberg 14. pp.71-102.

CCA/IRF 1988. *St. Lucia Country Environmental Profile*. (Draft) Caribbean Conservation Association, St. Michael, Barbados/Island Resources Foundation, St. Thomas, U.S. Virgin Islands.

Chan, H.T., Ong, J.E., Gong, W.K. and Sasekumar, A. 1993. The socio-economic, ecological and environmental values of mangrove ecosystems in Malaysia and their present state of conservation. In: Clough, B.F. (Ed.) 1993. *The Economic and Environmental Values of Mangrove Forests and their Present State of Conservation in the South-east Asia\Pacific Region*. ITTO/ISME/JIAM Project PD71/89 Rev.1 (F). pp.41-81.

Chebez, J. C. 1994. *Los que se van: especies Argentinas en peligro*. Albatros, Buenos Aires. 604pp.

Chua, T.E., Agulto, M.A.A., Guarin, F.Y. and Guerrero, S.C. 1989. *Directory of institutions and scientists in the ASEAN region involved in research and/or management related to coastal areas*. International Centre for Living Aquatic Resources Management (ICLARM), Manila, Philippines. 373pp.

Clutton-Brock, J. 1981. *Domesticated animals from early times*. British Museum (Natural History), and Heinemann Ltd., London.

Cogger, H.G., Cameron, E.E., Sadlier, R.A., and Eggler, P. 1993. *The Action Plan for Australian Reptiles*. Australian Nature Conservation Agency, Canberra, Australia. 254pp.

Collar, N.J., Crosby, M.J. and Stattersfield, A.J. 1994. *Birds to Watch 2: the world list of threatened birds*. (Birdlife Conservation Series No. 4). Birdlife International. Cambridge, UK.

Collins, N.M., Sayer, J.A. and Whitmore, T.C. (Eds) 1991. *The Conservation Atlas of Tropical Forests. Asia and the Pacific*. MacMillan Publishers Ltd., UK. pp.256.

Conti, F., Manzi, A., and Pedrotii, F. 1992. *Libro rosso delle piante d'Italia*. WWF, Rome, Italia. 637pp. Illus.

Corlett, R.T. 1986. Singapore. In: Umali, R.M., Zamora, P.M., Gotera, R.R., Jara, R.S. and Camacho, A.S. 1986. *Mangroves of Asia and the Pacific: status and management. Technical report of the UNDP/UNESCO research and training pilot programme on mangrove ecosystems in Asia and the Pacific*. Ministry of Natural Resources, Natural Resources Management Center and National Mangrove Committee, Quezon City, Metro Manila, Philippines. pp.211-218.

Curtis, T.J.S. and McGoueh, H.N. 1988. *The Irish Red Data Book. 1. Vascular Plants*. The Stationary Office, Wildlife Service, Ireland. 168pp.

Dahl, A. 1980. *Regional ecosystems survey of the South Pacific Area*. SPC/IUCN Technical Paper No. 179.

David, G. 1986. Les Mangroves de Vanuatu. 5ème Partie. *Naika* 22: 16-26.

D'Croz, L. 1993. Status and Uses of Mangroves in the Republic of Panamá. In: *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions. Part I. Latin America*. Mangrove Ecosystems Technical Reports Vol. 3. ISME/ITTO. pp.115-128.

Den Hartog, C. 1970. *The Sea Grasses of the World*. Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, AFD. Natuurkunde. 59(1).

Dodd, C. Kenneth, Jr. 1988. Synopsis of the biological data on the Loggerhead Sea Turtle *Caretta caretta* (Linnaeus 1758). US Fish and Wildlife Service, *Biol. Rep.* 88 (14). 110pp.

Doute, R.N., Ochanda, N. and Epp, H. 1981. *A forest inventory of Kenya using remote sensing techniques.* KREMU Technical Report Series 30.

Dray, A.M. 1985. *Plantas a proteger em Portugal continental.* Serviço Nacional de Parques, Reservas e Conservaçao da Natureza, Lisboa. 56pp.

Duelli, P. (Ed.) 1994. *Rote Liste der gefährdeten Tierarten der Schweiz.* Bundesamt für Umwelt, Wald und Landschaft (BUWAL), Bern. 97pp.

