



Biodiversity and Fisheries

CHAPTER 3: AQUATIC BIODIVERSITY

Summaries for countries with significant aquatic biodiversity concerns

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Introduction

In December 2000 World Fisheries Trust began to examine National Biodiversity Strategy and Action Plans (NBSAPs) of Signatories to the Convention on Biological Diversity for actions taken or proposed for the conservation and use of living aquatic resources. The deadline for the Trust's report to UNEP was the end of August 2001. In these nine months the Trust had to decide which countries would best repay its research effort, read the National Biodiversity Strategy and Action Plans of these selected countries, and condense and edit the reports.

In choosing the nations to concentrate upon two things were looked for: outstanding aquatic biological diversity, and plans for managing that diversity. A third circle, or several 'third circles', drew in countries within the several regions of UNEP's interest, countries that may not have outstanding aquatic biodiversity: developing fishing nations, Small Island Developing States, and emerging market economies in Eastern Europe and the former Soviet Union. Naturally, plans for managing diversity presupposed the existence of a National Biodiversity Strategy and Action Plan. In some cases of what appeared to be outstanding biodiversity in countries that had submitted no National Biodiversity Strategy and Action Plan, such as Papua New Guinea and Venezuela, the World Wide Web furnished other material.

In the absence of a database of aquatic biodiversity at the beginning of the search, more readily available material suggested which countries would best meet the Trust's criteria. The major fishing nations were an obvious starting point, which weighted the search heavily towards marine biodiversity, as the oceans produce approximately five times more aquatic food than inland waters. Eventually the list of nations to be examined evolved to include states that had great marine wealth, if not great variety at the species level, and those whose inland waters appeared to have high diversity at the species level.

Ranking the Countries

Determining what biodiversity is and how it can be measured remains a question with many answers. Data compiled by Fishbase and available on the Internet at www.Fishbase.org provided a rough numerical measure, which we have called the Total Aquatic Biodiversity-Value Index Ranking.

The Total Aquatic Biodiversity-Value Index Ranking is not a simple tally of fish species that inhabit a country's waters; that number can be arrived at by adding 'Marine/Brackish' to 'Freshwater.' All other categories - Reef-associated, Commercially important, Game Fish, Threatened, Introduced, Potential aquarium, Aquaculture - are sub-categories. For our purposes, in seeking a measure for aquatic wealth, many species are counted more than once. Reef-associated species, for example, already counted under Marine/Brackish, re-enter the weighting to reflect possible impacts on biodiversity associated with reefs, which provide habitat. Hence, where two states have an equal number of Marine/Brackish species, that state with the greater number of reef-associated species will get the higher ranking. Should two

states have identical fish species numbers in all categories save Threatened, that state with a higher number of threatened species will rank higher, reflecting priorities for action.

For developing countries, the index may be weighted too low vis-à-vis richer states or those that make greater use of their marine resources or that simply have their resources more comprehensively catalogued. Japan, by way of illustration, is listed as having almost three times the Total Biodiversity-Value Index of China - surely reflecting a greater taxonomic effort on the part of Japanese fishery scientists. Indeed, the entry for industrialised Taiwan shows a ranking twice that of mainland China, suggesting that the ranking for China is too low.

On the other hand, the extra effort that states such as Japan are capable of making on assessing fishery resources reveals the importance of the role developed countries may play in seeking or aiding aquatic biodiversity management worldwide. In this sense, the ranking reflects the significance of the country either as biodiversity *repository* or as *user*.

One unavoidable omission from the rankings is the actual productivity of some waters that may have a low species number but a great and vulnerable biomass. Antarctica, for example, ranks very low for biodiversity, and yet the abundance of krill makes Antarctic waters prodigious feeding grounds for higher elements of the food chain. In this sense, the index does ignore trophic interactions and, wrongly used, runs the risk of perpetuating the single-species management models that have led to so much mismanagement of fisheries worldwide.

The second ranking is a straightforward Freshwater ranking (FW), counting only Freshwater and Endemic species (although some endemic species may be marine or brackish-water). In general, freshwater biodiversity worldwide is under greater threat than marine biodiversity, and the FW ranking illuminates this distinctly susceptible category. In the Total Biodiversity-Value Index, Brazil ranks merely seventh; yet Brazil is the freshwater giant, having almost twice as many freshwater species as the second-ranking country, Indonesia. Its ranking in the Total Biodiversity-Value Index is low because Brazilian marine waters are relatively unproductive.

Appendix II, 'Total Biodiversity-Value Index Ranking by Country' shows that most of the highest-ranking countries have been examined. The Seychelles were not examined, as they figure less prominently in the literature than Fiji, the Maldives or Sri Lanka; only during the last stages of the report-writing was their Total Biodiversity-Value Index Ranking found to be among the highest for island groupings. Cuba was another omission, since it too showed up only rarely in the literature.

The fifty-two Country Summaries presented here have three parts: *Introduction*, *Trends* and *Responses*. The more in-depth Country Thematic Reviews cover:

- Significant aquatic biodiversity (freshwater and marine);
- Present and planned uses of aquatic biodiversity;
- Threats to aquatic biodiversity;

- Measures taken to manage fisheries for biodiversity;
- Research efforts or goals;
- Priorities for national action;
- National or sectoral plans that include sustainable use of aquatic biological diversity;
- Resources for meeting obligations and recommendations;
- Capacity-building measures for developing and implementing plans;
- State and priorities for expanding the ecological network;
- Legislation or legislative framework for aquatic biodiversity;
- Cooperative mechanisms among authorities, NGOs etc. to ensure integration;
- Vulnerable transboundary aquatic systems;
- Examples of transboundary cooperation; and
- Priority given to transboundary cooperation affecting aquatic biodiversity.

These headings were suggested by a document of the European Centre for Nature Conservation (ECNC) drawn up for the UNEP Pan-European Biological and Landscape Diversity Strategy and delivered at Riga, Latvia in May 2000.²⁵ Not all headings may be present, due to lack of information.

The National Biodiversity Strategy and Action Plans and other information sources have been carefully condensed and rewritten with as little interpretation by WFT as possible.

Notes

Unless otherwise cited, all information in Chapter 3 (Summaries for Countries with Significant Aquatic Biodiversity Concerns and Country Thematic Reviews) originates in the National Biodiversity Strategy and Action Plans to the Convention on Biological Diversity (available at: <http://www.biodiv.org/world/reports.asp?lg=0&t=ap#G>). All cited material remains the intellectual property of its authors. WFT has merely condensed, edited and reshaped the material. Reference notes at the end of a paragraph generally denote the source of all the material in that paragraph, or all that material which follows a reference note placed earlier in that paragraph.

The numbers of fish species occasionally mentioned in the National Reports rarely tally with the numbers cited by FISHBASE. WFT has left both claims in their original form.

Argentina

Number of fish species in Argentina ¹	
Freshwater	222
Endemic	3
Marine/Brackish	333
Reef-associated	9
Commercially Important	34
Game Fish	65
Threatened	11
Introduced	11
Potential Aquarium	53
Aquaculture	-

Total Biodiversity-Value Index: 741

FW: 225

Introduction

More than 400 fish, 90 crustacean, 200 mollusk and 150 macroalgae species have been registered in Argentine waters.⁹⁶ Marine fish catches (including aquaculture) increased by 128% between 1983 and 1993, when they rose to 918 000 tons. The fish were taken by artisanal fishers, small-scale coastal fishers, and larger scale floating freezers and factories.²⁴³

Trends

Soil erosion and inadequate flood control is a continuing problem along with soil degradation in irrigated zones, desertification, water pollution in major urban centers, and river degradation due to agricultural runoff of excess pesticides and fertilizers.²⁴³

Response

Currently there are four protected marine reserves, covering 2 500 ha.²⁴³ Although a subsystem of integrated protected marine coastal areas as such does not exist, the number of formally designated coastal and marine areas has increased. The First Coastal Marine National Park of the country has been created, and the Integrated Management Plan for the Patagonian Coastal Zone has been executed; the Conservation of Biodiversity Project has implemented the creation of the first national coastal marine park, in the Province of Santa Cruz.

¹ All fish species numbers are taken from the Fishbase Dataset at www.fishbase.org

Nationally, implementation of the CBD needs an intersectoral framework. Currently there is some duplication of efforts, and information on biological resources is spread among different institutes, from the National Council of Scientific and Technological Investigations, Universities, the 'Instituto Nacional de Tecnología Agropecuaria' (INTA) and provincial agricultural institutes and the 'Instituto Nacional de Investigación y Desarrollo Pesquero' (INIDEP).

The Secretariat of Natural Resources and Sustainable Development is developing and updating an inventory of Argentinean wetlands through a database of published or compiled materials. Efforts are also being made to establish self-financing institutional structures for river basin management, in the provinces of Buenos Aires, Mendoza and Cordova and in the respective river basins of the rivers Luján and Tunuyán and the San Roque dyke.

Projects funded by the UNDP-GEF include the 'Patagonian Coastal Zone Management Plan', the 'Management and Conservation of Wetland Biodiversity in the Esteros del Ibera', and the 'Consolidation and Implementation of the Patagonia Coastal Zone Management Programme for Biodiversity Conservation'.

Trans-boundary areas of dispute are the Falkland Islands, or 'Islas Malvinas', the South Georgia and South Sandwich Islands, and a part of Antarctica near Tierra del Fuego, to which Argentina lays a claim not recognized by the United States⁵⁰ (and the international community in general.) Regarding fish stocks around the Falklands, the Subcommittee of the Fishery Commission of the South Atlantic, in a meeting held in London (no date), led the evaluation of the state of the main species within the competence of the Commission. Recommendations for scientific investigation and the exchange of fishery data were also formulated.

Australia

Number of fish species in Australia	
Freshwater	290
Endemic	436
Marine/Brackish	3521
Reef-associated	1458
Commercially Important	212
Game Fish	319
Threatened	65
Introduced	30
Potential Aquarium	717
Aquaculture	22

Total Biodiversity-Value Index: 7070

FW: 726

Introduction

Australia is home to more than one million species, of which less than 15 % have been described. Most of the known marine species are endemic to Southern Australian waters, which have been geographically and climatically isolated for around 40 million years.²⁰

Australia has the third largest coral reef area in the world. The Great Barrier Reef (GBR), the largest reef system in the world, extends over 2500 km.²⁰

Trends

Although most reefs are still in relatively good condition, major changes have occurred to some of the GBR reef flats over the last 40 to 100 years.²⁰

Few ecosystems remain in a largely natural condition and the situation is worsening. Many species are not described or are poorly studied, and of those that are described, many are lost or threatened. Little is known of changes in genetic diversity for most species, although there is strong evidence of loss of genetic diversity for some. While the degree of genetic diversity is unclear, it is almost certainly falling. Native fish species have suffered declines in abundance and diversity in most of Australia since European settlement. Surveys in Victoria indicate that only two out of 17 segments of river basins still have high-quality native river fish populations. Some species continue to be over-exploited, harming habitat and non-target species. Currently some 9% of fresh-water fish are extinct, endangered or vulnerable.²⁰

The world's largest toxic blue-green algal bloom, along 1000 km of the Darling River, occurred in the summer of 1991, shutting down water supplies.²⁰

Response

Australia is a world leader in using Marine Protected Areas (MPAs) and has 24 per cent of the total number of MPAs in the world. However, 74 per cent of the 303 MPAs (covering 463 200 sq km, in 1992) is within the Great Barrier Reef Marine Park (MPA). Large sections of the marine environment have few or no protected areas. A national programme to build a representative system by 2000 is underway.²⁰

After Japan in 1998 failed to agree to lower catch quotas for dwindling stocks of southern bluefin tuna, Australia banned Japanese boats from its waters.²⁵⁴

Coordination and integration of marine management based on sustainability and multiple-use is lacking. No broad Commonwealth, State or Territory legislation for the conservation of biodiversity currently exists.²⁰

The toxic blue-green algal bloom along the Darling River in 1991 was the single most important factor in generating government and community action, resulting in a series of best-practice management activities targeting the reduction of phosphorus sources.²⁰

While protected areas are increasing, nature conservation is generally a residual land use in agricultural districts. Some ecosystems and species are well-represented, others poorly. The knowledge base, while poor, is gradually improving. Better integration of management is needed. Bioregional management requirements are partially recognised, but enormous efforts are still required to develop and implement them fully. Until then, most biodiversity will continue to rely on areas outside conservation parks and reserves.²⁰

In April 2001 the South African National Defence Force (SANDF) helped intercept and arrest the crew of the illegal fishing vessel, South Tommy, which was carrying a cargo of fish worth about R4-million and outrunning a patrol boat from the Australian Fisheries department. In a joint statement the SANDF and the Australian Defence Force warned that 'foreign fishing interests' cannot avoid South African and Australian fishing regulations.²⁴²

Bangladesh

Number of fish species in Bangladesh	
Freshwater	213
Endemic	1
Marine/Brackish	317
Reef-associated	81
Commercially Important	16
Game Fish	125
Threatened	6
Introduced	5
Potential Aquarium	78
Aquaculture	6

Total Biodiversity-Value Index: 848

FW: 214

Introduction

Bangladesh is ranked by the World Wildlife Fund among the top 20 fishing nations that take about 80% of the world's marine fish catch.⁴⁷

Most of Bangladesh lies in the Bengal basin, a vast lowland holding the largest delta in the world made by the Brahmaputra and Ganges river system. The main wetlands are rivers and streams, shallow fresh water lakes, fish ponds, seasonally flooded cultivated plains, and marsh areas known as haors, baors, beels or jheels.

Bangladesh's rivers and other inland waterbodies have 260 indigenous fish species (in 55 families). The inland waterbodies are also now the habitat of 63 species of prawns. About 20 fresh water mollusk species have been identified. Marine waters are habitat to 200 fish species, and there are also at least 16 species of marine shrimps. From the Bay of Bengal about 301 species of mollusks under 151 genera have been identified. In addition, several species of crabs and 31 species of turtles and tortoises, of which 24 live in freshwater, are found.²⁴ Thirteen exotic species of fish have been introduced.¹¹

The most important commercial fishery for the large-sized fishes is for the hilsa or ilish (*Hilsa ilisla*), a marine fish that enters the rivers to spawn¹¹ and that constitutes about 30% of total fish production. Three separate species are found in the Bay of Bengal, of which two are restricted to seawater.⁴⁷

Trends

The gradual loss of many of the perennial water bodies has resulted in severe losses in fresh-water fisheries and biodiversity.⁴⁷

The third of the three species of *Hilsa ilisha* found in the Bay of Bengal, *Tenualosa ilisha*, migrates up the rivers. A large number of its newly hatched larvae and juveniles (locally known as Jatka) are caught while drifting downstream. During the peak catch period, the shortage of sufficient storage and ice availability and poor transport facilities mean much of the catch is wasted. In addition to the indiscriminate exploitation of the Jatka, disruption of their migration routes and increased fishing, low water discharge from the Farakka barrage and the associated heavy siltation lowers riverine catches of the Hilsha. Although the total production of the Hilsha has remained stable during the past few years, the bulk of the catch comes from marine or estuarine areas.⁴⁷

Response

As of May 2001, Bangladesh had not submitted a National Biodiversity Strategy and Action Plan to the CBD. Separate ministries and departments, each acting independently, are in charge of surface irrigation, ground water irrigation, fisheries, public health, environment, municipal water supply, power and navigation.²⁴

The World Bank-sponsored Flood Action Plan (FAP), a mega-project to combat floods through a series of dams and dykes which would have impacted river fisheries, underwent significant changes after its developers met with increasing local and foreign challenges.⁴⁶

Barbados

Number of fish species in Barbados	
Freshwater	12
Endemic	-
Marine/Brackish	502
Reef-associated	229
Commercially Important	2*
Game Fish	106
Threatened	14
Introduced	1**
Potential Aquarium	150
Aquaculture	-

Total Biodiversity-Value Index: 1016

FW: 12

*Dolphins and flying fish.

**Mozambiquan tilapia.

Introduction

Barbados has limited biological diversity and its existing natural habitats are constantly threatened by man. There are no permanent rivers, and natural coral reefs, turquoise seas and beaches of white sand make the west and south coasts highly attractive to tourists.

Marine and freshwater ecosystems include wetlands and water catchments, rocky intertidal, tidepools, seagrass beds, coral reefs, and the deep-water benthic communities. A review suggests 990 genera and 1548 species of organisms live in the marine and freshwater ecosystems of Barbados. Flying fish are the mainstay of the local fishers.

The large pelagics are believed to be of two groups: Caribbean stocks which migrate within the Lesser Antilles, and Western Atlantic stocks or oceanic stocks which extend throughout the Western Atlantic and perhaps beyond.

Trends

The major threats to biological diversity in Barbados are habitat loss and fragmentation. Nearshore benthic marine communities are being degraded by deteriorating water quality, localised increases in temperature, decreases in salinity and increases in toxins, by overfishing, physical damage from divers and boats, and destructive fishing methods.

Environmental issues also include pollution of coastal waters by ship waste and contamination of aquifers by illegal solid waste disposal.⁵¹

The shallow-reef fish resources are believed to be overfished, particularly on the south and west coasts. The largely overfished sea urchin fishery has been suspended. While there is no accurate information on the status of the local conch species, the queen conch population is believed to be depleted and restricted to deep waters while that of the helmet shell conch is restricted to the northwest coast in relatively shallow waters. Snapper fish are considered under-exploited. All turtles found in Barbados are on the CITES list of endangered species.

ICCAT reports that many of the large Atlantic tuna species are either fully exploited or overexploited. The status of most other tuna and tuna-like species in the Western Atlantic and Caribbean is uncertain.

Response

The MEE (Ministry of Environment, Energy and Natural Resources) is the principal executing agency responsible for coordinating and monitoring the overall implementation of the NBSAP project and the Biodiversity Work Programme.