Duellman, W.E. 1993. *Amphibian Species of the World: additions and corrections.* University of Kansas Museum of Natural History, Special Publication No. 21.

Dupont, J., Girard, J-C, and Guinet, M. 1989. *Flore en detresse: le livre rouge des plantes indigenes menacées à la Réunion.* Societe réunionnaise d'étude et de protection de l'environnement, Saint Denis, Ile de la Réunion. 133pp.

Ecological Research Department, TISTR. 1991. *Endangered species and habitats of Thailand.* Thailand Institute of Scientific and Technological Research. 243pp.

Echevarria, J. and Sarabia, J. 1993. Mangroves of Peru. In: *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions. Part I. Latin America.* Mangrove Ecosystems Technical Reports Vol. 3. ISME/ITTO. pp.43-54.

Ehnström, B. and Waldén, H.W. 1986. *Faunavard i Skogsbruket.* Del 2-Den lägre faunan. 351pp.

Einarsson, E. 1988. Trude, sarbare og sjae Idne karplantearter pa Island. (Endangered, vulnerable and rare species of vascular plants in Iceland.). *Svensk Bot. Tidskr.* 82(6): 389-391.

FAO/UNEP. 1981. *Tropical Forest Resources Assessment Project. Forest Resources of Tropical Asia.* Vol. 3 of 3 vols. FAO, Rome, Italy. 475pp.

FAO. 1984. *Food balance sheets 1979-81 average.* Food and Agriculture Organisation of the United Nations, Rome, Italy.

FAO. 1988. *An Interim Report on the State of the Forest Resources in the Developing Countries.* Food and Agriculture Organisation of the United Nations, Rome, Italy.

FAO. 1990. *FAO Production Yearbook.* Vol. 46. Food and Agriculture Organisation of the United Nations, Rome, Italy.

FAO. 1991. *FAO Fishery Statistics Yearbook: catches and landings 1991.* Vol. 72. Food and Agriculture Organisation of the United Nations, Rome, Italy.

FAO. 1993. *Forest Resources Assessment Project. Tropical countries.* FAO Forestry Paper 112. Food and Agriculture Organisation of the United Nations, Rome, Italy.

Fenwick, J. 1992. *International profiles on marine scientific research.* Woods Hole Oceanographic Institution, Massachusetts, USA.

Fisher, P. and Spalding, M.D. 1993. *Protected Areas with Mangrove Habitat.* Protected Areas Data Unit, WCMC, UK. (Unpublished).

da Fonseca, G.A.B., Rylands, A.B., Costa, C.M.R., Machado, R.B., and Leite, Y.L.R. 1994. *Livro Vermelho dos Mamíferos Brasilieros Ameaçados de Extinção.* Fundação Biodiversitas, Belo Horizonte, Brazil. 479pp.

Forsman, D., Bussman, M., Mustonen, M. and Somerma, P. 1986. *Uhanalaisten eläinten ja kasvien suojelutoimikunnan mietintö. II Suomen uhanalaiset eläimet.* Piirrokset, Helsinki, Finland. 466pp.

Flores-Villela, O. and Gerez, P. 1988. *Conservacion en Mexico.* Instituto Nacional de Investigaciones Solo-e Recursos Bioticos, Xalapa, Mexico. 302pp.

Foster-Turley, P., Macdonald, S., and Mason, C. and the IUCN/SSC Otter Specialist Group. 1990. *Otters. An Action Plan for their Conservation.* 126pp.

Frost, D.R. 1985. *Amphibian Species of the World: A Taxonomic and Geographical Reference.* Allen Press Inc. and the Association of Systematics Collections, Lawrence, Kansas. I-V, pp.1-732.

Fu Li-Kuo and Jin Jiang-ming (Eds) 1992. *China Plant Red Data Book - Rare and Endangered Plants. Vol. 1.* Science Press, Beijing, China.

Gania, I.M. 1989. *Redkie i ischezaiushchie vidy ptits Moldavii (Rare and threatened species of birds of Moldova).* Stiintsa, Kishinev, Moldova. 152pp.

Garnett, S. 1992. *The Action Plan for Australian Birds.* Australian National Parks and Wildlife Service, Canberra, Australia. 262pp.

Gepp, J. *et al.* 1994. *Rote Listen Gefährdeter Tiere Österreichs.* Federal Ministry of Environment, Youth and Family.

Given, D.R., Sykes, W.R., Williams, P.A., and Wilson, C.M. 1987. *Threatened and local plants of New Zealand - a revised checklist.* Botany Division, DSIR, Christchurch, New Zealand. 17pp.

Glade, A. A. (Ed.) 1993. *Red List of Chilean Terrestrial Vertebrates* (Second Edition). Proceedings of the Symposium "Conservation Status of Chilean Terrestrial Vertebrate Fauna". Chilean Forest Service (CONAF), Santiago Chile, 21-24 April 1987. 68pp.

Glowacinski, Z. (Ed.) 1992a. *Polish Red Book of Animals.* Polish Academy of Sciences, Nature Protection Research Centre, Cracow. 352pp.

Glowacinski, Z. (Ed.) 1992b. *Red List of Threatened Animals in Poland.* Polish Academy of Sciences, Nature Protection Research Centre, Cracow. 119pp.

Gomez-Campo, C. 1987. *Libro rojo de especies vegetales amenazadas de España peninsular e Islas Baleares.* Ministerio de Agricultura, Pesca y Alimentación, ICONA, Madrid, Spain. 676pp.

Gowthorpe, P. and Lamarche, B. 1993. Mangroves of Mauritania. In: *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions. Part II. Africa.* Mangrove Ecosystems Technical Reports Vol. 3. ISME/ITTO. pp.1-18.

Gray, D., Zisman, S. and Corves, C. 1990 *Mapping the Mangroves of Belize.* Technical Report, Department of Geography, University of Edinburgh, UK. WWF-US Project No. 6782 and NRI (ODA and EMC T0071).

Groombridge, B. (Ed.) 1993. *1994 IUCN Red List of Threatened Animals.* IUCN Gland, Switzerland and Cambridge, UK.

Groombridge, B. and Luxmoore, R. 1989. *The green turtle and hawksbill (Reptilia: Cheloniidae): world status, exploitation and trade.* Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, Lausanne, Switzerland. 601pp.

Guyot, I. and Thibault, J-C. 1988. La Conservation de l'Avifaune des Iles Wallis et Futuna. In: Thibault, J.C. and Guyot, I. (Eds) *Livre Rouge des Oiseaux menacés des Regions Françaises d'Outre-mer.* ICBP, Monograph 5. pp.125-142.

Hall, A.V. and Veldhuis, H.A. 1985. *South African red data book: plants - Fynbos and Karoo biomes.* South African National Scientific Programmes Report No. 117. Council for Scientific and Industrial Research, Pretoria, South Africa. 160pp.

Hannecart, F. 1988. Les Oiseaux Menaces de la Nouvelle-Caledonie et des Iles Proches. In: Thibault, J.C. and Guyot, I. (Eds) *Livre Rouge des Oiseaux menacés des Regions Françaises d'Outre-mer.* ICBP, Monograph 5. pp.143-166.

Harcourt, C.S. and Sayer, J.A. (Eds). in press. *The Conservation Atlas of Tropical Forests. The Americas.* Simon and Schuster, UK.

Hawksworth, D.L. and Ritchie, J.M. 1993. *Biodiversity and Biosystematic Priorities: microorganisms and invertebrates.* CAB International, Egham, Surrey, UK. 120pp.

Henning, S.F. and Henning, G.A. 1989. *South African red data book - butterflies.* South African National Scientific Programmes Report No. 158. Council for Scientific and Industrial Research, Pretoria, South Africa.

Herz, R. 1991. *Manguezais do Brasil.* Instituto Oceanográfico, Universidade de São Paulo, SP, Brazil. 227pp.

Holmgren, P.K., Holmgren, N.H. and Barnett, L.C. 1990. *Index Herbariorum. Part I: the herbaria of the world.* 8th edition. New York Botanical Garden, for International Association for Plant Taxonomy.

Holmgren, P.K. and Holmgren, N.H. 1991. Additions to Index Herbariorum (Herbaria), Edition 8. *Taxon* 40: 687-692.

Holmgren, P.K. and Holmgren, N.H. 1993. Additions to Index Herbariorum (Herbaria), Edition 8 - Second Series. *Taxon* 42: 489-505.