A comprehensive environmental enactment, to include legislation currently scattered in a number of statutes, is lacking. Provisions of the Fisheries Management Plan include ensuring the fishing industry is integrated into fisheries and coastal zone management policy and decision-making; promoting selective fishing gear and practices that minimize waste and by-catch; ensuring effective monitoring, control and surveillance of fishing; restoring populations of endangered marine species; and preserving rare or fragile ecosystems and ecologically sensitive areas, in particular coral reefs, estuaries, mangroves, seagrass beds, spawning and nursery areas.²

² Provision is made in the Fisheries Act for access by foreign vessels, in accordance with access agreements and licensing procedures.

Belarus

Number of fish species in Belarus	
Freshwater	39
Endemic	-
Marine/Brackish	
Reef-associated	
Commercially Important	1
Game Fish	20
Threatened	1
Introduced	6
Potential Aquarium	10
Aquaculture	1

Total Biodiversity-Value Index: 78

FW: 39

Introduction

Belarus has many water areas with a great diversity of water and wetland ecosystems: over 10 000 lakes totalling about 150 000 hectares, 130 water reservoirs totalling over 80 000 hectares and more than 20 000 rivers with a total length of 90 600 km.

Trends

Because much of the aquatic environment of Belarus includes wetlands, rather than large lakes and strong rivers, aquatic diversity is highly bound up with agriculture and is affected especially by reclamation. Little land is not used (five percent of the territory) by man. Efficient conservation of biological diversity is impossible without ecologically optimised land-use planning, which is further complicated by the need to redistribute land, a process that will continue for many decades.

Especially harmful is done by ecologically unjustifiable drainage of boggy land and use of reclaimed facilities, improper use of poisonous chemicals and fertilisers, contamination by industrial waste, poaching, and stress from recreation and development of the road network. Their impacts are aggravated by a lack of ecological awareness and responsibility in many economic leaders and significant strata of the population, and by the absence of efficient legal and economic leverage to stimulate conservation.

Introduction of new fish into water reservoirs has been especially active in the last 30-40 years and has led to a catastrophic drop in the number of some indigenous species. Reclamation of bogs in the Polesye, creation of a network of water reservoirs, ploughing of waste lands and many other measures have also changed the composition and number of fish populations. In areas of snow-melt, warming of water reservoirs has seriously altered biological cycles.

Response

Legislation on biological diversity is entrusted to central and local state bodies, state government and self-government which makes this management function unclear and decreases its efficacy. Development of immediate measures and their approval by executive committees and ministries have been based on a realistic grasp of economic opportunities. Naturally, few departments have included into this Plan large-scale and long-term measures or measures that unite activities of a number of departments.

The main problems for aquatic biodiversity planners are overcoming patterns of large-scale land use inherited from the Communist state and now devolving into private plots, which may not yet be efficiently restrained by legislation (or enforcement) from damaging the environment; balancing the popular desire for higher living standards with ecological health; increasing public awareness to reduce the impact of new highways and uncontrolled tourism and recreation; integrating ecological protection into the economy by instituting 'ecological economics' into assessments of worth; and gaining the support of the international community for payment of 'ecological rent' for sites of international significance (such as the Pripjat marshes).

Immediate tasks must concentrate on biological diversity in the agrarian sector, creation of the National Ecological Network and introduction of this network into the Pan-European Ecological Network. Priority protection should be given to ecosystems that have been least subjected to anthropogenic transformation and that reflect the natural historic character as well as the relationship between biological diversity in the territory of the country. Special importance shall be given to highly eutrophic lakes and medium and large rivers with a high water supply plain (2.6 % of the total river length) that are least of all represented on the territories under protection, but that have highest uniqueness and diversity of fauna. Not all the most valuable natural territories in the now-formed ecological network have been protected adequately.

The public conservationist movement in the country has been weakened by the poor economy, which has curtailed the activities of the majority of clubs, museums and nature circles, conservationist patrols and other conservationist public organisations.

An opportunity for creating more protected areas may arise from the decommissioning of military areas (2 % of the country) that followed relaxation of border tensions after the fall of Communism.

Number of fish species in Belize	
Freshwater	81
Endemic	2
Marine/Brackish	549
Reef-associated	244
Commercially Important	33
Game Fish	115
Threatened	21
Introduced	1
Potential Aquarium	158
Aquaculture	-

Total Biodiversity-Value Index: 1204

FW: 83

Introduction

The Belize Barrier Reef is the second largest in the world and the largest in the Western hemisphere. The documented aquatic biodiversity of Belize today is 43 species of fresh water fish, 117 species of total inland fish, 157 mollusks, crustacean, and 43 species of amphibians.

Trends

Concerns are that the Fisheries Stock is being affected by overfishing of lobster, conch and some other commercial marine products.

Specific threats to aquatic biodiversity are hunting and fishing, and Coastal Zone Developments that destroy habitat. These developments can be considered the basis of the Gaps identified in the cross-sectoral issues for which no sectoral plans exist. The major policy gap is the absence of written policies on critical environmental issues.

The environmental problems or issues outlined in the National Environmental Action Plan and other studies are inadequate liquid and solid waste management systems, natural resource degradation that pollutes the marine environment and Coastal Zone, and rising poverty in environmentally fragile areas. More fishing and tourism may cause irreversible damage to the mangroves and reef system upon which marine species rely.

Response

Since signing the CBD in 1992 Belize has declared more than 25 protected areas (PAs) out of a total of 55. A Coastal Zone Management Unit has been developed as a UNDP Project under the Fisheries Department, which may result in a Coastal Zone Authority for more

comprehensive planning and management, and has led to a surge of activity in marine conservation. The unofficial strategy in place to preserve the biodiversity of the marine area appears to be the development of Marine Protected Areas, either as Marine Reserves under the Fisheries Act or as other types of Protected Areas under the National Parks Systems Act. The Marine Reserves may also incorporate adjacent areas of land, and allow for multiple use.

The Preliminary Assessment of Needs in the Policy Framework with respect to Biodiversity include an official Population Policy and a Policy relating to Biodiversity which states the national position on the key issues emerging from the CBD.

Information on specific sites and review of protected area needs was conducted by the Critical Habitat Survey of Belize (BCES, 1990). This data collection component also played a major part in the designing of the Protected Area Systems Plan (PfB, 1995). A literature review suggests information is missing on most amphibians, fishes, insects and other microscopic species in Belize. All administrative and management bodies, particularly the protected areas themselves, lack finance, equipment, infrastructure and qualified staff. As a group, NGOs play an influential role and indeed possess the greater part of the in-country protected area management expertise.

Belize has signed the Mesoamerican Reef Initiative, the International Convention for the Prevention of Pollution from Ships, 1973; the Bilateral Agreement between Belize and Mexico on Cooperation for the protection and improvement of the Environment and conservation of Natural Resources in the Border Zone, 1991; and the Agreement for the implementation of the Provision of the United Nations Convention on the Law of the Sea of 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, 1995.

Number of fish species in Bolivia	
Freshwater	215
Endemic	10
Marine/Brackish	
Reef-associated	
Commercially Important	1
Game Fish	17
Threatened	-
Introduced	11
Potential Aquarium	44
Aquaculture	4

Total Biodiversity-Value Index: 302

FW: 225

Introduction

Bolivia is the poorest country and has the least explored biodiversity of South America.

The Pacú and other river species of fish are important sources of protein in the diets of the inhabitants of tropical Bolivia, and contribute to the income of fishers and middlemen in the region.

Bolivia shares Lago Titicaca, the world's highest navigable lake (elevation 3 805 m), with Peru.

Trends

Since colonisation by Spain centuries ago, the local population made up of many indigenous groups that formerly lived sustainably off the land has been cut off from the benefits of natural resources and left with only the costs: severe erosion, and pollution arising from urban settlement and mining. Mercury contamination of fish, particularly in the central and northern highlands, presents a grave risk to human health and can lead to acute nervous afflictions. At present all extractive activities (agriculture, mining, fishing, forestry) are diminishing biodiversity.

The number of biological and resource professionals residing in Bolivia is still low and there does not exist a 'critical mass'. Most environmental studies are carried out by foreign scientists, and the results are in many cases published abroad in journals whose access to locals is very limited. The participation of foreign scientists is not always accompanied by training, support and leadership for young national scientists. Difficulties exist in developing research tasks, especially in view of the low salaries at the level of universities and the

limitations of logistical support. More professionals with different levels of specialisation in environmental themes are needed, for the number of graduates in these areas continues to be very low.

Lack of planning and coordination has created an anarchical situation in which institutions establish their own criteria and priorities without consulting other sectors.²¹⁹

Currently Bolivia is in dispute with Chile over Rio Lauca water rights.⁵²

Response

The National Strategy for Conservation of Biodiversity is still being defined, and so there is no mention in the NR of specific aquatic biodiversity or plans to preserve it.

Actions being developed for the use and sustainable management of river basins are found in the policies of the PGDES (Plan General de Desarrollo Económico y Social). Some of the activities on the subject discuss mainly the implementation of the river basin as the basic planning unit for the management of the sustainable development. The Directorate of River Basins, within the Undersecretary's office of Natural Resources, has asked for the support of the FAO.⁵²

Highland Wetlands are considered well represented in the National System of Protected Areas, Lowland Wetlands medium-well represented. This National System is the youngest in Latin America, and its development is the result of initiatives taken by NGOs. NGOs, both domestic and foreign, have played a preponderant role in occupying the vacuum left by central government.

Numbers of fish species in Brazil	
Freshwater	1955
Endemic	147
Marine/Brackish	856
Reef-associated	172
Commercially Important	132
Game Fish	168
Threatened	36
Introduced	17
Potential Aquarium	398
Aquaculture	6

Total Biodiversity-Value Index: 3887

FW:2102

Introduction

Brazil is the richest of the world's megadiversity countries,¹⁶⁷ its fauna and flora comprising at least 10% to 20% of the world's species described to date. Brazil has 12.7% of the world's river water (5 190 km³ outflow a year) and over 3 000 species of freshwater fish, over twice the number in any other country. Fish farms depend on carp from China and *Tilapia* from East Africa.

Data on endemism in freshwater fish are not available. Knowledge of the freshwater invertebrates of Brazil is also far from complete. Most research has been carried out in the south and southeast and in the Amazon, while regions of the central-west and the northeast remain almost entirely unexplored.

Trends

Freshwater biodiversity is threatened most by mining and by hydroelectric power developments. By December 1989, reservoirs of 60 hydroelectric power stations covered 23 847 km², or 0.28% of the country. Under the expansion programme another 13 191 km² will be flooded in the near future. Most migratory fish of Brazil depend upon flowing water for the hatching of their eggs; but the dams convert great stretches of the rivers into standing water.⁴¹

As marine tropical waters tend to have high species diversity but a low biomass compared to temperate waters, most of the Brazilian coast is relatively unproductive. Fisheries policies have changed since the late 1960s, when policies were directed at the industrial sector and sizeable incentives made it difficult to assess economic viability. The policies also ignored small fishermen, despite their accounting for 80% of national fish production. Nonetheless, the

fisheries sector still suffers as a result of misguided policies allowing open access to seas and oceans once thought inexhaustible.

Response

Marine Extractivist Reserves have been created along the coast, to cover open water only. There are also federal protected areas for coastal and oceanic islands, as well as for beaches, dunes, coral reefs, marine feeding grounds, bays, estuaries, saltwater lagoons, mangrove swamps, sand bars, marshes, and coastal, sandy soil vegetation (*restinga*). Despite the marine Extractivist Reserves, however, conservation of the marine and coastal zone biological diversity is still highly precarious. In recent years, the importance of conserving the landscapes next to protected areas has been recognised, and management plans for the protected areas now take conservation measures into account (e.g., the National Council for the Environment (CONAMA)).

At the SBSTTA Montreal meeting in 1997 Brazil proposed establishing basin committees for trans-frontier waters. Brazil's position is that discussion on this aspect should always be bilateral, and without conditions arising from international instruments that might be limiting to them.

Burundi

Number of fish species in Burundi	
Freshwater	218
Endemic	4
Marine/Brackish	
Reef-associated	
Commercially Important	1
Game Fish	11
Threatened	-
Introduced	4
Potential Aquarium	133
Aquaculture	1

Total Biodiversity-Value Index: 372

FW: 222

Introduction

While fisheries contribute only an estimated 1% to Burundi's agricultural GDP and 0.5% to its global GDP, their significance as a source of food and employment is substantial. Fish represents close to 30% of the total animal protein available in the national food supply.⁷⁰

The pelagic fisheries of the Burundi waters of Lake Tanganyika seem fully developed. (Demersal resources are negligible.)

The catch comes almost entirely from Lake Tanganyika (shared by the Democratic Republic of Congo, Tanzania and Zambia). Burundi's share of the total lake-wide catch in 1995 was around 12%, or 21 000 t. Smaller inland lakes, the most notable of which are Lake Cohoha and Lake Rweru along the border with Rwanda in the north of Burundi, also host fisheries for tilapia and catfish, but their contribution to the national catch is very minor. Various rivers, swamps and floodplains associated with the Ruzizi, Kagera, and Malagarazi river basins also provide small catches.⁷⁰

Trends

Natural lakes in the northeast - Cohoha, Rweru, Rwhinda, Gacimirindi, Kanzigiri, Gitamo, Rwungere, Narungazi, and Inampete - have a rich biodiversity not yet sufficiently explored. While Burundi has many rivers and watercourse, four rivers make up the essential hydrological reserve. The banks of these rivers once had luxurious vegetation, but in all highly populated regions, little of this vegetation has survived.

Response

An Action Plan is being elaborated.

The LTR Project Management Working Group, after assessing six years of LTR research into Lake Tanganyika, drafted a Framework Fisheries Management Plan (FFMP) for Lake Tanganyika, based on the FAO *Code of Conduct for Responsible Fisheries* (CCRF).⁷⁰

A new fisheries-related activity, Project IDEAL, was still being prepared in mid-1999. Its aims were to get long-term, high-resolution records of climatic change in tropical East Africa, to provide a comprehensive training programme for African students and scientists, and to strengthen African institutional capabilities in the aquatic sciences; such strengthened capacities would help foster research partnerships between African and northern hemisphere limnologists and paleo-climatologists. As of mid-1999, finances were still lacking.⁷⁰

From 1995, another major undertaking, the Lake Tanganyika Biodiversity Project (LTBP), has complemented LTR's fisheries-related investigations by addressing wider, basin-scale management problems of pollution control, conservation, and the maintenance of biodiversity. LTR and LTBP have cooperated extensively, sharing national staff, technical equipment and documentation, and some survey costs and administrative support.⁷⁰

Cameroon

Number of fish species in Cameroon	
Freshwater	403
Endemic	46
Marine/Brackish	454
Reef-associated	26
Commercially Important	4
Game Fish	99
Threatened	35
Introduced	4
Potential Aquarium	102
Aquaculture	3

Total Biodiversity-Value Index: 1176

FW: 449

Introduction

After the Democratic Republic of Congo, South Africa and Madagascar, Cameroon ranks fourth in Africa in overall biodiversity richness, with a high degree of endemism. Cameroon has a coastline of 402 km, and claims a 'territorial sea' out to 50 nautical miles.⁵³ The EEZ however is only fifteen square kilometers.²⁴⁴

Trends

Cameroon's rich biodiversity is seriously threatened by heavy reduction of species numbers through agriculture, fisheries, forestry and poaching. Of 354 species of fish, 115 are endemic, all are threatened, and only one is protected.

Of natural wetlands, only 20% remain.²⁴⁴

Implementation of action plans is hindered by lack of means to follow up and faithfully apply prescriptions; slow administrative procedures which sometimes do not reckon time as a determining factor when dealing with nature, seasons and various life-forms; local populations that find it difficult to understand the conservation messages being delivered by the executors of various plans; and, since it is only beginning to be applied, the failure of the participatory approach to yield fruits. The absence of incentives to the principal actors and the custodians of the resource also provokes reactions against conservation measures.

Delimitation of international boundaries near Lake Chad, which led to border incidents in the past, now awaits ratification by Cameroon, Chad, Niger, and Nigeria. The dispute with Nigeria over land and maritime boundaries around the Bakasi Peninsula and Lake Chad is currently before the ICJ, as is a dispute with Equatorial Guinea over the EEZ.⁵³

Response

Cameroon concluded its National Environmental National Plan (NEMP) in 1996 and National Forestry Action Programme in 1995. As of 1997, the Cameroon National Biodiversity Strategy and Action Plan (NBSAP) was still being prepared. (The WRI fact sheet on Cameroon however states a Biodiversity Action Plan existed as of 1991; the Convention was ratified in 1994.)

Suitable sites are being sought for Marine Protected Areas, especially in the Campo-Kribi region. Since the National Biodiversity Strategy and Action Plan was submitted in 1997, it would appear that one marine protected area has been created.²⁴⁴ At the time of the writing of the NR other sites had been identified and the procedure for creating the protected areas was to begin shortly. Apart from occasional research, no information has been found on marine ecosystems. The degree of evaluation and monitoring of fisheries is still 'experimental', according to the NR (Table 9.1)

In developing the NBAP the country's biological resources were identified and categorised within an ecosystem approach. A multi-disciplinary task force was assigned to examine biodiversity for each sector with a view to coming up with a general monograph for the country as a whole. This was achieved through training and consultation workshops. For each ecosystem and sector, strategies were proposed and the corresponding actions for each strategy were provided; for each action to be taken, a suitable actor to implement the strategy was identified. The draft document is expected to be available by January 1998 while the final document should be available by March 1999.