Holmgren, P.K. and Holmgren, N.H. 1994. Additions to Index Herbariorum (Herbaria), Edition 8 - Third Series. *Taxon* 43: 305-328.

ICONA. 1986. *Lista Roja de los Vertebrados de Espana.* Ministerio de Agricultuira, Pesca y Alimentacion. 400pp.

Ingelög, T., Andersson, R., and Tjernberg, M. 1993. *Red Data Book of the Baltic Region.* Swedish Threatened Species Unit, Uppsala, Sweden. 95pp.

IUCN. 1994. *1993 United Nations List of National Parks and Protected Areas.* Prepared by WCMC and CNPPA. IUCN, Gland, Switzerland and Cambridge, UK.

Ivan Benoit, C. 1989. *Red Book on Chilean Terrestrial Flora.* Chilean Forest Service, Ministry of Agriculture, Santiago, Chile.

Jackson, P. and Wager, R. 1993. *The Action Plan for Australian Freshwater Fishes.* Australian Nature Conservation Agency, Canberra, Australia. 122pp.

Jayewardene, R.P. 1986. Sri Lanka. In: Umali, R.M., Zamora, P.M., Gotera, R.R., Jara, R.S. and Camacho, A.S. 1986. *Mangroves of Asia and the Pacific: status and management.* Technical report of the UNDP/UNESCO research and training pilot programme on mangrove ecosystems in Asia and the Pacific. Ministry of Natural Resources, Natural Resources Management Center and National Mangrove Committee, Quezon City, Metro Manila, Philippines. pp.219-230.

Jennings, S., Brierley, A.S. and Walker J.W. 1994. The Inshore Fish Assemblages of the Galápagos Archipelago. *Biological Conservation.* 70 (1): 49-57.

Jimenez, J.A. 1992. Status of Mangrove Ecosystems in Central America. In: Lacerda, L.D. and Field, C.D. (Eds). *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions.* Mangrove Ecosystems Proceedings: 1. ISME/ITTO. pp.7-8.

Johnson, R. and Johnson, R. 1993. Mangroves of Sierra Leone. In: Diop, E.S., Field, C.D. and Vannucci, M. 1993. *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions.* Mangrove Ecosystems Proceedings: 2. ISME/ITTO. pp.7-9.

Karandinos, M. (Ed.) 1992. *The Red Data Book of Threatened Vertebrates of Greece.* Hellenic Zoological Society and Hellenic Ornithological Society, Athens, Greece. 356pp.

Kazarian, V.O. (Ed.) 1989. *Krasnaia kniga Armianskoi SSR (Plant Red data book of the Armenian SSR).* Aiastan, Erevan, Armenia. 284pp.

Kennedy, M. (Ed.) 1992. *Australian Marsupials and Monotremes: an Action Plan for their Conservation.* IUCN, Gland, Switzerland.

Klankamsorn, B. and Charuppat, TI. 1982. *Study on Changes in Mangrove area in Thailand by using LANDSAT Images.* Final Report. Royal Forest Department, Bangkok, Thailand.

Koistinen, M., Metsänheimo, K. Niemelä, T. and Rönkä, A. 1986. *Uhanalaisten eläinten ja kasvien suojelutoimikunnan mietintö. III Suomen uhanalaiset kasvit.* Piirrokset, Helsinki, Finland. 431pp.

Kovshar, A.F. and Bekenov, A.B. (Eds) 1985. *V mire redkikh zhivotnykh (The World of Rare Animals).* Kainar, Alma Ata, Kazakhstan. 100pp.

Kramme, T. and Hagvar, S. 1985. *Truede og sarbare insekter i norske skogsmiljoer.* Norsk Institut for Skogforskning. Rapport T-529. 89pp.

Landolt, E. 1992. *Plantes vasculaires menacées en Suisse: Liste rouge.* Office federal de l'Environnement, des fôrets et du paysage, Berne, Switzerland. 183pp.

Landolt, E. 1991. *Gefährdung der Farn- und Blümenpflanzen in der Schweiz, mit gesamtschweizerischen und regionalen Roten Listen.* Bundesamt für Umwelt, Wald und Landschaft (BUWAL), Bern. 185pp.

Lapele, M. and Vaiciunaite, R. 1992. *The Lithuanian Red Data Book.* Lithuanian Republic Environmental Protection Department, Vilnius.

Legg, C. *in litt.* 23.8.1994.

Loftus, R. and Scherf, B. (Eds) 1993. *World Watch List for domestic animal diversity.* 1st Edition. Food and Agriculture Organization of the United Nations, Rome.

Lojtnant, B. and Gregersen, J. 1986. *Truede Planter og Dyr I Danmark.- en Samling rodlister* (Threatened Plants and Animals in Denmark - a collection of red lists). Fredningsstyrelsen and Landbrugsministeriets Vidtforvaltning. 55pp.

Longhurst, A.R. and Pauly, D. 1987. *Ecology of Tropical Oceans.* Academic Press Inc. London, UK.

Louette, M. 1988. La Conservation des Oiseaux de Mayotte. In: Thibault, J.C. and Guyot, I. (Eds) *Livre Rouge des Oiseaux menacés des Regions Françaises d'Outre-mer.* ICBP, Monograph 5. pp.197-208.

Lowe, D.W. 1990. *The Official World Wildlife Fund Guide to Endangered Species of North America.* Vols 1 and 2. Beacham Publishing Inc., Washington DC, USA.

Mabberley, D.J. 1987. reprinted with corrections 1989, 1990. *The plant-book. A portable dictionary of the higher plants.* Cambridge University Press, Cambridge, UK. xii + 707pp.

Mace, G. and Stuart, S. 1994. Draft IUCN Red List Categories, Version 2.2. *Species* 21-22: 13-24.

MAG, 1991. *Inventario de los manglares del Ecuador continental.* Min. de Agricultura y Ganaderia. Quito, 438pp.

Márquez, M.R. FAO species catalogue. Vol.11: Sea turtles of the world. An annotated and illustrated catalogue of sea turtle species known to date. *FAO Fisheries Synopsis.* No.125, vol.11. Rome, FAO. 1990. 81pp.

MARNR, 1986. *Conservación y manglares costeros en Venezuela y Trinidad & Tobago (Sintesis).* Serie Informes Técnicos DG 11 A/ti/259, Ministerio de Agricultura y Recursos Naturales Renovables, Caracas. 165pp.

Mason, I.L. (Ed.) 1984. *Evolution of domesticated animals.* Longman, London and New York.

Massay, S. 1983. Revision de la Lista de los Peces Marinos del Ecuador. *Boletin Cientifico y Tecnico, Instituto Nacional de Pesca.* 6(1): 1-22.

McAllister, D.E., Schueler, F.W., Roberts, C.M. and Hawkins, J.P. 1994. Mapping and GIS analysis of the global distribution of coral reef fishes on an equal area grid. In: Miller, R. (Ed.) 1994. *Mapping the Diversity of Nature.* Chapman & Hall, London, UK.

Mel'nik, V.I. 1987. Krasnaya kniga Narodnoi Respubliki Bolgarii. (The Red Book of the People's Republic of Bulgaria.). *Byull. Glavn. Bot. Sada* (Moscow) 146: 87-88.

Ming, C.L. 1990. Assessing the coastal living resources of Singapore - a study under the ASEAN-Australia Coastal Living Resources Project. In: *Wallaceana* 59 and 60 (1990). pp.7-9.

Ministry of Science, Technology and Environment 1992. *Red Data Book of Vietnam. Volume 1. Animals.* Science and Technics Publishing House, Hanoi. 396pp.

Morcos, S. and Mahmoud Kh. El-Sayed. (Eds) 1990. *Directory of marine scientists and marine environmental centres in the Arab States.* (UNEP regional seas directories and bibliographies; No. 34). United Nations Environment Programme, Nairobi. 213pp.

Morris, P.A. 1994. *A Red Data Book for British Mammals.* The Mammal Society, Bristol, UK.

Moseley, C.J. (Ed.) 1992. *The Official World Wildlife Fund Guide to Endangered Species of North America.* Vol. 3. Beacham Publishing Inc., Washington DC, USA.

Movsesian, S.O. (Ed.) 1987. *Krasnaia kniga Armianskoi SSR: redkie i nakhodiashchiesia pod ugrozoi ischeznoveniia vidy zhivotnykh (Animal Red data book of Armenian SSR).* Aiastan, Erevan, Armenia. 123pp.