Number of fish species in Canada	
Freshwater	206
Endemic	1
Marine/Brackish	650
Reef-associated	27
Commercially Important	70
Game Fish	225
Threatened	25
Introduced	16
Potential Aquarium	36
Aquaculture	9

Total Biodiversity-Value Index: 1265

FW: 207

Introduction

Canada has an estimated 24 % of the world's wetlands. The cod stocks off the Grand Banks of Newfoundland once supported an immense fishery.

Trends

In settled regions, wetlands and estuaries have been drained or significantly altered. In eastern Canada, thousands of small lakes continue to lose fish, amphibian and shellfish communities to transboundary acid precipitation, much of which comes from the United States. The Great Lakes ecosystems have been greatly altered by intensive commercial fishing, invasions and deliberate introductions of alien species, pollution and habitat alteration. For many decades, the St. Lawrence River watershed has received the accumulated discharge of toxic wastes, including those from the Great Lakes, from municipal sewage and agricultural runoff.

Northern cod, salmon and other harvested fish stocks have massively fallen in Atlantic and Pacific coastal waters, raising concerns over greatly diminished gene pools. A recent report by the Auditor General of Canada finds that of the 4906 stocks of salmon in the province of British Columbia and the Yukon, 600 are at high risk, 63 are at moderate risk and 57 are of special concern. Habitat loss, urban development, forestry activity and non-sustainable use are believed to be the causes. Atlantic salmon escaping from fish farms in Pacific waters are also a concern. Canada is currently developing a national framework and policy statement for the management of marine protected areas, following which pilot projects will be initiated.

Response

The Federal Policy on Wetland Conservation commits the federal government to ‘no net loss of wetland functions’, mitigation of the impacts of federal actions on wetlands, co-operation with NGOs, native groups and the public, and the development of a sound science base and research for wetland management. Many provinces have also developed policies and programs for the conservation and protection of wetlands.

Canada is collaborating with arctic nations to develop an Arctic Regional Program of Action under the auspices of the Arctic Environmental Protection Strategy and the Arctic Council. The federal government has taken legislative and policy steps to address marine pollution in the Fisheries Act, the Toxic Substances Management Policy and the Canadian Environmental Protection Act.

Environment Canada continues to provide information on the changing Canadian environment, but in a more cost-effective manner that focuses on individual areas or issues as opposed to producing a National State of the Environment Report. Ecosystem-specific reports are prepared to increase awareness of threats in specific areas. Examples of these reports include the State of Forests Report, the State of the Great Lakes Report, the Northern River Basins Study and the State of the Parks Report.

Number of fish species in China	
Freshwater	862
Endemic	110
Marine/Brackish	667
Reef-associated	168
Commercially Important	63
Game Fish	161
Threatened	46
Introduced	18
Potential Aquarium	118
Aquaculture	26

Total Biodiversity-Value Index: 2239

FW: 972

Introduction

Fisheries production increased from 1 million tons in 1951 to 36 million tons in 1997, by which year it ranked first globally and accounted for about one fourth of the world's total.⁹⁴ By 2010 China's maritime and oceanic products industry is expected to account for 10% of the GDP.

Trends

Major biodiversity problems are ongoing destruction of ecosystems, linked to a broad public indifference to the ecology. Despite widespread international objections, the Three Gorges Dam project on the Yangtze is proceeding.

China is in a complex dispute over the Spratly Islands with Malaysia, Philippines, Taiwan, Vietnam, and possibly Brunei; in a maritime boundary dispute with Vietnam in the Gulf of Tonkin; over the Paracel Islands occupied by China, but claimed by Vietnam and Taiwan. Furthermore, China claims the Japanese-administered Senkaku-shoto (Senkaku Islands/Diaoyu Tai), as does Taiwan.⁵⁴

Response

The stipulation of the Chinese fishery department in recent years that fishery following must be carried out in the East China Sea and Yellow Sea in July and August of every year has got good results in protecting maritime fishery resources. Since the early 1990s, 25 nature preserves have been set up, covering a total area of 660 000 hectares. A special ocean environment preserve is also planned to protect typical ocean ecosystems and endangered species.²²

Eighteen priority projects for immediate implementation have been identified in China's Action Plan of 1994. Three of 26 actions within these projects relate to aquatic biodiversity. Action 5: To establish new nature reserves in areas in urgent need of biodiversity conservation, to select locations for nature reserves for forest, grassland, wetland, fresh water, marine ecosystems and crop and domesticated animal wild relatives; Action 19, to protect main vegetation or habitats outside nature reserves and prohibit or control strictly the exploitation of meadows and wetlands; and Action 20, to protect the coastal and marine environment.

Almost all the action plans and schemes are being implemented to varying degrees, in particular, the priority projects identified in China Agenda 21 and China Action Plan for Biodiversity Conservation. Overall, initiation or implementation is slow, mainly due to lack of financial resources at the national, cross-departmental and departmental levels. The wide range of ministries and agencies involved in biodiversity conservation also hampers progress.

Colombia

Number of fish species in Colombia	
Freshwater	537
Endemic	32
Marine/Brackish	1132
Reef-associated	307
Commercially Important	106
Game Fish	193
Threatened	26
Introduced	37
Potential Aquarium	235
Aquaculture	11

Total Biodiversity-Value Index: 2616

FW: 569

Introduction

Of all countries lying between the tropics, Colombia has the highest diversity for its size, accounting for 10% of world biodiversity on only 0.7% of the world's land surface. It is the only country in South America with coasts on both Atlantic and Pacific Oceans. The EEZ totals 590 000 km² in the Caribbean and 340 000 km² in the Pacific. About 80% of the fish landed in Colombia are marine, and 6% are freshwater; the remainder are farmed. Most of the saltwater fish are from the Pacific (91 000 tons/year), while 15 000 tons are landed from the Atlantic.

Trends

The main causes of biodiversity loss are indirect: poor awareness, poor structure of land ownership, deficiencies in knowledge and institutional capacity, and lack of methods for evaluating biodiversity, whose true value is not reflected in the market. Political violence, and inequitable distribution of the benefits of biodiversity, which hampers awareness of the consequences of biodiversity loss, are the other causes.

Thanks to overfishing and inappropriate gear the Magdalena River lost about 78% of its production in the 20 years up to 1994. In other basins such as the Orinoco and the Amazon, production has gone up with the recent introduction of commercial fishing in these areas.

Response

In December 1996 the Ministry of Environment declared as a Natural Area for Special Management the coral reefs of the archipelago of San Andres, Providence and Santa Catalina, in the Caribbean Sea.. Environmental licenses and Environmental Impact Assessments are

now required for projects, works and other activities which might have an adverse effect on renewable natural resources. Tax incentives now exist to encourage clean production and to purchase property with ecological functions, as conservation is less costly than restoration.

Congo - Brazzaville (Republic of)

Number of fish species in Congo, Republic of (Brazzaville)	
Freshwater	350
Endemic	2
Marine/Brackish	433
Reef-associated	20
Commercially Important	4
Game Fish	101
Threatened	10
Introduced	13
Potential Aquarium	97
Aquaculture	1

Total Biodiversity-Value Index: 1031

FW: 352

Introduction

Approximately 10 000 fishermen, men and women, capture more than half the fish landed in the Congo. Of these, around 70% are marketed smoked, and the remainder is marketed fresh. The fishing boats are dugouts, numbering around 12 000, with very few being motorised.⁷¹

Trends

The Congo River remains the principal axis of distribution towards Brazzaville, where the distribution chains for freshwater fish end. Neither the Congo nor Kouilou basins are fully exploited. With the exception of refrigerated storage for fish at the industrial angling clubs of Point-Noire, the infrastructure for the preservation and distribution of fish are poorly developed.⁷¹

The marine ecosystem in Congo shows increasing signs of degradation, in particular hydrocarbon pollution. Coastal erosion is another alarming phenomenon.⁷¹

Although 99.4% of Congo's energy consumption is from hydroelectricity,⁵⁶ Congo's large hydroelectric potential (3 000 MW) is largely unexploited. Congo has signed an \$11.2-million agreement with Geo-Industria of the Czech Republic to conduct feasibility studies on four micro-hydroelectric power plants in the north. Development of the \$925-million, 1-gigawatt Sounda Gorge hydroelectric project, at the confluence of the Niari and Kouilou Rivers has been postponed. The planned dam was to have a height of over 300 feet and a generating capacity of 1 GW.⁶⁷

Little of the river boundary between Congo-Kinshasa and Congo-Brazzaville is definite. No agreement has been reached on the division of the river or its islands, except in the Stanley Pool/Pool Malebo area.⁵⁶

Response

In May 2001 the Congolese government banned shark fishing in territorial waters. Sharks are endangered by poaching on Pointe-Noire's Atlantic coast, mostly for their fins, which fetch high prices in Asia. Fishermen now must pay a tax on sharks captured, a shark fishing license tax, and a tax for shark quality control and certification. Fishermen are also not allowed to export any sharks or shark products.¹⁸³

Under the ban, only accidental secondary catches would be allowed for the smaller sharks, while large specimens caught accidentally or intentionally must be put back. Many small-scale Beninese and Congolese fishermen practice this trade illicitly to get fins to resell at high prices to West African traders, who then sell them on the Asian market. Unfortunately, the fisheries department lacks the means to closely monitor the 180-kilometre coastline, which is fished illegally by hundreds of pirate boats from Asia, Europe, and Africa. A similar ban was issued in 1998.¹⁶⁶

Since 1991, three significant projects shut down for lack of financing: 'Support for maritime fishing', 'Development of artisanal fishing in the Congo Basin', and 'Development of rural pisciculture'. Only the regional 'Integrated development of artisanal fishing in West Africa (DIPA)' continues to support maritime fisheries. Additionally, since 1991 USAID has financed twenty 20 Peace Corp experts to help build ponds and popularize pisciculture.⁷¹

Congo - Kinshasa (Democratic Republic of)

Number of fish species in Dem. Rep. of Congo	
Freshwater	1037
Endemic	18
Marine/Brackish	375
Reef-associated	14
Commercially Important	3
Game Fish	103
Threatened	13
Introduced	6
Potential Aquarium	282
Aquaculture	-

Total Biodiversity-Value Index: 1851

FW: 1055

Introduction

The Democratic Republic of the Congo is among the most important countries of Africa for biological diversity. Around 1 000 species of fish, essentially freshwater, with some brackish, are known. The Rift Valley lakes contain the richest lacustrine fauna in the world, the family of *Cichlidae* alone represented by more than 900 species. At the same time, there is a pronounced difference among the lakes: whereas Lake Tanganyika has 250 species of fish, of which 216 are endemic, Lake Kivu contains only 32 and 16, respectively.

Aquatic vertebrates are used for food, commerce (live species, aquarium fish, tourism, leather-working), and as ecological indicators.

Trends

Aquatic vertebrates are threatened by overexploitation, some species to the point of extermination; by alteration of habitat through deforestation; by methane gas in Lake Kivu and by pollution (hydrocarbons, and artisanal mining of gold and diamonds).

Of numerous problems the most notable are ineffective monitoring of regulations (too few staff, under-trained and under-equipped); lack of motivation due to insufficient and irregular salaries; non-involvement of local and riverine populations in programmes in protected areas, where there is poor rapport between inhabitants and implementers; the absence or inadequacy of community educational programmes; and poorly adapted and defined institutional bodies.

Response

Very little of the biodiversity in the Democratic Republic of the Congo has been studied, much less managed.

The objective of the Government is to increase the surface of protected areas to 12- 15 % of the national area. Thirteen sites of national and international interest and four sites of local interest have been identified by the IUCN.

Ecuador

Number of fish species in Ecuador	
Freshwater	231
Endemic	10
Marine/Brackish	528
Reef-associated	104
Commercially Important	64
Game Fish	88
Threatened	8
Introduced	4
Potential Aquarium	56
Aquaculture	5

Total Biodiversity-Value Index: 1098

FW: 241

Introduction

The Galápagos Islands are recognized worldwide for the evolutionary processes that have occurred there and for their unique species. Fluvial systems in Ecuador have 730 species of fish in 61 families and 315 genera. (Geographically, 76% are in the Amazonian Region, 22% along the Coast and 3% in the fresh waters of the Inter-Andean Region.¹⁴¹) The coastal marine ecosystems are extraordinarily productive biologically. Twenty-five of the 30 Holdridge Zones of Life (mangrove swamp, dry tropical forest etc.) identified for South America are found in Ecuador. Of the marine fish, cartilaginous as well as bony, 423 species have been counted; in Galápagos registries approximately 300 species exist, many of which are also present in continental coastal waters. Endemism is about 23%.

Shrimp brought in 14.5% of Ecuador's export earnings in 1998.

Trends

Population growth, over-consumption, unequal land distribution, insufficient information, and the prevalence of exploitative institutional and legal systems have all degraded the environment.¹⁴¹

The rivers of the Coast that empty in the Pacific Ocean are overfished and affected by serious alteration of aquatic atmospheres, which has diminished the population of fish and crustaceans. Despite restrictions, the aquatic resources around the Galápagos Islands are being damaged by both industrial and artisan fishing.

Response

Responsibilities for managing biodiversity are fragmented in a series of institutions. At legal and institutional levels, initiatives have not improved management and conservation of biodiversity. A legal frame that is still very diffuse limits these initiatives, and furthermore the initiatives suffer from a lack of inter-institutional coordination. Ecuador is not a signatory to the UN Convention on the Law of the Sea.

Number of fish species in Fiji	
Freshwater	47
Endemic	1
Marine/Brackish	716
Reef-associated	479
Commercially Important	43
Game Fish	136
Threatened	8
Introduced	15
Potential Aquarium	242
Aquaculture	6

Total Biodiversity-Value Index: 1693

FW: 48

Introduction

Fiji's marine flora and fauna are moderately well known. About 1 200 different species of fish, 200 different corals, and 1 100 different mollusks have been identified, and the number of fish is expected to reach 1 500.²⁵⁶ Marine fisheries predominate; the industrial fishery is entirely tuna oriented. Inshore fishing is largely subsistence. The most important aquaculture is of various species of tilapia (*Oreochromis* sp.).⁷²

Fiji has one of the largest and best developed coral reef systems in the South Pacific. It has one of the longest fringing reefs and one of the longest barrier reefs in the world.

Trends

Major problems are pollution and overfishing near urban centres. (All but two of Fiji's dumps for domestic and industrial wastes are in mangrove areas or by rivers.) Severe localised damage has been caused to reefs and shore environments by ports, wharves and marinas, seawalls, and reclamations. Many fish species in heavily populated areas are growth overfished, and several species that are stock overfished have been severely depleted. Destructive fishing practices, including dynamiting, traditional fishing poisons or modern pesticides and bleach, are a serious problem in parts of Fiji. Marine turtles are rapidly declining, two species of Giant clams are extinct, and coconut crabs are rare to locally extinct on almost all islands.

Response

As of 1997 Fiji was still formulating a National Biodiversity Strategy and Action Plan. A Strategy and Action Plan Report was to be submitted in mid-1998.

The coral reefs remain poorly studied. In 1996, giant clams being maintained at ocean and land nurseries were used in reef re-seeding.⁷²

Area closures and bans on gill netting for reef fish seem to have been effective in restoring stocks of some commercially important species in some inshore areas near population centres.⁷² There are no formally designated Marine Protected Areas, although several local initiatives protect certain sites. The Fisheries Department is promoting Community Marine Reserves managed by Traditional Fishing Rights Owners. The present system of existing reserved and protected areas is seriously inadequate, for a Marine Protected Area without the Fishing Rights Owner's approval and economic involvement is virtually impossible.

Production from inshore and coastal areas is generally considered to have reached its limit, and the government is focusing on managing over-exploited inshore fisheries. A central feature of new initiatives is the devolution of management authority to local government units and, beyond this, to coastal communities having traditional rights of marine tenure.⁷²

Much fisheries development activity that in the past has been carried out by government will be devolved to the private sector, enabling government to focus on fisheries management. This change will involve skills presently lacking, and some retraining of government staff will probably be required. Mechanisms need to be developed to ensure that any government interventions in the fisheries sector are relevant to the interests of stakeholders.⁷²

Number of fish species in Guinea	
Freshwater	229
Endemic	8
Marine/Brackish	535
Reef-associated	29
Commercially Important	4
Game Fish	113
Threatened	11
Introduced	-
Potential Aquarium	67
Aquaculture	-

Total Biodiversity-Value Index: 996

FW: 237

Summary Only

Introduction

Guinea contains portions of the Guinean Moist Forests, Senegal and Gambia River Mangroves and Wetlands, and Western Guinea Current Marine Ecosystems. The Upper Guinea ecoregion (Côte D'Ivoire, Guinea, Liberia, and Sierra Leone), because of the more or less permanently wet conditions in the Guinean mountain range, has two endemic genera of crabs and dozens of endemic fish species. The many small river basins that drain into the Atlantic are also unique in their high fish richness by area, and there are many endemic species.²⁵¹

The rivers that empty into the Gulf of Guinea run through equatorial forest and savanna, and the levels of endemism are amongst the highest for any of Africa's freshwater river systems: at least ten endemic species of crabs in several endemic genera, and the second highest fish-species richness of river systems in Africa.²⁵¹

The coast is 300 km long, bordered on the north by Guinea-Bissau and on the south by Sierra-Leone. Guinea's maritime waters profit from the currents from the Canaries that support regular upwellings of cold water. Guinea also has 6 250 km of inland rivers and streams. In 1995, total captures reached 69 000 t, made up of 48 000 t artisanal and 21 000 t industrial. Tuna makes up a significant share of the pelagic species, which remain to be developed economically.⁷³

Trends

Pelagic fisheries landed 3 000 t in 1995, working the northwestern continental shelf at the end of the dry season when pelagic resources are at their maximum thanks to the effect of the upwelling currents from the Canary Islands.⁷³ Demersal fisheries landed 8 000 t in 1995, mainly from the continental shelf in the North-West around Conakry. In the same year, Cephalopod fisheries landed 9 000 t. The ships concentrate on the northwestern zone of the continental shelf, zones of strong cuttlefish abundance in March-April. Shrimp fisheries captures are estimated at 600 t. Shrimpers exploit two quite distinct stocks: a very coastal stock, made up primarily of *Parapenaeopsis atlantica* and *Penaeus notialis*, and a stock found more at depths from 200 to 600 m including species of the *Parapenaeus* and *Hétérocarpus* families.⁷³

Threats to freshwater biodiversity include heavy deforestation within the Upper Guinea ecoregion, and mining of iron ore and diamonds in Liberia, which is causing the siltation of rivers and the loss of much riverine vegetation. Political instability in Liberia and Sierra Leone has weakened natural resource management.²⁵¹

Dam building on many coastal rivers and continued deforestation in the Gulf of Guinea pose the greatest threat to the aquatic diversity in the ecoregion. The aquarium trade and introduced species also threaten native fish populations.²⁵¹

Response

Despite many years of efforts authorized by the Guinean State to develop a national industrial fishery base, the pelagic fishery is dominated by foreign fleets.⁷³

Number of fish species in India	
Freshwater	620
Endemic	196
Marine/Brackish	985
Reef-associated	283
Commercially Important	248
Game Fish	214
Threatened	22
Introduced	18
Potential Aquarium	221
Aquaculture	30

Total Biodiversity-Value Index: 2837

FW: 816

Introduction

India is one of the 12 mega-biodiversity centres in the world, and the Indian ocean is fished heavily by Spain, Korea, Taiwan, France, Romania, Italy, and Lithuania. Cumulative catches from the Indian Atlantic ocean between 1950-1994 were approximately 2 million tons, and from the West Indian Ocean 6 million tons.³⁷ By 1995, India was the fourth largest producer of farmed shrimp in the eastern hemisphere.⁸

About 12% of all the world's fishes are in India, or about 2 200 species, of which 27 are in some degree of danger. Of about 4 million ha of wetlands, 2.6 million are man-made.