National Environment Protection Agency 1994. Annex 2: Priority Species in China. pp70-78 in: *China Biodiversity Conservation Action Plan.* Beijing, China. 126pp.

NERC (Natural Environment Research Council). 1992. *Evolution and Biodiversity: the new taxonomy.* Report of the NERC Committee chaired by Professor J.R. Krebs. Natural Environment Research Council, UK. 44pp.

Nayar, M.P. and Sastry, A.R.K. 1987. *Red Data Book of Indian Plants.* Botanical Survey of India, Calcutta, India.

NBU 1992. *The Costs and Unmet Needs of Biological Diversity Conservation in Kenya*. The National Biodiversity Unit (National Museums of Kenya) and Metroeconomica Ltd, Nairobi, Kenya. 217pp.

Niklfeld, H. (Ed.) 1986. *Gruene reihe des bundesministeriums fuer gesundheit und umweltschutz, band 5. Rote listen gefaehrdeter pflanzen Oesterreichs*. (Green series of the federal ministry for health and environmental protection, vol. 5. Red lists of endangered plants of Austria.). Botanisches institut der universitaet fuer bodenkultur, Vienna, Austria. 202pp.

Nowak, E. 1989. Verzeichnis der in der Bundesrepublik Deutschland herausgegeben Roten Listen der gefährdeten Tiere und Pflanzen. (2. Ergaenzung). *Schrifentenreihe für Landschaftspflege und Naturschutz* 29: 307-321.

Odum, W.E., McIvor, C.C. and Smith III, T.J. 1982. *The ecology of mangroves of south Florida: a community profile*. US Fish and Wildlife Service, Off. Biol. Ser., FWS/OBS-81/24, Washington, DC, USA. 144pp.

Oldfield, S. 1987. *Fragments of Paradise: a guide for conservation action in the UK dependent territories*. The British Association of Nature Conservationists. Pisces Publications, Oxford. 192pp.

Padron, C.M. 1992. Status and Management of Mangroves of Cuba. In: Lacerda, L.D. and Field, C.D. (Eds) *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions*. Mangrove Ecosystems Proceedings: 1. ISME/ITTO. pp.4-5.

Parfenov, V.I., Liakavitsius, A.A., Kozlovskaia, N.V., Vinaev, G.V., Iankiavitsenee, R.L., Baliavitsenee, U.U., Lazdayckaite, Z., and Lapele, M. 1987. *[Rare and threatened plant species of Byelorussia and Lithuania.]*. Akademiya Nauk Byelorusskoi SSR. Minsk, Nauka i Tekhnica. 352pp.

Phillips, R.C. and Meñez, E.G. 1988. *Seagrasses*. Smithsonian Contributions to the Marine Sciences, Number 34. Smithsoniam Institution Press, Washington DC, USA.

Prescott-Allen, R. and Prescott-Allen, C. 1990. How many plants feed the world? *Conservation Biology* 4(4): 365-374.

Pulido, V. 1991. *El Libro Rojo de la Faune Silvestre del Perú*. INIAA, WWF and USFWS. Lima, Peru. 220pp.

Putney, A.D. 1982. *Survey of conservation priorities in the Lesser Antilles. Technical Report No. 1*. Caribbean Conservation Association.

Reijnders, P., Brasseur, S., van der Toorn, J., van der Wolf, P., Boyd, I., Harwood, J. Lavigne, D. and Lowry, L. and the IUCN/SSC Seal Specialist Group. 1993. *Seals, Fur Seals, Sea Lions, and Walrus. Status Survey and Conservation Action Plan*. 88pp.

Ridgway, S.H. and Harrison, R.J. (Eds) 1981. *Handbook of Marine Mammals, vol. 1: The walrus, sea lions fur seals and sea otter*. Academic Press, London.

Ridgway, S.H. and Harrison, R.J. (Eds) 1981. *Handbook of Marine Mammals, vol. 2: Seals*. Academic Press, London.

Rodriguez, J.P. and Rojas-Suarez, F. (Eds) (in prep). *Red Data Book of the Fauna of Venezuela*. PROVITA, Caracas, Venezuela.

Ruwa, R.K. 1993. Mangroves of Kenya. In: Diop, E.S., Field, C.D. and Vannucci, M. 1993. *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions*. Mangrove Ecosystems Proceedings: 2. ISME/ITTO. pp.227-243.

Saenger, P., Hegerl, E.J., and Davie, J.D.S. 1983. *Global Status of Mangrove Ecosystems*. Commission on Ecology Papers Number 3. IUCN, Gland, Switzerland.

Sayer, J.A., Harcourt, C.S., and Collins, N.M. (Eds) 1992. *The Conservation Atlas of Tropical Forests. Africa*. MacMillan Publishers Ltd., UK. 288pp.

Schembri, P.J. and Sultana, J. (Eds) 1989. *Red data book for the Maltese islands*. Environment Division, Ministry of Education, Malta. 142pp.

Sedlacek, K. *et al.* 1988. *Cervena Kniha 1, Ptaci. Ohrozench a vzacnych druhu rostlin a zivocichu CSSR*. (Czechoslovakian Bird Red Data Book.) Statni zemedelske nakladatelstvi, Praha.

Severinghaus, L.L. and Liu, V.T. 1990. *The Endangered Plants and Animals of Taiwan*. Council of Agriculture and National Parks Association, Taiwan.

Shirt, D.B. (Ed.) 1987. *British Red Databooks: 2. Insects*. Nature Conservancy Council, London, UK. 402pp.

Sibley, C.G. and Monroe, B.L. 1990. *Distribution and Taxonomy of Birds of the World*. Yale University Press, New Haven.

Sibley, C.G. and Monroe, B.L. 1993. *A Supplement to Distribution and Taxonomy of Birds of the World*. Yale University Press, New Haven.

Simmonds, N.W. (Ed.). 1976. *Evolution of crop plants*. Longman Scientific and Technical.

Skapec, L. *et al.* 1992. *Cervena Kniha 3, Bezobratlí. Ohrozench a vzacnych druhu rostlin a zivocichu CSSR*. Príroda, Bratislava. 155pp.

Skelton, P.H. 1987. *South African red data book - fishes*. South African National Scientific Programmes Report No. 137. Council for Scientific and Industrial Research: Pretoria, South Africa. 199pp.

Smith, N.J.H,. Williams, J.T., Plucknett, D.L., and Talbot, J.P. 1992. *Tropical Forests and their Crops*. Comstock Publishing Associates, London, UK. xvi + 568pp.

Smithers, R.H.N. 1986. *South African red data book - terrestrial mammals.* South African National Scientific Programmes Report No. 125. Council for Scientific and Industrial Research, Pretoria, South Africa. 216pp.

Snedaker, S.C. (pers. comm., 1991 to Fisher and Spalding).

Soemodihardjo, S. 1986. Indonesia. In: *Mangroves of Asia and the Pacific: status and management.* Technical report of the UNDP/UNESCO research and training pilot programme on mangrove ecosystems in Asia and the Pacific. Ministry of Natural Resources, Natural Resources Management Center and National Mangrove Committee, Quezon City, Metro Manila, Philippines. pp.89-129.

Strahm, W. 1989. *Plant red data book for Rodrigues.* Koeltz Scientific Books, Koenigstein, West Germany. 241pp.

Sugawara, H., Ma, J., Miyazaki, S., Shimura, J. and Takishima, Y. 1993. *World Directory of Collections of Cultures of Microorganisms.* World Data Centre on Microorganisms, Saitama, Japan.

Swengel, F.B. (Ed.) 1993. *Global Zoo Directory 1993.* IUCN/SSC Captive Breeding Specialist Group in collaboration with International Zoo Yearbook, American Association of Zoological Parks and Aquariums and International Species Information System.

Systematics Agenda 2000. 1994. *Systematics Agenda 200: charging the Biosphere. Technical Report.* American Museum of Natural History, New York, USA. 34pp.

Technical Staff, Philippine National Mangrove Committee. 1986. Philippines. In: *Mangroves of Asia and the Pacific: status and management. Technical report of the UNDP/UNESCO research and training pilot programme on mangrove ecosystems in Asia and the Pacific.* Ministry of Natural Resources, Natural Resources Management Center and National Mangrove Committee, Quezon City, Metro Manila, Philippines. pp.175-210.

Thibault, J-C. 1988. Menaces et Conservation des Oiseaux de Polynesie Française. In: Thibault, J.C. and Guyot, I. (Eds) *Livre Rouge des Oiseaux menacés des Regions Françaises d'Outre-mer.* ICBP, Monograph 5. pp.87-124.