Trends

Coastal area population is 154 million, or 18.2 %of the total population of India.²²⁵ Development of the coastal zone coupled with population increase has stressed coastal mangroves, coral reefs and the marine environment. Every day nearly 19 000 million litres of sewage are estimated to reach the coast, and nearly 100 000 hectares of land are used for prawn culture in Andhra Pradesh, Tamil Nadu, West Bengal and Orissa states. International tankers travel the western EEZ of India and the Andaman and Nicobar waters, polluting the waters.

Marine fin fishes threatened by indiscriminate fishing include the whale sharks and marine catfishes. Overfishing of catfishes from 1979-1986 has had far-reaching effects at other centres, since the stock is migratory in nature. The indiscriminate catch of females of deep-sea lobster by a large number of deep-sea trawlers has resulted in consequential depletion in landings, while the sand lobster and the rock lobster have also fallen in production. The Horseshoe crab, distributed along Orissa coast, is threatened.²²⁵

Response

The Action Plan seeks to implement a broad planning approach to aquatic ecosystems, to raise awareness of their value, to reinforce the capacity of institutions, to conserve all protected aquatic ecosystems, to give protected area status to major aquatic ecosystems currently unprotected, and to expand cooperation. However, the National Biodiversity Strategy and Action Plan makes no mention of the threats to India's aquatic biodiversity. Instead, concerted efforts are being made to investigate cultivable fish species to prevent over-exploitation of such resources in their natural habitat. Inventory and monitoring programmes include Ecosystem Surveys, a Conservation Area Survey of Marine Protected Areas, estimation of fish resources within the EEZ of India, and monitoring landing data of major commercially important species. The WWF-India in collaboration with AWB (Asian Wetland Bureau) published a detailed 'Directory of Indian Wetlands' in 1993. The UNDP is currently supporting at least five programs in support of aquatic biodiversity. The MoEF (Ministry of Environment and Forests) is the nodal Ministry for the Convention on Biological Diversity.

To combat river pollution, three Centrally Sponsored Schemes are being implemented: the Ganga Action Plan (GAP) Phase I, Ganga Action Plan Phase II and National River Conservation Plan.

Number of fish species in Indonesia	
Freshwater	983
Endemic	100
Marine/Brackish	2511
Reef-associated	1251
Commercially Important	681
Game Fish	253
Threatened	83
Introduced	18
Potential Aquarium	772
Aquaculture	39

Total Biodiversity-Value Index: 6691

FW: 1083

Introduction

Indonesia's First National Biodiversity Strategy and Action Plan (1998) makes no mention of measures taken or planned to preserve aquatic biodiversity. However, in Indonesia's 1997 submission to the Commission for Sustainable Development the country claims to be one of the few countries in the region to have a strategy, a country study and an action plan on biodiversity.²²⁶

Official priorities in managing Indonesia's biodiversity are: fulfillment of basic human needs, especially food, shelter and medicines; sources of income; and lastly, usefulness for the environment. In 1993 the annual budget for managing Indonesia's biodiversity was estimated at US\$ 1 million.

Indonesia is ranked seventh in maritime catches worldwide³, and is one of the world's top producers of farmed shrimp.

Trends

Oil pollution, sewage discharges, coastal development, siltation of mangroves, poor overall management, low public concern, and laws that are not enforced or prey to corruption are other threats to maritime and coastal fisheries. Sectoral conflicts are also a serious issue, leading to oil and mining exploration in conservation areas often being conducted without an EIA.²²⁶

³ FAO statistics, without citation, in National Report

As with the other maritime nations of the South East Asia seas, the greatest threats to marine fisheries are from overfishing. Encroachments on national fishing grounds lead to conflicts; a more serious threat is the overfishing linked to modern technologies and transboundary agreements that allow the richer states like Japan and South Korea access to fishing grounds that were traditionally the mainstays of indigenous coastal communities, which now struggle over the diminishing resources.^{237 and 201}

Response

Conservation areas have been established or designated on major islands and island groups to cover all major habitats. However, protected areas face pressures such as low local community participation, an inadequate management framework for identifying and controlling resource use, inadequate human power, excessive centralization in management and lack of funding. A large part of the 368 established protected areas at present have not been surveyed, mapped or given clear boundaries.²²⁶

WWF's Indonesia Programme has created a special marine conservation unit, and WWF has been working with the Indonesian government to secure 10 million hectares of the most important natural areas as national parks or marine reserves. In addition, a coral reef campaign coordinator will soon be recruited to work closely with governments in the region to help deter cyanide and dynamite fishing. The live fish trade, much of which goes to Hong Kong, will also be investigated and monitored by TRAFFIC (the wildlife monitoring arm of the WWF). Until recently, marine work in Indonesia has focused on dugongs and marine turtles and two main field projects in the Take Bone Rate in Sulawesi and Teluk Cenderawasih in Irian Jaya. WWF has helped Take Bone Rate develop its management plan and assess the priorities identified by the local communities, including the establishment of 'regeneration zones', the formation of credit and marketing cooperatives, the development of value-added marine products, mariculture, and ecotourism.²⁴⁹

A project to establish a Biological Diversity Inventory and develop a User Advisory Group Information System by 1999 has been in progress since October 1994.²²⁶

Number of fish species in Iran	
Freshwater	93
Endemic	17
Marine/Brackish	260
Reef-associated	71
Commercially Important	14
Game Fish	91
Threatened	11
Introduced	9
Potential Aquarium	23
Aquaculture	5

Total Biodiversity-Value Index: 594

FW: 110

Introduction

Because of its size and varied ecosystems, Iran is one of the most important countries in the Middle East and Western Asia for conservation of biological diversity. The country has over one hundred sizable wetlands, 20 of which have been listed in the Ramsar Convention’s List of Wetlands of International Importance. Many of the aquatic resources are exclusive to the region. Five rivers, namely Chalus (Caspian watershed), Karaj, Lar, Sardab and Jajeroud (all in the Central watershed) are protected by the Department of Environment (DoE).

Iran has more than 3 450 rivers (including seasonal) and within the six main watersheds lie 37 major river basins. The Caspian, the largest lake in the world, is in northern Iran, covering about 422 000 km² with 6397 km of coastline, of which more than 900 km are on the Iranian side. About 128 large and small rivers flow into the Caspian from Iran. Along the southern borders of the country lie two important water bodies: the Persian Gulf, covering 232 850 km², and the Sea of Oman, both home to nearly 336 fish species.

Inland fisheries extend over 1.5 million hectares. Rivers, natural lakes, artificial reservoirs, irrigation canals, aqueducts and ponds are used for fish culture, which is organized in fish farms. The most popular species are sturgeon, white fish, pike-perch, salmon, rainbow trout, and carp.⁷⁴ One recent activity of Shilat is shrimp culture along the southern coasts, as well as hatcheries to produce shrimp larvae such as *Penaeus merguensis* and *P. semisulcatus*.

Trends

Lack of regulations on site selection for shrimp farms and effluent is a concern.

Response

To ensure sustainable fisheries and to conserve fishing grounds, the Shilat Organization (affiliated to the Ministry of Jihad-e Sazandegi), has forbidden bottom trawling for pelagic fishes. Shilat has also moved to promote scientific research and to execute regulations for resource management. Commercial species include *Scombermorus commerson*, *S. guttatus*, *Auxis thazard*, *Katsuwonus pelamis*, *Thunnus tonggol*, and *Istiophorus platypterus*. Shrimp fishing is concentrated on the Persian Gulf within the main inter-tidal zones and sea-grass areas. Among other valuable aquatic resources are the bivalves. Harvesting of pearl oysters, whose natural habitats are primarily the coral islands in the Persian Gulf, is now restricted to Lavan, Qeshm and Hendurabi islands.

Shilat has placed great emphasis on the development of sustainable fisheries. Because of their economic importance, fishing of caviar-producing sturgeons is the sole responsibility of Shilat, and large sums of money are allocated for preservation of the sturgeons. Shilat also monitors fishing methods to prevent over-fishing and damage to fish stocks. Beach seining, for example, is the sole fishing system by which licensed cooperatives are allowed to catch bony fishes other than kilka. To prevent illegal fishing, marine guards control fishing in the Caspian. To give technical and scientific support for fisheries-related activities Shilat has established the Iranian Fisheries Research and Training Organization. Funds are allocated for research on identification and conservation of fish stocks.

A threatened CITES export ban on caviar from the Caspian countries was not to include Iran, since Iran's management of caviar exports was deemed fairly effective.¹³⁴

The major national policy objective is to increase fish consumption, which has risen from 1 kg per capita in 1987 to 4.6 kg in 1995. The increase was due both to increased fish production and to Government policy to keep fish prices lower than those for red meat and poultry.⁷⁴

Japan

Number of fish species in Japan	
Freshwater	249
Endemic	38
Marine/Brackish	3338
Reef-associated	1181
Commercially Important	154
Game Fish	312
Threatened	35
Introduced	34
Potential Aquarium	649
Aquaculture	26

Total Biodiversity-Value Index: 6016

FW: 287

Introduction

Japan is the most important fishing nation in its region, demonstrated by the extent of its deployment and size of catch and its bilateral agreements with every country in the region.

Between 1954-1994 the Japanese took 21% of all marine catches by distant water fleets, or almost 50 million tons,³⁷ second only to the former USSR.

Trends

Total catch of the Japanese fishing industry has fallen rapidly during the last decade. Most of the largest fishing companies, generally part of integrated food manufacturing enterprises, have withdrawn from distant-waters fishing vessels to concentrate on sea-food manufacturing.⁷⁵ Marine fishing remains the most important fishery sector, as the narrowness of Japanese rivers and lakes limit inland fishing.

At sea, the growing catches of sport fishers are causing conflicts with professional fishers.⁷⁵

Response

As evidenced by the promises of future action, there seems to be a present dearth of effort aimed at assessing biodiversity, most research being driven by economic factors.

Although about 40% of protein consumed in Japan is aquatic, the aquatic life along the Japanese shores has not been systematically studied. As basic research for natural protection, Japan is surveying its coastal areas, and will promote the conservation of habitat areas.

The bilateral agreements with other nations in the region are often between fishermen's organizations rather than between governments. They also apply more to bottom fisheries than to pelagic fisheries, which migrate and occupy different areas at different times for spawning and feeding.²³⁷

To protect tuna resources, in 1999 Japan removed 132 large-scale tuna longline vessels, 20% of the total number of vessels.⁴

Japan cooperates in many international programs promoting biological diversity compatible with regional economic and social development. Japan was also one of the signatories of the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea, a rare example of successful international cooperation.³⁷

⁴ In accordance with the International Plan of Action for the Management of Fishing Capacity adopted by FAO. Japan Fisheries Association, 1999 (http://www.suisankai.or.jp/iken_e/iken99_e/ik006_e.html)

Number of fish species in Kenya	
Freshwater	320
Endemic	4
Marine/Brackish	692
Reef-associated	379
Commercially Important	10
Game Fish	195
Threatened	36
Introduced	18
Potential Aquarium	240
Aquaculture	5

Total Biodiversity-Value Index: 1899

FW: 324

Introduction

Marine fisheries are an important source of protein for coastal populations as well as a significant economic activity. The main fishery along the Kenyan coast is artisanal.

The Lake Victoria basin (western Kenya) produces 90% of Kenya's total fish catch and sustains nearly half the population. Kenya's inland waters are however generally poor in fish diversity. Lake Victoria has over 250 fish species, a large number of which are endemic. Lake Turkana, the second largest lake in Kenya (Northern Kenya), has 48 fish species, of which ten are endemic. With the exception of Lake Magadi (Southern Kenya), which has one endemic fish species, the alkaline Rift Valley lakes are generally poor in fish. Rivers such as Tana, Athi, Uaso Ngiru (North), Malewa and Nzoia contain non-endemic fish species. Nonetheless, inland water resources support a wide range of socio-economic activities, including a rapidly growing fishing and tourist industry which includes wildlife conservation.

Marine and coastal areas have a rich diversity, containing over 456 species of fin fish, 169 species of corals, 9 species of mangroves and over 300 species of macroalgae, 11 species of seagrasses, 344 species of mammals, 5 species of reptiles, countless numbers of phytoplanktons, zooplanktons, and thousands of species not yet described.

Trends

Tourism, the country's second-highest foreign exchange earner, depends highly on the coastal and marine environment and the associated biological resources.

Kenya has lost about 15% of its coastal wetlands and 9% of its inland wetlands during the last decade.¹⁷² Man is the principal threat to aquatic biodiversity, through habitat degradation,

water pollution, exploitation of resources, invasive alien species such as the water hyacinth, and through lack of comprehensive legal and policy guidance.

Response

In February 2001 the Kenyan government prohibited the use of trawlers and trawling in Lake Victoria in an effort to safeguard fish exports, especially to Kenya's key market in the European Union.¹⁸¹ In February 2001 the Kenyan government was also reported to have imposed a ban on fishery activities in Lake Naivasha following a decline in fish stock and alarms raised over rising pollution from the expanding flower and horticultural industry around the lake. Lake Naivasha is unique in that it is the only freshwater ecosystem in an otherwise soda-lake series in Eastern Rift Valley. (It was designated a Ramsar site in 1995).²⁰⁶

Four Marine National Parks and five reserves cover about 5% of the Kenyan reef. The parks and reserves (Malindi, Watamu, Kiunga, Mombasa and Kisit Mpunguti) are protected only from direct use, not from pollution. There are efforts to expand marine protected areas by gazetting Diani National Park, which also partially protects some inland aquatic biodiversity through national parks and reserves. Lakes Nakuru and Bogoria are protected under national park and national reserve status, respectively. Two islands in Lake Turkana are also protected under national park status. In addition, there are wetlands and lakes protected within Amboseli, Saiwa and Tsavo west National Parks. The Nyando River delta in Lake Victoria basin is partially protected as part of the Impala Sanctuary near Kisumu. Despite the high ecological and economic significance of the Tana River and Yala River deltas, they are not protected.

Number of fish species in Laos	
Freshwater	433
Endemic	2
Marine/Brackish	
Reef-associated	
Commercially Important	14
Game Fish	18
Threatened	10
Introduced	9
Potential Aquarium	78
Aquaculture	7

Total Biodiversity-Value Index: 571

FW: 435

Summary Only

Introduction

As of May 2001, Laos had not submitted a National Biodiversity Strategy and Action Plan to the CBD, nor had it submitted a report to the United Nations Commission on Sustainable Development (1997).

Laos is rich in forests, water, biodiversity, mineral and land resources. Unfortunately, rugged terrain and long distances between settlements make internal and external communications among the world’s most difficult. Marketing channels are also poor, partially as a direct result of the poor transport infrastructure. ¹⁵⁰

Trends

Population growth and policy failure in the two last decades have rapidly diminished resources. Although Laos has the largest per capita volume of renewable water resources in Asia, the population has only limited access to clean water and waste water treatment, and waste water contamination of groundwater in Vientiane and other urban areas has become serious. Clear and enforceable water rights are lacking, especially in rural areas. Social constraints to saving biodiversity in Laos include high population growth (2.8 %), illiteracy, poor health, and a low level of formal education. A limited technical infrastructure, underdeveloped production methods, a poorly trained labor force, and a shortage of capital and uncertain markets are some other constraints. The liberalising tendencies of foreign air donors also conflict with the aims of Communist state cadres. ¹⁵⁰

Laos consumes only a fraction of the hydroelectricity it produces. About 70% is exported to Thailand, earning about 25% of Laos' foreign exchange. Over 50 dam projects are being planned, of which 20 should be completed by 2009. Added to the displacement of local population and compensation and resettlement issues, including State recognition of the property rights of indigenous groups, are the loss of biodiversity, effects on water catchment potentials, and drainage capacities.¹⁵⁰

The Theun-Hinboun Hydropower Project is being planned for one of the largest tributaries of the Mekong, the Nam Theun, rising on the frontier between Laos and Vietnam. Part of the flow (100 m³/s, from a mean discharge of 460 m³/s) will be diverted to the River Nam Hai 250 m below, a tributary of the Nam Hinboun. The rivers are crucial to the local population, who rely on fish as their most important protein source and harvest their rice from the floodplains. The Norwegian Institute for Water Research (NIVA) is carrying out an EIA for this project entitled 'Water Quality and Aquatic Life Study'. Studies predict serious adverse effects on the biological production in Rivers Nam Theun and Nam Kading. The dam will block migratory fish, making necessary a fish by-pass canal. During the first phase after the completion of the project there will be substantial erosion in River Nam Hai. However, the new level of flow in the Nam Hai may have a positive effect on fish and other biological production, provided that the river is not allowed to dry out during low water flow.¹⁷⁵

A study in southern Laos on the impact of irrigation on small-scale aquatic resources concluded that individual, small-to-medium scale irrigation schemes have moderate, but significant, negative impacts on local aquatic resources.¹⁷⁴

Response

With the help of IUCN and SIDA, the government has identified 71 forest areas for potential protection; eighteen of these have been declared National Biodiversity Conservation Areas (NBCA). The goal is to involve local communities in preserving the natural riches.⁵

As of 1994 there was no protected area system.¹⁷⁹

⁵ All external projects must be approved by the Commission for Planning and Cooperation (CPC). Kirk, Michael. 1996.

Madagascar

Number of fish species in Madagascar	
Freshwater	125
Endemic	33
Marine/Brackish	862
Reef-associated	437
Commercially Important	8
Game Fish	215
Threatened	27
Introduced	31
Potential Aquarium	248
Aquaculture	3

Total Biodiversity-Value Index: 1989

FW: 158

Introduction

Madagascar does not yet have a specific national strategy on biodiversity. To conform to Article 6 of the CBD it would be necessary to adapt existing strategies, plans and national programs. The Country has just signed the Ramsar Convention.

Trends

Coastal and marine biodiversity of Malagasy was studied between 1960-1970. Biology, ecology, stocks and current status remain poorly defined except for certain species, in particular the coastal shrimps of the northwestern coast.

Threats to biodiversity are poorly known. Shrimp fishing is responsible for much destruction of by-catch. Moreover, during trawling, scraping the seafloor tears off the algae and plants which provide oxygen. In the lobster fishery, the intensification of fishing effort has led to overexploitation. Legal capture size is not respected, nor is the prohibition on the capture of egg-bearing females.

International demand for medicinal and decorative plants stimulates collection, and thus considerably stimulates *in situ* biodiversity loss through deforestation by peasant growers and collectors. While the aquatic invertebrates in the rivers of the Malagasy West are likely to survive, those restricted to the forest rivers of the East probably will disappear along with the forest.

Response

Environmental management strategy is based on developing regional and local approaches. During the preparation of the Environmental Program II, begun in 1994, Madagascar adopted a participatory process to establish priorities, taking account of the scientific conclusions of the experts and the priorities of the actors and local users of the resources. The general tendency of the first phase of the PAE (1991-1996) was to integrate all priority activities in a single program (EP I). The biodiversity component places particular importance on protected areas, in connection with integrated development of their peripheral zones, and with the fight against deforestation in the basins' priority slopes. The EP II also includes the marine and coastal environment.

Pilot projects within the framework of the regional program Environment (PRE- COI) include adapting lobster net techniques to preserve young, and encouraging the participation of communities in stock management at the local level. The Ministry for Fishing and Aquaculture has worked on equitable distribution and limitation of fishing effort for shrimps according to exploitable potential of zones, and on an annual closure of fishing for stock recovery.

Sensitizing of the public has been carried out since 1992 by the WWF, including sensitization to biodiversity conservation from the scientific and economic point of view. Ecological niches were reconstituted through school afforestation, the creation of school reserves in rural areas, and so on. Audio-visual supports (films, posters etc.) were produced, as were teaching materials and radio broadcasts.

A new fisheries agreement between Madagascar and the European Union (EU) includes modern monitoring technology, increasing Madagascar's possibility to survey foreign vessels. This is the first time the EU has accepted satellite monitoring of its vessels by a foreign nation. Under the new rules, the Madagascar Fisheries Surveillance Centre will be informed every two hours by Control Centres in EU Member States on the position of fishing boats carrying their flags in Madagascar waters.³

Malaysia

Number of fish species in Malaysia	
Freshwater	476
Endemic	4
Marine/Brackish	986
Reef-associated	452
Commercially Important	87
Game Fish	199
Threatened	29
Introduced	22
Potential Aquarium	317
Aquaculture	22

Total Biodiversity-Value Index: 2594

FW: 480

Introduction

Malaysia is one of the 12 megadiversity countries of the world. Freshwater habitats such as the lowland slow-flowing streams and upland rivers with water torrents support a diverse aquatic invertebrate fauna and a variety of fish. Marine fauna include fish, cuttlefish, squids, sea urchins, giant clams, sea cucumbers, copepods, segestid shrimps, arrow worms and many other large and small organisms. Malaysia's marine waters are estimated to have the highest catch potential of demersal fish and are second only to Peru for pelagic fish. An estimated 4 000 species of marine fishes are believed to be in Malaysia waters.

Trends

While inshore fisheries may be oversaturated, deep-sea fisheries show potential for further development. Despite increasing stresses on fishery resources, the government is pursuing efforts to increase fish catches of coastal fishers. According to a Star report of 1997, the Malaysian government planned to spend RM 2.5 million on fish-attracting devices to boost yield for fishers working within five nautical miles of shore. The Malaysian Fisheries Development Board reported that 378 such devices were in use at that time.²¹¹

The marine fisheries industry faces several threats, the most significant being the destruction of important breeding and feeding areas. Managing fisheries on a sustainable basis has become increasingly complex with the destruction of aquatic habitats and the degradation of the aquatic environment. The inshore fishing zone currently supports 83 % of the fishermen and boats in the Malaysian fishing industry, and the bulk of the marine fish landings in Malaysia comes from the coastal zone. The extent of overfishing is related to the traditional practice of treating fisheries as a common property resource. The previous open access policy

and relatively rich resource has led to too many fishermen, and the presence of large numbers of trawlers in the inshore zone has exacerbated the problem.

Response

Malaysia signed the United Nations Convention on the Law of the Sea in 1982, which has aided the management of marine biodiversity in Malaysia, leading to the formulation of the Fisheries Act 1983. Malaysia is also making efforts to protect breeding and nursery grounds, especially of coral reefs and mangrove areas, to restrict certain types of fishing gear such as trawl nets in the coastal areas, to create artificial reefs using old tyres for breeding grounds, and to establish marine protected areas. The Convention has also been a catalyst for various bilateral arrangements with Philippines, Thailand and Indonesia to coordinate efforts to conserve and protect marine resources.

By the end of 1994, the surrounding marine waters of 38 offshore islands in Peninsular Malaysia and Labuan had been gazetted as marine parks. In addition, one national park in Sarawak, three in Sabah and one state park in Terengganu protect coastal and marine ecosystems. Currently there are 21 Marine Protected Areas.

As the Government continues to place emphasis on privatisation, the private sector is expected to play a dominant role in developing Malaysia's environmental infrastructure.

Maldives

Number of fish species in Maldives	
Freshwater	8
Endemic	2
Marine/Brackish	1085
Reef-associated	754
Commercially Important	11
Game Fish	158
Threatened	7
Introduced	2
Potential Aquarium	407
Aquaculture	1

Total Biodiversity-Value Index: 2435

FW: 10

Introduction

Maldives is an archipelago of nearly 1 200 coral islands grouped into nineteen widely dispersed atolls over 90 000 km² in the centre of the Indian Ocean. The EEZ is almost 1 000 000 km².⁷⁶

Trends

Although Maldives is rich in marine biodiversity, the biodiversity remains to be documented and managed properly. Implementation of most of the CBD activities and other efforts at conservation are financed through international organisations and agencies due to the lack of local financial resources.

The bulk of foreign support is directed towards the fisheries post-harvest sector.⁷⁶

Due to the small size, isolation and vulnerability of the ecosystem, the biological diversity is amongst the most threatened in the world. The major economic activities, tourism and fishing, are both based on the coastal and marine environment. Fishing has always been the main source of food and export, and has expanded due to the mechanisation of the traditional fishing fleet, fuel distribution systems and fish collection facilities.

The share of fisheries in the national GDP is around 15%. However, strong growth in tourism is drawing fishers away from fishing.⁷⁶ Rapid population growth is also placing great pressure on local resources.

Response

Fourteen Marine Protected Areas (MPAs) have recently been designated in the central atolls of Maldives, covering approximately 12.55 sq. km. All anthropogenic activities such as coral and sand mining, fishing, collecting, netting, and anchoring are also banned from these areas. (Baitfish fishing however, which is important for the local tuna fishery, is permitted.) Under the Fisheries Law, many species have been protected from exploitation, trade or export. The government is also taking measures to minimise coral mining activities by reducing tariffs on imported building material as well as developing building aggregates.

The major activities identified by the 2nd NEAP that need implementing are stocktaking and assessment based on existing information. As there is a general lack of human resources and technical manpower dealing with biodiversity issues, much work remains to be done.

Number of fish species in Mexico	
Freshwater	483
Endemic	193
Marine/Brackish	1692
Reef-associated	359
Commercially Important	124
Game Fish	306
Threatened	114
Introduced	29
Potential Aquarium	266
Aquaculture	7

Total Biodiversity-Value Index: 3573

FW: 676

Introduction

Mexico is one of the five richest countries in the world in terms of biodiversity. Ranked 19th in catches among maritime nations,¹³⁹ Mexico produces 959 700 tons of fish yearly for human consumption.

Trends

In the last fifty years enormous reaches of jungles, moors, and forests have been eradicated, species have gone extinct, river basins and coastal lagoons have been contaminated and invasive and aggressive species have been introduced.

Total marine landings during the past decade have remained stable at around 1.5 million t, and future increases are unlikely. Without action, some fisheries may be fished to exhaustion. Of the 30 main fish stocks in Mexican waters, 20 are being exploited at about their maximum sustainable yield or are overfished and need recovery plans. Among the most threatened stocks are abalone and anchovies on the west coast of Baja California peninsula; sea urchins and shrimps in the Campeche Sound; queen conch in the Mexican Caribbean; and various species in the Lake of Patzcuaro.⁷⁷

Response

Under the Fisheries and Aquaculture Program, priority areas in the coastal and marine zone will be identified, and for the Conservation of Marine Species, there is the National Program for the Use of Tuna and the Protection of Dolphins. Dolphin deaths in the Eastern Tropical Pacific fishery are declining thanks to an international agreement to bring the tuna fleets under control.²²⁸

In fisheries research, a strong cooperative link between fishermen and academic institutions is still missing.⁷⁷

In the past five years SEMARNAP has begun to study fishing effort through a census of fishing boats; fortified regulations by publishing 15 norms for the Sustainable Use of eight marine fisheries and seven impoundments; rehabilitated 13 lagoon systems of over 80 thousand hectares, published the *Carta Nacional Pesquera* (National Fisheries Map) based on the determination of sustainable use level of the 31 principal fisheries and the status of the populations subject to special protection; carried out the first-ever audit of the 17 fisheries which represent 62 %of the volume of national production and more than half of their value; and adopted the FAO Code of Conduct for Responsible Fishing, itself the result of a Mexican initiative.¹⁹⁷

One hundred and fifty-five Priority Regions for Conservation covering approx. 21% of the national territory have been identified. Some include aquatic ecosystems (fresh and marine). The identification of priority regions will be complemented and carried out in 1998 as part of an exercise to determine Priority Marine and Coastal Regions. However, the principal problems for environmental conservation lie not in a lack of laws, regulations and norms but in a lack of precision and coordination among them. The Secretariat of the Environment, Natural Resources and Fish (SEMARNAP) considers modernization of environmental regulation a high priority.

Mozambique

Number of fish species in Mozambique	
Freshwater	306
Endemic	3
Marine/Brackish	1437
Reef-associated	688
Commercially Important	289
Game Fish	319
Threatened	26
Introduced	3
Potential Aquarium	539
Aquaculture	3

Total Biodiversity-Value Index: 3613

FW: 309

Introduction

Lake Niassa (a.k.a. Malawi/Nyasa), the third largest lake in Africa and the third deepest in the world, may have 500-1000 species of fish, possibly more species of fish than any other lake in the world.¹⁶ Information on freshwater fish sites other than Lake Niassa is limited, but one endemic species, *Parakneria mossambica*, is known to be in the Mjuzambidzi River, Gorongosa National Park. At least two other threatened freshwater species occur in the south along the border with South Africa: the orange-fringed largemouth *Astatotilapia brevis* and the lowland largemouth *Serranochromis merriamianus*. One globally threatened estuarine fish, the checked goby, *Redigobius dewali*, occurs from the lower Limpopo southwards.

Marine fisheries account for more than 90% of total fish production, while the export-oriented shrimp fishing industry brings in over 40% of the country's earnings.

Trends

The recent EU convention included a five-year agreement allowing EU vessels to fish for tuna and shrimp and assuring institutional support to the fisheries sector of Mozambique for a total of ECU 175 million. So far, relatively few Mozambicans have been trained in fisheries.

The Mozambican portion of Lake Niassa (in Northern Mozambique) is not protected. The virtual disappearance of certain prized species, normally the larger fishes, are reported in the artisanal fisheries. Catches appear to be diminishing and larger species are becoming rare, suggesting that in many areas current fishing levels are unsustainable.¹⁶

In 1967-1968 the Lake Tanganyika sardine (or kapenta) was introduced into Lake Kariba, on the Zimbabwe-Zambia border. Subsequently kapenta became established in Lake Cahora

(Western Mozambique), evidently surviving passage through the Kariba barrage hydro-electric turbines to move down the Zambezi River.

The shrimp catch is continuously expanding. Frozen directly on trawlers, the shrimp are exported mainly to Japan and the European Community.⁷⁸

Lobster production fell from an average of 262 t from 1987-1996 to 81 tons in 1997.⁷⁸

Response

No coordinated, comprehensive surveys of Mozambique's biological resources have been carried out, partly because of civil unrest. The draft National Strategy identifies as a highest priority the need to update and acquire information on biological diversity.

A Coastal Zone Management Unit is currently drawing up an Integrated Coastal Zone Management Plan to focus on sustainable use and conservation of coastal and marine biological resources. Among the most destructive activities affecting mangrove ecosystems are clear-felling for the establishment of solar salt pans (mainly in the north), charcoal production and firewood. The total degraded area appears to be small.

Zones of partial protection include the bed of inland waters, the territorial sea and the exclusive economic zone; the continental platform; the strip along the maritime coast and along the coasts of islands, bays and estuaries as measured from the maximum high tide line to 100 metres inland; the land strip of up to 100 metres surrounding a source of water; and up to 250 metres of land around dams and reservoirs.

Number of fish species in Myanmar	
Freshwater	311
Endemic	64
Marine/Brackish	468
Reef-associated	142
Commercially Important	14
Game Fish	150
Threatened	9
Introduced	4
Potential Aquarium	123
Aquaculture	8

Total Biodiversity-Value Index: 1293

FW: 375

Summary Only

Introduction

Myanmar has a coastline of 3 060 km, an EEZ of 510 sq km, and a total mangrove area of 171 000 ha. Marine fish catch in 1993 was 625 000 tons, up 41% since 1983.

The fisheries sector is Myanmar's fourth largest foreign exchange earner after timber, minerals and rice. Shrimp is the most important fisheries export. The Rakhine coast (in particular, that part close to Bangladesh) is the main shrimp fishing ground. Enriched by flood waters of the Ayeyawady, Sittaung and Thanlwin (Salween) rivers, the Ayeyawady (Irrawaddy) delta is highly productive in estuarine species such as polynemids, scienids, hilsa, harpadon, sea eel and penaeid shrimp. The Tanintharyi (Tenasserim, border with Thailand) is rich in shoaling pelagics (e.g., mackerels, sardine, tunas) and demersal fishes (e.g., snappers, nemipterids, hair tails, sharks, rays and shrimp). Ninety five percent (95%) of fish are caught by small-scale artisanal fishermen. Border trade of freshwater and marine shrimp, raw or dried, is prohibited. ⁷⁹

Surveys undertaken with FAO, ODA and Thailand between 1979 and 1988 calculated standing pelagic stocks (e.g. mackerels and sardines) at about one million (1 000 000) mt, of which 50% is considered the annual MSY. Demersals such as snappers, croakers, and thread fin breams have a standing stock of about 880 000 mt, of which 550 000 mt is considered the MSY. Deep-sea demersal stock of about 9 000 mt has been found off the Tanintharyi coast. One quarter of this stock are deep-sea lobsters (*Puerulus sewelli*). However, no lobster fishery has yet developed. ⁷⁹

Inland waters cover 8.2 million hectares, made up of the mingling of the riverine and estuarine systems of the Ayeyawady, Chindwin, Sittaung and Thanlwin rivers. Only 3% of the catch is exported.