Thiollay, J-M. 1988. Les Oiseaux Menaces de Guyane. In: Thibault, J.C. and Guyot, I. (Eds) *Livre Rouge des Oiseaux menacés des Regions Françaises d'Outre-mer.* ICBP, Monograph 5. pp.61-80.

UNEP/FAO. 1985. *Directory of marine environmental centres for the Indian Ocean and Antarctic Region.* UNEP Regional Seas Directories and Bibliographies. FAO, Rome, Italy. 226pp.

UNEP/FAO. 1985. *Directory of marine environmental centres in South Pacific.* UNEP Regional Seas Directories and Bibliographies. FAO, Rome, Italy. 147pp.

UNEP/FAO. 1985. *Directory of marine environmental centres in Caribbean.* UNEP Regional Seas Directories and Bibliographies. 2nd ed. FAO, Rome, Italy. 214pp.

UNEP/IUCN. 1988. *Coral Reefs of the World. Volume 1: Atlantic and Eastern Pacific.* UNEP Regional Seas Directories and Bibliographies. IUCN, Gland, Switzerland and Cambridge, UK/UNEP, Nairobi, Kenya. xlvii + 373pp., 38 maps.

UNEP/IUCN. 1988. *Coral Reefs of the World. Volume 2: Indian Ocean, Red Sea and Gulf.* UNEP Regional Seas Directories and Bibliographies. IUCN, Gland, Switzerland and Cambridge, UK/UNEP, Nairobi, Kenya. 1 + 373pp., 36 maps.

UNEP/IUCN. 1988. *Coral Reefs of the World. Volume 3: Central and Western Pacific.* UNEP Regional Seas Directories and Bibliographies. IUCN, Gland, Switzerland and Cambridge, UK/UNEP, Nairobi, Kenya. xlix + 329pp., 30 maps.

UNESCO 1992. *Coastal systems studies and sustainable development, Proceedings of the COMAR Interregional Scientific Conference, UNESCO, Paris, 21-25 May, 1991.* UNESCO, Paris. 276pp.

Vidic, J. (Ed.) 1992. Nature Conservation. A periodical of research and practice of nature conservation. *Varsto Narave* 17. Ljubjana.

Watling, D. and Chape, S.P. (Eds) 1992. *Environment Fiji - The National State of the Environment Report.* IUCN, Gland, Switzerland. 154pp.

Weeda, E.J., van der Meijden, R. and Bakker, P.A. 1990. Rode lijst can de in Nederland verdwenen en bedreigde planten (Pteridophyta en Spermatophyta) over de periode 1980-1990. *Gorteria.* 16, 1990. 26pp.

Weiss, J. 1988. Rote Liste der brutvögel Luxemburgs. *Regulus* 1: 7-9.

Whilde, A. 1993. *The Irish red data book. 2. Vertebrates.* HMSO, Belfast, N. Ireland.

Wilson, D.E. and Reeder, D.M. (Eds) 1993. *Mammal Species of the World: a taxonomic and geographic reference.* Second edition. Smithsonian Institution Press. Washington and London.

World Conservation Monitoring Centre (Groombridge, B., Ed.) 1992. *Global Biodiversity: status of the Earth's living resources.* Chapman & Hall, London.

World Conservation Monitoring Centre (Spalding, M., Ed.) 1994. Features of Biodiversity of Small Island Developing States. Volume 4: Fishes. Unpublished Report prepared for UNEP.

World Resources Institute. 1994. *World Resources 1994-95.* Oxford University Press, New York and Oxford.

Yáñez-Arancibia, A., Lara-Dominguez, A.L., Zapeta, G.J.V. and Seijo, J.C. 1993. Mangrove Ecosystems of Mexico: Ecological Function, Economic Value and Sustainable Development. In: Lacerda, L.D. and Field, C.D. (Eds) *Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions.* Mangrove Ecosystems Proceedings: 1. ISME/ITTO. pp.3-4.

Zarzycki, K. and Wojewoda, W. (Eds) 1987. *List of threatened plants in Poland.* Polish scientific publishers: Warsaw, Poland. 1986 (Recd. 1987). 83-108. (in Polish).

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