Freshwater giant prawn *Macrobrachium rosenbergii* production is sustained by suitable ecological conditions. The Ayeyawady delta, with its many rivers, rivulets and flooded paddy fields during the monsoon season, offers very good nursery and feeding grounds for the prawn. In the southern delta regions, the brackish water is suitable for its breeding and larval development. These factors have helped this area become one of the richest freshwater prawn fishing grounds in Southeast Asia.⁷⁹

Trends

Due to inadequate facilities for monitoring, control and surveillance, poaching is prevalent. The most common offence is fishing in undesignated fishing grounds.⁷⁹ Only 2% of the country's wetlands remain.²⁴⁶

Pressure on inland fishery resources is fairly high. Nonetheless, increased exploitation and hydro-electric dam construction have not lowered catches, possibly thanks to the enforcement of laws and regulations on the conservation of spawning stocks and to the systematic implementation of restocking programmes for lakes and reservoirs.⁷⁹

Response

As of May 2001, Myanmar had not submitted a National Biodiversity Strategy and Action Plan to the CBD.

Under the Freshwater Fisheries Law, three-year leases are granted on condition that leaseholders maintain or repair the waterways leading to their lease areas, the fish habitats, and that they replenish exploited stocks.⁷⁹

Under the Marine Fisheries Law, artisanal fishermen have priority in all fishing zones. Foreign joint-venture enterprises are allowed to fish within a defined belt starting from the Base line to the Territorial line, while vessels operating under agreement are allowed to operate from the Territorial line to the Exclusive Economic Zone.⁷⁹

Fishing rights and joint-venture agreements have in the past been granted to foreign companies. In 1988-89, 285 vessels (belonging to 5 countries) were permitted to fish in Myanmar waters; 217 of these vessels were Thai. Since 1990 only Thai vessels have been granted fishing rights.⁷⁹

Number of fish species in Namibia	
Freshwater	139
Endemic	3
Marine/Brackish	554
Reef-associated	12
Commercially Important	104
Game Fish	128
Threatened	12
Introduced	7
Potential Aquarium	72
Aquaculture	-

Total Biodiversity-Value Index: 1031

FW: 142

Introduction

Namibia is mostly desert. Rainfall is sparse and erratic, limiting fresh water resources.

Fisheries have acquired an increasingly important role in the Namibian economy since independence in 1990. Pescanova of Spain, one of the largest fishing companies to build a processing factory in Namibia, exports most of the production.³⁷

Trends

Before independence the country effectively had no EEZ along its 200-mile coast, one of the richest in the world. The number of licences granted to foreign trawlers is now limited and joint ventures are encouraged.³⁷

The most important recommendation the Sea Fisheries Advisory Council makes to the Minister of Fisheries and Marine Resources (MFMR) is on setting 'Total Allowable Catch' (TAC) levels for various species. However, excessive capacity in the industry creates a powerful lobby for interpreting scientific data over-favourably. This has arguably led to catch levels which have inhibited recovery of the pilchard stock.³³

Response

The Coastal and Marine Biodiversity Working Group has developed a focused action plan as part of the NBSAP which will also serve as the national action plan for the GEF/ UNDP-funded Benguela Current Large Marine Ecosystem (BCLME) Program. A further proposal to GEF/ World Bank focuses on the decentralised management of coastal biodiversity and development planning. To draw together the parallel environmental monitoring aims of the

Terrestrial Biomonitoring Group, Wetlands Working Group and Coastal and Marine Biodiversity Group, the Namibian Long-Term Ecological Research (Na-LTER) Network was begun in 1999. Namibia is the first (and so far the only) African country to join the International Long Term Ecological Research (ILTER) network.

Legislation accompanying The White Paper on inland fisheries aims to favour subsistence fishers over large-scale commercial harvesters.³³

Namibia's policies since 1990 have been largely homegrown. The most successful have been those based either on strong community-level institutions such as conservancies, or on high-quality scientific analysis, such as the management of fisheries and Environmental Assessments (EAs). Both have involved strong stakeholder participation. Democratisation of natural resources issues has proceeded well and most of the necessary institutions for sustainability are now in place. The major challenges are to encourage debate, identify indicators of sustainable development and improve the capacity of institutions to improve policies and programmes in the light of lessons learnt.³³

The National Biodiversity Program coordinators report the following 'lessons learnt' from the Action Planning process:

1. Do the job yourselves. A report written by a foreign consultant will be largely ignored within-country. Consultancy funds should be reserved for when local experts haven't the time or perspective, and an outside consultant should support, not supplant, the local experts.
2. Pay attention to building commitment and team spirit throughout the process.
3. Entrust key activities to the most committed and dynamic people on the team.
4. Don't focus entirely on the technical level; cultivate political will and interest from the start.

New Zealand

Number of fish species in New Zealand	
Freshwater	54
Endemic	78
Marine/Brackish	948
Reef-associated	128
Commercially Important	78
Game Fish	113
Threatened	15
Introduced	20
Potential Aquarium	75
Aquaculture	2

Total Biodiversity-Value Index: 1511

FW: 132

Introduction

New Zealand's EEZ, about 1.2 million square nautical miles, is deep but not very productive. Marine reserves are still very limited.²⁴¹

Trends

In the late 1970s and early 1980s the Minister of Fisheries encouraged fishing effort to move from the over-fished inshore fisheries to the deeper water of the recently declared EEZ. This led to a series of government-initiated, energy-intensive, export-oriented, development projects. Land development encouragement loans encouraged the draining of wetlands and the destruction of native vegetation, and many hydro dams were built. Waterways have been degraded by sediments, eutrophication, pollution and alien species. Only 1.2% of wetlands remain.²⁴¹

Excessive fishing pressure has stressed the snapper, paua, rock lobster, oreo and Orange Roughy and several other fisheries. Bycatch issues are a serious problem for marine mammals, sea birds, and a number of other fish stocks. Stock declines have been very severe in the Orange Roughy and oreo dory stocks. These species live long and reproduce slowly, yet their prices are high, encouraging commercial 'mining' of their stocks.²⁴¹

Response

New Zealand has not yet completed its national biodiversity strategy. At the time of writing, a first draft of the strategy is being discussed within the Government.

The Resource Management Act (RMA) took effect on October 1, 1991, as the primary legislation for managing all of New Zealand's natural and physical resources. Of key importance is the requirement that while social, economic, and cultural objectives will play an important role in decision-making, they cannot be allowed to threaten the sustainability of ecosystems. One of the more remarkable features of this reform is that New Zealand's resource management is now based primarily on watershed boundaries.¹⁹¹ However, fisheries was omitted from the Resource Management Act, as are a number of matters connected with energy, minerals and the whole area beyond the 12 nautical mile territorial limit to the 200 nautical mile EEZ.²⁴¹

To reduce catch more effectively, the government rewrote the Fisheries Act and in 1986 introduced the Quota Management System (QMS). Quota was 'grand parented', and allocations of ITQ were then bought back to reduce total effort. Unfortunately, incentives to misreport were high and may have distorted catch figures, hence stock estimates and catch limits. As well, the high prices for quota, which reflect scarcity and expectations of future rents, encourage illegal fishing.²⁴¹

New Zealand does have a clear programme of action for biodiversity management in place, and the work on the national strategy is, on the whole, confirming its appropriateness rather than identifying any need for significant change. The challenge is to reach the necessary level of implementation. While the draft strategy and the existing programmes recognise the uniqueness of New Zealand's biodiversity, they also recognise the losses current generations have inherited, resulting from unsustainable harvest, habitat destruction, and the impacts of alien species.

New Zealand has recently introduced a requirement that the fishing industry pay some of the costs of fisheries management. This cost-recovery policy has led to conflicting views. Where the industry argues that it should have a major say in the determining the research agenda, environmentalists see user-pays as analogous to the polluter-pays principle, and fear 'industry capture' of research agendas.²⁴¹

Number of fish species in Nigeria	
Freshwater	310
Endemic	2
Marine/Brackish	469
Reef-associated	28
Commercially Important	41
Game Fish	110
Threatened	14
Introduced	6
Potential Aquarium	87
Aquaculture	5

Total Biodiversity-Value Index: 1072

FW: 312

Introduction

As of May 2001, Nigeria had not submitted a National Biodiversity Strategy and Action Plan to the CBD.

The Niger Delta, in southeastern Nigeria, is one of the largest deltas in the world and the third largest in Africa, covering about 20 000 square km.²²⁹ Its mangrove forest is the largest in Africa and the third largest in the world. The Niger Delta also produces the oil that provides Nigeria with 90% of its foreign exchange earnings and 80% of the Federal government's revenue.

The productivity of the waters closer to the Nigerian coast is limited by oceanographic conditions. Currently, artisanal coastal and brackish-water fishery activity is low, because of low investment in craft and gear. But for pollution and incursions of the industrial fleet, the reduced effort could have been translating into recovery of stocks, which would in turn offer prospects for sustainable exploitation. Although the potential yield of offshore resources within the EEZ is estimated to be only moderate, the trawling industry could be re-oriented to acquire the necessary technology and diversify operations.⁸⁰

Between the 30 nautical mile territorial limit and the 200 nautical mile EEZ, fishery resources are mainly tuna, part of the large Gulf of Guinea stocks. Nigeria is not exploiting the tuna.⁸⁰

Trends

Current landings of shrimp are well beyond potential yield estimates, and the trawling is significantly degrading the coastal demersal stock. While it is thought that artisanal coastal fishers could exploit their resources sustainably if they had absolute jurisdiction, the 0 to 5

nautical miles area reserved for them is constantly violated by trawlers, especially shrimpers combing the river mouths. Waste from this industry could be curtailed; there is room for use of industrial by-product, such as shrimp heads from shrimpers exporting only tails, and shells from peeled shrimp. Much miscellaneous fish that could be made available for processing into fishmeal is usually dumped at sea.⁸⁰

For estuarine and brackish-water fisheries, the main issue is pollution. Many fishing households in this area merely subsist, the waters around them having lost their productivity. Inland fisheries resources are also highly depleted, especially the rivers, where illicit fishing practices are rife, and erosion and siltation recur annually. The reservoirs and lakes are in better health, their natural productivity enhanced by re-stocking with high quality, hatchery-produced fingerlings, and fishing effort having been placed under some control.⁸⁰

Exploration for oil, large-scale agriculture, upstream dams on the River Niger and other human activities are degrading the aquatic resources, plants and animals of the Delta.¹⁵⁸ The operations of the Kainji Lake and other dams and barrages have led to deforestation, erosion, river siltation and loss of biodiversity.¹⁷⁶

Response

To coordinate approaches to developing the River Niger system, Benin, Burkina Faso, Chad, Cameroon, Cote D'Ivoire, Guinea, Mali, Niger and Nigeria formed the Niger River Commission. The commission is more or less moribund, and uncoordinated development of the Niger system continues.¹⁷⁶

Norway

Number of fish species in Norway	
Freshwater	52
Endemic	1
Marine/Brackish	263
Reef-associated	9
Commercially Important	26
Game Fish	105
Threatened	8
Introduced	11
Potential Aquarium	12
Aquaculture	5

Total Biodiversity-Value Index: 492

FW: 53

Introduction

In 1997 Norway's fishery exports were the highest in the world.⁹² Marine areas under Norwegian jurisdiction include coastal waters and shallow and deep areas of open sea.

Trends

Current fisheries management in the Barents Sea has put more pressure on marine ecosystems, and many stocks have fallen through overfishing and pollution. Norwegian spring-spawning herring and North-east Arctic cod stocks in the North and Barents Seas are expected to remain high in the next few years, but it is uncertain what impact the collapse of capelin in the Barents Sea will have on the cod stock. Wild populations of Atlantic salmon are declining markedly while aquaculture has grown to the point where the weight of fish produced by fish farms is greater than the total meat production of Norwegian agriculture. Development, pollution and acidification, the introduction of alien fresh-water organisms and overfishing are the most important causes of the decline of migratory fish stocks.

In all, 31 fresh-water fish species are registered in Norway. Most of these are not classified as endangered, vulnerable or rare. However, some species are declining at population level. Some of the most serious disruption is caused by hydropower developments, particularly reservoirs.

Long-range transport of pollutants in the form of acid rain has most affected biological diversity in inland waters. About 2 500 fish stocks in southern Norway have been lost because of acidification. Since 1988, the sulphur content of precipitation, rivers and lakes in southern Norway has dropped by about 35%, and certain species of aquatic invertebrates are now recovering. Inputs of nitrogen have not been reduced.

River deltas are heavily exploited for industry, housing, roads and agriculture, and drainage has reduced fish spawning areas and habitat.

Response

Much effort has been put into the development of regulatory and inspection systems. Together with favourable climatic conditions in the sea, these efforts have helped fish stocks in the Barents Sea and along the Norwegian coast. In contrast, trends in fish stocks in the North Sea, where Norway and the EU share responsibility, have been generally bad.

Sectoral planning appears well organised. Norway actively helped in efforts to improve the scientific basis for implementing decisions under the CBD and is working for better management of fish stocks in international waters within organizations such as the NEAFC and the NAFO. Resource and quota control has improved through common reporting standards and better exchange of information between fisheries authorities. Together with the EU, Norway has begun to ensure that the precautionary principle is applied in the North Sea, to improve technical measures to regulate fisheries, and find suitable ways of improving harvesting patterns, including improving selectivity and reducing the dumping of bycatches and catches from depleted stocks. Norway also recognises the need to withhold subsidies and other financial supports from activities that degrade biological diversity. In some sectors however, the focus on issues related to the Convention on Climate Change have diverted efforts from the CBD. In future, it will be important to focus on the interplay between the two conventions.

Papua New Guinea

Number of fish species in Papau New Guinea	
Freshwater	312
Endemic	63
Marine/Brackish	2201
Reef-associated	1177
Commercially Important	106
Game Fish	244
Threatened	28
Introduced	16
Potential Aquarium	631
Aquaculture	5

Total Biodiversity-Value Index: 4783

FW: 375

Summary Only

Introduction

Papua New Guinea (PNG) is the eastern half of the world's largest tropical island, plus an archipelago of a further 600-odd islands. The EEZ is estimated to cover from 2 437 480 sq. km. to 3 120 000 sq. km. The Gulf of Papua, facing south towards Australia, has large delta areas, mud flats and mangrove swamps, and the north coast and high island coasts have fringing coral reefs and narrow lagoons. Extensive submerged reef systems or broad shallows lie next to some of the smaller island clusters. PNG also has fast and slow rivers, over 5 000 lakes, and extensive marshes. Five of the Provinces are landlocked, while the remainder are coastal or maritime.⁸¹

Commercial trawlers take prawns in the Papuan Gulf and other parts of southern PNG, and a small-scale tuna longline fishery is getting underway, with a handful of vessels exporting sashimi-grade tuna overseas by air. Subsistence harvesting is the most important domestic fishery both for volume and value, but is poorly known. The major species for domestic commercial fisheries are, in order of value, prawns, lobster, trochus and other shells, bêche-de-mer, sashimi-grade tunas, sharks, lagoon and reef fish, and coastal pelagic fish. The prawn fishery is the most valuable commercial fishery. Five species are routinely taken; the banana prawn, *Penaeus merguensis*, makes up about 60% of landings.⁸¹

Landings of lobster are dominated by the ornate spiny lobster, *Panulirus ornatus*. The shell fishery for trochus (*Trochus niloticus*), pearl shell (three *Pinctada* species, the most abundant of which is the black-lip pearl shell, *P. margaritifera*) and green snail (*Turbo marmoratus*), is also essentially village-based.⁸¹

By far the biggest fishery resource in PNG is that of tuna and allied species, whose MSY potential is estimated at 300 000-400 000 t/yr. Most tuna fishing in PNG has been carried out by foreign fishing vessels.⁸¹

Trends

Provincial Governments have considerable autonomy in fisheries development and management.⁸¹

There has been little commercial development of freshwater fisheries other than the barramundi fishery. Two major river systems, the Sepik/Ramu and the Fly/Purari, provide most of the freshwater catch. Most landings from the Sepik/Ramu are of two introduced species. Because of the very limited fish biodiversity, exotic species were stocked up to 1997. Many freshwater bodies thus have Java carp, rainbow trout, and at least seven other types.⁸¹

The substantial fishery for barramundi (200- 400 t/yr.) collapsed in the early 1990s.⁸¹

The apparent decline in landings of lobster, trochus, pearl shell and green snail is thought to be due to localised over-harvesting. Harvests of *bêche-de-mer* have also begun to fall, probably from localised over-exploitation or removal of virgin biomass. The Government is trying to manage some of the more heavily exploited areas and species.⁸¹

Response

As of May 2001, Papua New Guinea had not submitted a National Biodiversity Strategy and Action Plan to the CBD.

In an attempt to keep the prawn fishery from collapsing, the government has limited the number of fishing vessels. Trawling for lobster was permitted in the Gulf of Papua and Torres Strait until 1985; since then all lobster in PNG have been caught by diving.⁸¹

Until recently freshwater aquaculture was the focus of a major national government programme which included carp and trout hatcheries, restocking of natural water bodies with introduced species, and promotion of small-scale commercial aquaculture. The programme was considerably scaled down and handed over to provincial governments in late 1996. Marine aquaculture has included farming of pearl oysters, ranching and grow-out of wild-caught juvenile groupers, and giant clam culture.⁸¹

Attempting to promote domestic participation in the tuna fishery, the Government stopped issuing foreign longlining licenses in mid-1995. After some longliners began taking advantage of local charter arrangements, the fishery was closed to all but *bona fide* domestic entrants. So far only a handful of local longliners have entered the fishery.⁸¹

The Fisheries Act (1994) governs most fisheries in the country except those in the Torres Strait, which is jointly managed by Australia and PNG and administered under the Fisheries (Torres Strait Protected Zone) Act 1983.⁸¹

UNDP-GEF projects include ‘Bismarck-Ramu Integrated Conservation and Development Project’, which aims to protect and ensure the sustainable use of biodiversity in the Ramu River Catchment within a biosphere reserve framework; and ‘Biodiversity Conservation and Resource Management Support’, for government conservation strategy through assistance in establishing two pilot areas for Integrated Conservation and Development. This project includes building technical and institutional capacity, raising awareness, establishing biodiversity objectives and monitoring criteria, and implementing sustainable development practices and alternative income opportunities.

Number of fish species in Peru	
Freshwater	685
Endemic	43
Marine/Brackish	557
Reef-associated	94
Commercially Important	25
Game Fish	100
Threatened	8
Introduced	17
Potential Aquarium	146
Aquaculture	6

Total Biodiversity-Value Index: 1681

FW: 728

Introduction

Ranked second in maritime catches worldwide, Peru has jurisdiction over almost a million square km of the Pacific Ocean. Overfishing of these productive waters, between 6.8 and 11.3 million tons yearly, is particularly serious. Only six percent of the catch is for human consumption.

Fish oil production in Peru fell sharply from 415 000 tonnes in 1996 to 280 000 tonnes in 1997. Nevertheless, exports of fish oil rose in 1997, expanding in value to US\$ 95 million.⁹¹

About 20 000 tons of fish are taken yearly from the Amazon basin. Some fish, such as the freshwater *paiche* (*Arapayma gigas*) and endemic species of Lake Titicaca are becoming endangered, but the status of the anchovy and other marine species are not mentioned in the Report. The Ministry of Fisheries has recently forbidden the catch of *paiche* in the entire rainforest except for the Putumayo River Basin. The Ministry has also decreed the restriction of a 5 mile coastline water strip to preserve artisanal fishing (though it is not clear what is restricted), and since 1995 has forbidden the catch of marine turtle species and marine cetaceous species as well as Amazon dolphins, declaring these species to be protected by law. Plans regulating the fishing of highly commercial sea species, establishing the allowable size of the catches and the temporary closed seasons, are in effect for tuna, hake and its 16 accompanying species and are under preparation for anchovy, sardine, prawn, jack, mackerel and scallops.

Trends

Economic measures to encourage mining have caused high amounts of acutely toxic tailings to be released into water bodies. In coastal waters, pollution dumped by fishmeal and fish oil

plants creates azoic areas without benthic communities. In the Peruvian rainforest, ravines and rivers are being severely polluted by chemical ingredients used to make basic cocaine paste (PBC).

The worst threat to wetlands is pollution, caused by domestic and industrial waste, mining and oil drilling tailings and discharges, in addition to human damage to ecosystems. About 50% of the wetlands on the southern coast and 24% of the wetlands on the northern coast were lost between 1987-1997. Since 1984 the effects of water pollution on terrestrial and marine biota have been monitored by the Ministry of Fisheries, the Ministry of Health, the Navy of Peru, and some universities.

Response

There is no National Strategy for the Conservation and Sustainable Use of Biodiversity or its respective Action Plan; issues referring to the Convention have been included in the National Biodiversity Strategy and Action Plan in lieu.

No regulations govern the introduction of exotic species. *Tilapia* breeding on the other hand has been forbidden throughout the Amazon Basin.

Philippines

Number of fish species in Philippines	
Freshwater	293
Endemic	82
Marine/Brackish	2255
Reef-associated	1196
Commercially Important	616
Game Fish	238
Threatened	46
Introduced	35
Potential Aquarium	666
Aquaculture	45

Total Biodiversity-Value Index: 5472

FW: 375

Introduction

The northern Philippines are important for straddling stocks of migratory species such as marine mammals, marine turtles, and tuna, mackerel and sardines, while the Spratly Islands reef areas may play a crucial role in providing larvae for the rest of South China Sea.

Trends

Overfishing and illegal fishing are two major direct threats to Philippine fisheries. Indirect threats include pollution, siltation, destructive fishing methods, and the introduction of exotic species into freshwater ecosystems. A government investigation concluded that 120 000 Filipino fishermen will lose their livelihood by the year 2000 unless access to fishery resources is restricted to Philippine nationals. Fishing of small, surface-dwelling fish would have to be reduced by 50% to avoid the collapse of some of the Philippine's most important fisheries.²¹³

Illegal fishing by mainland Chinese in Philippine waters has occurred regularly, contributing to falling fish stocks region-wide.⁴⁴

Only about 5 % of the Philippines's coral reefs remain in excellent condition. From 30-50 % of its seagrass beds have been lost in last 50 years, and about 80 % of its mangrove areas in the last 75 years. (From 1952 to 1981 the total fishpond area more than doubled, from 88 681 to 195 831 ha.¹⁴⁷) An estimated 50 % of national parks are no longer biologically important.

Response

In view of the rapid conversion of mangrove swamps, the Government formulated proper management strategies for the mangroves.¹⁴⁷ After examining fishing pond lease fees to take into account the values lost through destruction of mangroves, a multidisciplinary team supported a proposal to increase the fees on government-owned, converted mangrove areas by twenty times, from p 50.00/ha/year to p 1 000/ha/year.¹⁸⁹

The most significant achievement of the Fisheries Sector Program was ‘reforming’ the fisheries sector. Granting fishing permits within sustainable yield is now government policy, incorporated into the new Fisheries Code.

According to Sajise (1997) research efforts on biodiversity in the Philippines in the past and in the present is inadequate, fragmented, uncoordinated, reactive and donor-driven. Rationalization would reduce if not eliminate duplication of efforts. While the government is aware of the issues, no comprehensive research agenda addresses priorities. In general, the government strategy had been biased towards action programs without providing for an implementing mechanism and research support. Nor have economic incentives been used fully.¹⁹⁴

Poland

Number of fish species in Poland	
Freshwater	74
Endemic	-
Marine/Brackish	57
Reef-associated	3
Commercially Important	11
Game Fish	63
Threatened	6
Introduced	18
Potential Aquarium	16
Aquaculture	2

Total Biodiversity-Value Index: 250

FW: 74

Introduction

Poland is not a major world force in the exploitation of marine resources (including fisheries). Because of the Baltic Sea's low salinity, diversity is low compared with other seas.

Aquatic ecosystems (flowing and standing waters, including reservoirs) occupy about 3% of Poland, 99.7% of which lies in the drainage basin of the Baltic Sea. The Vistula is one of the last largely unregulated large rivers in Europe. Of Poland's 116 fish species, 23 are alien. Wild salmon *Salmo salar* populations in different Baltic rivers are a significant element in the genetic diversity of this Sea's anadromous fish.

Trends

The Red Book's inclusion of only 8 species of fish plus 3 of lamprey does not provide a realistic picture of threats to Poland's ichthyofauna. A great richness of species has been preserved in rivers that retain their natural character; however, other rivers have seen many species disappear. The sturgeon *Acipenser sturio* and the fifteen-spined stickleback *Spinachia spinachia* have disappeared from the Baltic and many other species are threatened there.

The deep-water ecosystems of the Baltic Sea have changed the most. In the last 50 years, a long-term oxygen deficit has virtually eliminated macroscopic life from the sea bed, with the zone of water below the halocline experiencing considerable limitations on the occurrence of plankton and on fish reproduction. The highest diversity is characteristic of inshore areas, whose location exposes them to degradation.

The most serious threats in the Baltic Sea are eutrophication, overexploitation, physical destruction of biotopes through shoreline construction, bottom fishing, the exploitation of

aggregates and oil and dredging. Coastal infrastructure for tourism; pollutants; alien species introduced by aquaculture or ballast water, fishing implements and baits, the taking of organisms for aquaria, etc. are also important. At least 50 species have been introduced to the Baltic in the last 100 years, mainly in ballast water.

The biocoenoses of the southern Baltic have witnessed an enhancement of certain unfavourable biological phenomena first observed at the beginning of the 1990s. These changes, particularly clear in the dominance structure of species, are occurring in all ecological formations, but are most intensive in the shore zone, above all in coastal lagoons.

Highly-threatened freshwater ecosystems include oligotrophic lakes in the mountains and those of the so-called 'lobelia' type found mainly in the Pomeranian Lakeland. Eutrophication and the low resistance of the organisms are dangers. Dystrophic lakes in forests are also threatened by drying-out, eutrophication and acidification. The lowering of the water table may be a factor threatening all lakes. Besides pollution, construction and regulation along rivers seriously threaten biological diversity.

Other important threats to fish diversity are drainage, river regulation, and the introduction of alien species. The release of cyprinids into some lakes has caused native plant-eating species to decline.

Response

Nearly 1500 combined sewage treatment plants installed since 1992 have improved inland waters, particularly rivers. From 1989–1995 wastewater discharged to surface waters fell by 12%, and untreated discharges by more than 30%.

Stage IV of the international Baltic Monitoring Programme began in 1994 and includes regular measurements and observations of a series of physicochemical and biological parameters. The results of Stage III of BMP are now being compiled into a *Third Periodical Assessment of the State of the Environment in the Baltic Sea*. The results of monitoring suggest that water quality in the basin has not improved significantly, in spite of long-term efforts at combating pollution from the Baltic countries, including legislation, organisation and investment by Poland. Local improvements have been obtained mainly in coastal areas as a result of the start-up of many modern sewage treatment plants and significantly limited releases of untreated wastewater to the Vistula, Odra and coastal rivers.

The state, which subsidized fishing operations in the 1980s and early 1990s, has given no financial assistance to fisheries for several years.⁸²

Russian Federation

Number of fish species in Russian Federation	
Freshwater	344
Endemic	24
Marine/Brackish	492
Reef-associated	7
Commercially Important	65
Game Fish	139
Threatened	27
Introduced	13
Potential Aquarium	32
Aquaculture	10

Total Biodiversity-Value Index: 1153

FW: 368

Introduction

Russia is ranked No. 6 among maritime fishing nations,⁶ and fishery and commercial use of sea biological resources rank among the key sectors of the economy, particularly in export volume. Export of seafood from Russia to Japan reaches 2 billion US dollars per year. However, data of the Federal State Border Service in charge of fishing control on Russian high seas suggest only 10% of the export to Japan is registered. Fish and sea invertebrates are exported to South Korea and other Asian countries in similar amounts. Freshwater basin fisheries amount to around 200 000 tons yearly.

Trends

Growing poaching and renewal of marine sturgeon fishing by the new Caspian states of Kazakhstan, Azerbaidzhan and others is also greatly stressing the sturgeon stocks of the Volga, despite Russian efforts at replenishment through artificial breeding.

Cross-border problems became critical after the collapse of the USSR. Information received in one region or department, as a rule, does not reach other, now 'foreign', interested parties, and hampers the use of the biogeographical and watershed approaches to biodiversity conservation and bioresource use. This is especially relevant for the large natural areas usually intact at the borders of the administrative units.¹⁸⁴

Reserves of valuable commercial fish (sturgeon, pike perch, carp) have been decreasing and those of low-value fish increasing. Most water basins suffer uncoordinated commercial

⁶ Greenpeace, quoting FAO statistics.

fishing, ecologically unsafe fishing gear, absence of catch and sale registration, and intensive poaching.

Response

The Action Plan was incomplete as of the writing of the Second National Biodiversity Strategy and Action Plan.

Many countries and provinces of the Newly Independent States (e.g. Ukraine and Southern Russia) have the same level of ecosystem degradation as France or the Netherlands. In contrast, huge areas of the North and East remain untouched, and the conservation strategy for these areas should differ from the strategy for the strongly fragmented areas. Although the Pan-European Biological and Landscape Diversity Strategy (PEBLDS) is a completed document and covers all regions, it is felt that Russian priorities, interests and experience are not properly considered in this strategy, which is essentially Western European.¹⁸⁴

Monitoring of commercial fish, regulation and conservation are minimal, the result of a drastic cut-back in funding for scientific research efforts in conservation and reproduction of commercial water organisms as well as from the absence of a sectoral biodiversity conservation strategy.

The main objective of Russian fisheries today is to study the raw material stock, monitor its status and provide grounds for its management to avoid adverse impacts on biodiversity of water basins.

Russia was to ban commercial fishing of Caspian Sea sturgeon as of July 20, 2001. (Azerbaijan and Kazakhstan have also supported a temporary freeze following a CITES threat to ban all exports of caviar from the Caspian Sea countries if they did not act to curb illegal fishing.)¹³⁴

South Africa

Number of fish species in South Africa	
Freshwater	171
Endemic	69
Marine/Brackish	1858
Reef-associated	624
Commercially Important	126
Game	352
Threatened	50
Introduced	20
Potential Aquarium	385
Aquaculture	8

Total Biodiversity-Value Index: 3663

F_w: 240

Introduction

South Africa's marine life is highly diverse, partly as a result of the extreme contrast between the water masses on the East and West Coast. Three water masses - the cold Benguela current, the warm Agulhas current, and deep oceanic water - make the region one of the most oceanographically heterogeneous in the world. Over 10 000 marine plant and animal species (almost 15 % of the coastal species known world-wide) are found in South African waters. About 12 % of these occur nowhere else.

Trends

Commercial fishing, development of transportation corridors, mining, and dams have degraded a substantial proportion of natural habitat. In addition, overexploitation of certain species, exotic species introductions and water pollution have had major effects on South Africa's freshwater and marine biodiversity.

Response

Neither terrestrial nor marine protected areas in South Africa form part of a planned network. Protected areas have remained inaccessible to the majority of South Africa's people, and are perceived to be playgrounds for a privileged elite. Wetland conservation is extremely poor in South Africa and the majority of wetlands fall outside of protected areas. Several marine protected areas are located along South Africa's extensive coastline, representing most marine biogeographic regions, and including two of the largest 'no-take' reserves in the world. However, as is the case for terrestrial protected areas, there has been no overall planned development of marine reserves.

Several measures do govern the conservation and use of South Africa's wetlands, and many new initiatives are under way, as a result of the revision of the country's water law. A number of strong wetland related projects have been launched. A national wetland conservation policy is currently being drafted by the Department of Environmental Affairs and Tourism. Many other measures are promised in the National Biodiversity Strategy and Action Plan.

The White Paper: A Marine Fisheries Policy for South Africa (May 1997) states: 'A policy objective is the development and maintenance of a cost-effective fisheries management structure that ensures fishing sectors be subject to environmental audits where applicable, and investigations on potential detrimental effects on marine and estuarine species and their environment from activities causing environmental disturbance or pollution be initiated or continued; that levels and patterns of exploitation, determined on the basis of best available scientific information, do not jeopardize the soundness of the resource, its environment or the ecosystem on which biodiversity and long-term optimal sustainable yields depend; the harvesting of one species does not endanger the continued existence, or cause the substantial depletion of any other species, and that a variety of regulatory measures be introduced to avoid such dangers..... Where feasible, selective and environmentally safe fishing gear will be used with a view to maintaining biodiversity and conserving ecosystems. Size limits and restrictions on gear may be applied where appropriate, but changes in gear restrictions will take into account costly disruption to resource users.'

Spain (EU)

Number of fish species in Spain	
Freshwater	85
Endemic	6
Marine/Brackish	556
Reef-associated	24
Commercially Important	31
Game Fish	174
Threatened	26
Introduced	24
Potential Aquarium	45
Aquaculture	11

Total Biodiversity-Value Index: 982

FW: 91

Introduction

Spain is rich in freshwater habitats, and its marine waters have the greatest biological diversity in Europe. Unfortunately, knowledge of the marine biodiversity at the species level continues to be poor.⁸³

Trends

Mussel farming has developed spectacularly in the rivers of Galicia, producing about 200 000 tons annually, and fish and mollusk farms have also been set up on large coastal areas.⁸³

Of the 7 300 km of rivers in Spain, 11% are substantially contaminated (800 km) and another 15% are moderately contaminated. Much of the marshlands and lagoons have been drained. Two species of fish are in danger of extinction, more than 1 are vulnerable, and 5 are being monitored.

Response

Spain leads Europe in protected marine areas. Marine biodiversity is, however, generally less critical than terrestrial. Around 40% of the Spanish littoral has been impacted by man, and aquaculture periodically contaminates inshore waters.

Overfishing has also affected some commercial species: the bigeye tuna (in the Canary Islands), swordfish, bonito del norte (*ed note*: presumably northern Atlantic bonito) and the northern bluefin tuna are listed as threatened by the IUCN, as are the cod and *eglefino*, or haddock. The anchovy and the sardine of Cantábria are also beyond the biological limits of security.

Declines in the cod stocks of the northern hemisphere have led the cod fleet to shrink by more than 50% in recent years, both in number and capacity. A ministerial ordinance of 22 October 1990 prohibited the use of long driftnets to conserve large migratory stocks in the Atlantic and Indian Oceans, forcing 100 vessels operating in the straits of Gibraltar to be reconverted. The international and European Union ban has improved prospects, though a number of problems still exist in the Mediterranean and the Gulf of Biscay.

The Spanish fishing fleet is adjusting to available resources under the EU's programmes, whose aims are to modernize the fleet, strengthening those sectors that use selective fishing gear. Measures to replenish domestic fish stocks and relocate and diversify fishing grounds are helping assure stable fleet activity. The EU has taken over Spain's bilateral fishing agreements with third party states and included the Spanish fleet in the EU's agreements.⁸³

One recommendation the OCDE has made to Spain is for a greater integration of environmental concerns in the political sectors.⁸³

Number of fish species in Sri Lanka	
Freshwater	144
Endemic	26
Marine/Brackish	809
Reef-associated	385
Commercially Important	89
Game Fish	170
Threatened	19
Introduced	23
Potential Aquarium	300
Aquaculture	8

Total Biodiversity-Value Index: 1973

FW: 170

Introduction

In terms of species, genes and ecosystems, Sri Lanka is one of the 18 biodiversity hot spots in the world. Shrimp is the major export commodity of the fisheries sector, accounting for nearly 40% of total export earnings.⁸⁴

Trends

The major threat to biodiversity in Sri Lanka is the ever-increasing demand for land for human habitation and related development. Poor land-use planning, indiscriminate exploitation of biological resources, weak enforcement of legislation and the absence of an integrated conservation management approach are other threats.

Response

A coastal zone management plan has been prepared by the Ministry of Fisheries in order to adopt an integrated approach to the management of coastal resources and to involve local communities in the planning and implementation of programmes for the conservation and sustainable use of marine resources and the conservation of the coastline. Regulations to prevent over-fishing have been developed and protected zones are provided for in the coastal management plan. A national contingency plan to deal with oil spills is also under consideration.²³¹

The current inland fisheries and aquaculture development programme includes stocking waterbodies with fingerlings, raising fish in ponds, cages, and pens, and providing subsidies for buying canoes and fishing gear. The newly established Aquaculture Development Division

of the Ministry of Fisheries & Aquatic Resources Development is acting to rehabilitate two fish breeding stations and to encourage fish feed production.⁸⁴

Two capture fisheries projects are operating: a Fisheries Sector Development Project funded by ADB, and the Marine Fisheries Management Project funded by UNDP/FAO. The first started in 1993 and will run for six years and cost US\$ 33 million. It aims to support rehabilitation of fishing harbours and anchorages, fishing community development, research and institutional development. The second project is a 5-year technical assistance project which started in 1993, at a cost of US\$ 1.8 million. Its purpose is to establish a fisheries management mechanism.⁸⁴

There are also four aquaculture projects: Management of Ornamental Fishery (with the assistance of the Bay of Bengal Programme (BOBP); Minimizing Post-Harvest Losses and Improving the Quality of Fish; the FAO/TCP Project on Disease Prevention and Health Management in Coastal Shrimp Culture; and the FAO/TCP Project on Aquaculture Development.⁸⁴

The Natural Aquatic Resources Research and Development Agency (NARA) is responsible for coordinating research on fisheries and aquatic resources. Eight scientific divisions deal with marine biology, aquaculture, fisheries engineering and technology, oceanography, hydrography, post-harvest technology, environmental studies and socioeconomic and market research.⁸⁴

Suriname

Number of fish species in Suriname	
Freshwater	278
Endemic	4
Marine/Brackish	702
Reef-associated	138
Commercially Important	6
Game Fish	128
Threatened	20
Introduced	4
Potential Aquarium	132
Aquaculture	1

Total Biodiversity-Value Index: 1413

FW: 282

Summary Only

Introduction

Suriname has a coastline of 386 km and an EEZ of 101 km². Total mangrove area is 115 000 ha. Marine catches were 9 313 tons in 1993, a rise of 176% from 1983. Freshwater fish production was 190 000 metric tons that same year, down 12% from 1983.²⁴⁷

Suriname's extensive waterway network provides an important part of the diet of the population of the interior, where freshwater fish are often the only source of animal protein. Some freshwater species are occasionally supplied to the populated coastal areas. Freshwater swamp fish is traditionally preferred.⁸⁵

The coastal rivers of the Guianian Freshwater ecoregion, which drain the Guyana Shield, have a wide range of cataracts, rapids, and riparian flooded forests. The rivers are poorly investigated, but are known to support a diverse, highly intact, and notably endemic freshwater fauna. In many rivers, local endemism is the result of isolating waterfalls.²⁵¹

Aquaculture is of little importance due to the lack of technical and financial support and to economic and political disincentives to both local and foreign investment. The few aquaculture operations culture red hybrid tilapia (*Oreochromis* red hybrid) and the white leg shrimp (*Penaeus vannamei*). Only a small portion of the shrimp is sold locally; 90% goes to Japan, and 10% to North America and Europe. The small shrimp caught artisanally is sold, fresh or dried, on the local market and also for export. Most of the shrimp by-catch is processed into dried and smoked products.⁸⁵

Trends

In the second half of the 1980s, a number of shrimp trawlers were converted into finfish trawlers. In 1993, North Sea trawlers entered Surinamese waters, taking many pelagic finfish such as barracuda and mackerel for the EU market. Snapper hook-and-line boats operating offshore were not registered until 1982.⁸⁵

Key environmental concerns are potential deforestation and watershed degradation due to the planned sale of massive concessions to foreign timber companies.²⁴⁷

In 1985 an agreement permitted a maximum of 100 vessels every year to operate in Surinamese waters. In 1997, this maximum was exceeded. The most expensive and desirable fish, the armoured catfish *Hoplosternum littorale*, is actively hunted and is disappearing from accessible places. Shrimp catches have also reached or surpassed their maximum sustainable yield, and illegal fishing and transshipment at sea are problems. The large demersal finfish are fully exploited.⁸⁵

Response

As of May 2001, Suriname had not submitted a National Biodiversity Strategy and Action Plan to the CBD, which Suriname ratified in 1996. In March 1997, for the first time, the Fisheries Department, with the cooperation of the Ministry of Education, developed a one-year training programme to train fish inspectors and quality managers. Since 1997, processing plants exporting to Europe and USA must have a written HACCP programme and it must be implemented. (These requirements are from the importing countries.)⁸⁵

The Government of Suriname is promoting biological research on the most important stocks, such as penaeid shrimp, large demersal finfish species and red snapper. Guidelines for fisheries management have been prepared, and propose concrete sustainable catch levels for large demersal finfish (5 000 t/yr), small demersals (11 000 t/yr), large pelagics (10 000 t/yr), small pelagics (200 000 t/yr), red snapper (3 000 t/yr) and other deep-sea demersals (1 200 t/yr).⁸⁵

Number of fish species in Tanzania	
Freshwater	789
Endemic	14
Marine/Brackish	765
Reef-associated	381
Commercially Important	44
Game Fish	225
Threatened	40
Introduced	12
Potential Aquarium	516
Aquaculture	5

Total Biodiversity-Value Index: 2791

FW: 803

Introduction

Tanzania controls 49% of the surface of Lake Victoria (in the north of the country). It shares Lake Tanganika (along its western border) mostly with Congo-Kinshasa, the smaller northern tip with Burundi and the southern tip with Zambia. Lake Malawi, in the south, is shared with Malawi and Mozambique. Tanzania also has a marine coast, which is part of the East African Marine Ecosystem.

The faunas of Lake Victoria, Lake Malawi and Lake Tanganyika all show rapid speciation from very few ancestors.¹⁹⁰

Lake Tanganyika is the deepest lake in Africa and second deepest lake in the world. Much older (about 20 ma) than Lakes Victoria and Malawi, the lake's fish species diversity is high, though lower than in Lake Malawi and Victoria before the introduction there of the Nile perch. Two species of herring form the mainstay of the fisheries. Most species in the lake are endemic.²³⁹

The fish of Lake Malawi represent 14 % of the world's fresh water fish and about 4 % of all fish in oceans, estuaries and fresh waters in the world.²⁰⁵

Trends

Lake Victoria, Lake Malawi and Lake Tanganyika are seriously threatened by over-fishing, exotic introductions, harmful land-use and pollution.¹⁹⁰

In 1999, the European Union imposed a ban on fish from the Lake Victoria region following reports that fishermen were using poisonous substances to kill fish.¹⁷⁸ Chemical fishing has

indeed been detected in some landing bays around Lake Victoria, as many artisanal fishermen are turning to chemicals because they cannot afford fishing tackle. The poisoning mainly affects the tilapia species, which live in shallow water near shore. Only a small percentage of the deep water Nile Perch is affected.¹⁷³

The Lake Victoria fishery, which once drew on hundreds of species, mostly endemic, now rests on three: a native pelagic minnow called the Omena (*Rastrineobola argentea*) or Dagaa in Tanzania; the introduced Nile perch (*Lates niloticus*), known as Mbuta; and the introduced Nile tilapia, *Oreochromis niloticus*. Until recently, the native fish were harvested by small-scale fishers and traded by women locally. After the introduction of the Nile perch, foreign-aid groups and investors moved in with processing plants. From the open lake, large boats, whose catches are largely unregulated, sell the perch to processing plants along the Kenyan and Ugandan shores, which ship the catch to Europe and the Middle East. The local women who formerly dried or cured the disappearing small native fish now purchase the filleted scraps.¹⁹⁰

Response

As of May 2001 Tanzania had not submitted a National Biodiversity Strategy and Action Plan.

Fish diversity patterns in the Lake Victoria Region have been surveyed since 1989 in order to complete the picture of the haplochromine fauna, to document fish species loss and persistence during the current mass extinction, to provide the taxonomic foundation for species conservation and adaptive management in Lake Victoria and adjacent regions, and to help Kenya, Uganda, and Tanzania establish host-country reference collections and aquatic biodiversity survey capabilities.

Breeding stocks of 40 haplochromine species (selected to represent most of the different feeding strategies that evolved in Lake Victoria) and the native ngege are safe in exile at 30 aquariums in the United States and Europe under a World Conservation Union program.¹⁹⁰

Thailand

Number of fish species in Thailand	
Freshwater	566
Endemic	18
Marine/Brackish	725
Reef-associated	276
Commercially Important	538
Game Fish	163
Threatened	31
Introduced	19
Potential Aquarium	234
Aquaculture	32

Total Biodiversity-Value Index: 2599

FW: 584

Introduction

In the late 1970s, almost 90% of the total fishery production was from the marine fishery. By 1979, 10 000 ha of coastal tidal and estuarine areas had been developed into ponds to culture highly-valued shrimp species as well as some fin fish,⁴⁹ and shrimp now make up 70 % of fisheries exports, Thailand's fourth-largest export.²⁷ Of the world's farmed shrimp, the eastern hemisphere produced an estimated 78%, or 558 000 mt (live weight) in 1995; Thailand was the top producer.⁸ Between 1993 and 1996, Thailand was the leading world exporter of fish products, which brought in US\$ 3.4 billion.⁹²

Trends

The greatest overall threats to biological diversity in Thailand are public ignorance and the appeal of a western lifestyle. Habitat destruction is the most serious concrete threat.

Overfishing has caused the most damage to marine biodiversity. Following a rise in the number of fishing vessels from 4 000 in 1972 to 13 000 only eight years later, Thai waters have reached or surpassed carrying capacity. Coral reefs have also been severely damaged by uncontrolled ecotourism and by the trade in coral souvenirs.

A recent boycott of Thai shrimp because of environmentally damaging fishing practices was lifted by the United States, but further bans may arise once environmentalists become aware of the environmental damage done by shrimp farming.²⁸ Mangroves are cleared for shrimp ponds, or killed by the toxic runoff from shrimp farms. Since the shrimp farming industry took off in 1979, almost 50 % of Thailand's mangroves have been lost.^{135 and 27}

Response

Opposition by NGOs and other groups who misinterpreted the CBD delayed ratification of the Convention from 1992 until 1997. The 1992 Biodiversity Country Study, despite considerable efforts, has been viewed by many to be incomprehensive. However, recent literature surveys found that 70% of reptiles, amphibians and fishes have been identified. Five hundred and forty-five freshwater fishes are expected to be in Thailand, of which 70 species are considered endemic.

Limited achievement in conserving biodiversity was due not to inadequate legislation, but rather to a lack of sufficient and proper capacity to enforce laws. Attempts were made as early as 1975 to identify environmental criteria and policies for coastal zone management and to develop detailed guidelines for regulating new development in the coastal zone, as well as establishing a Central Pollution Control Centre.⁴⁹ The National Policies, Measures and Plans approved by the Cabinet on July 15, 1997 to ensure compliance and prioritize actions will be the sole principle framework for biodiversity conservation and management in Thailand until 2002.

Uganda

Number of fish species in Uganda	
Freshwater	257
Endemic	1
Marine/Brackish	
Reef-associated	
Commercially Important	3
Game Fish	10
Threatened	35
Introduced	8
Potential Aquarium	19
Aquaculture	4

Total Biodiversity-Value Index: 337

FW: 258

Introduction

One of the Least Developed Countries (LDCs), Uganda largely depends on natural resources for its survival.

Eight rivers are more than 100 km long and six major lakes cover 34 814 km². Extensive wetlands occupy about 13% of the total area of the country, including areas of permanent flooding but not open water. While most traditional uses of wetlands are sustainable, a few have had serious effects on the wetland ecosystem as a whole. Relatively few fish species occur in protected areas, as there are very few protected lakes and wetlands.

Lake Victoria has by far the most important of the African Great Lakes fisheries, owing to the tremendous upsurge in Nile perch (*Lates niloticus*). From 1985 through 1997, the annual Nile perch catch has comprised around half of total annual production in the country.⁸⁶

Trends

Even those few waterbodies that are protected are often exploited for fish, although the status of species there is unknown. Aquatic biodiversity lies largely outside the Protected Areas and so suffers direct human exploitation for sustenance. Fish biodiversity has been harmed by unregulated exploitation, and the fish species composition in lakes such as Victoria and Kyoga has changed following the introduction of the Nile perch in the 1950s.

Current environmental issues include the draining of wetlands for agriculture,⁵⁹ the invasive/stocked Nile perch, increasing eutrophication and anoxic layers at lower depths. Water hyacinth weed (*Eichhornia crassipes*) which began to appear in the Lakes Kyoga and

Victoria and the Victoria Nile during 1989-90, has been particularly severe along the northern and eastern shorelines and islands (Uganda and Kenya).⁸⁶

Response

Although no National Biodiversity Strategy and Action Plan has been prepared, the country has already gone through a comprehensive National Environment Action Planning process. A National Wetland Policy has been formulated.

In 1999 the European Union imposed a ban on fish from the Lake Victoria region following reports that fishermen were using poisonous substances to kill fish.¹⁷⁸

A new regional management body, the Lake Victoria Fisheries Organization (LVFO), was established by a Convention signed by the three lacustrine States in 1994. It will succeed the CIFA Sub-Committee for Lake Victoria, and is charged with fostering effective cooperation between the Contracting Parties to ensure ecosystem health and sustainability of the Lake. LVFO's headquarters are in Jinja, Uganda.⁸⁶

Although there is no national monitoring programme, monitoring is taking place at specific sites.⁸⁶

Current or recently completed projects include the FAO Regional Project for Inland Fisheries Planning, Development and Management in Eastern/Central/Southern Africa (IFIP); Programme on the Lakes of East Africa (PLEA), International Decade of the East African Lakes (IDEAL); The Lake Victoria Environmental Management Project (LVEMP) and the EEC Lake Victoria Research Project.

Number of fish species in Ukraine	
Freshwater	116
Endemic	-
Marine/Brackish	35
Reef-associated	7
Commercially Important	19
Game Fish	82
Threatened	14
Introduced	15
Potential Aquarium	27
Aquaculture	9

Total Biodiversity-Value Index: 324

FW: 116

Introduction

The coasts of the Black and Azov Seas in Ukraine stretch for 2800 km. Ukrainian fisheries comprise the Black and Azov Seas fishery, the distant-water fishery, and inland water fisheries;. Most inland water production is from reservoirs. The most important species are silver carp (*Hypophthalmichthys molitrix*), roach (*Rutilus rutilus*), tyulka, freshwater bream (*Abramis brama*), pike-perch (*Stizostedion lucioperka*) and common carp (*Cyprinus carpio*).⁸⁷

During the second half of the 1980s total fisheries production peaked at 1.1-1.2 million mt annually. Landings from the Black and Azov Seas were 120 000 - 210 000 mt (including areas now under Russian and Georgian jurisdiction). Inland production was 115 000-150 000 mt.⁸⁷

Trends

Under Communism the hydrology of Ukraine was dramatically altered by power-station dams on rivers, huge water reservoirs ('artificial seas'), drainage of mires, swamps and wetlands in the northern forest regions (Ukrainian Polissya), and irrigation of the southern steppe.

Following independence and curtailed access to the Black and Azov Seas, catches fell considerably.⁸⁷

Catches of fish and other marine and freshwater organisms fell between 1991—1995, mainly due to habitat degradation from pollution, lower water quality and critical levels of freshwater flow to the Black and Azov Seas. Alien marine animals also cause serious problems and threaten native species and ecosystems. Catches of freshwater fish are also falling. The most important causes are water pollution, poor water management, and insufficient control of fish

populations. Poaching continues to rise due to the worsening financial and economical situation, unsatisfactory support for nature conservation bodies, and falling living standards for the overwhelming majority of the population. As well, the fishing industry has yet to restructure to adapt to national independence

The Pripjat River plays an important role in regulating the water levels of the Dnepr River (the third largest river in Europe). Fens, bogs and wetland systems are also important for local and global climate processes. The fens and bogs, as well as the forests in the Polesia area, are important carbon dioxide sinks, and Ukraine is interested in creating interstate protected areas in the Upper Basin of the Pripjat River. Tourism, especially eco-tourism, is economically important in the region.²³⁶

Response

To sustain sturgeon stocks in the Black and Azov Seas, the number of Russian sturgeon juveniles (*Acipenser guldenstadti*) released annually into the Azov Sea rose from 700 000 in the 1980s to 3 million in 1994. In addition, 1-2.5 million sturgeon juveniles are released yearly into the Black Sea. Artificial reproduction of valuable species in the Black and Azov Seas has been researched.⁸⁷ In 1994 more than 50 000 000 individuals of plant-eating fish species, 1 500 000 sturgeon, 3 200 000 young plaice, etc., were released into Ukrainian waters.

Much attention is paid to restoring the hydrologic regime of rivers (mostly small), creating water protection zones and riverside forests, restoring and improving floodplain ecosystems, and increasing species diversity of plants and animals in water bodies. Such measures are being implemented within the National Programme for Ecological Optimization of the Dnepr River Basin and Improvement of Potable Water Quality (1997), within the State Committee of Ukraine on Water Management, and through international programmes aimed at conserving the river basins of the Danube, Western Bug, Prypyat and Desna. Ukraine intends to increase the areas of protected wetlands, mire and aquatic ecosystems.

Shortage of funds most seriously delays the proper fulfillment of Ukraine's responsibilities as a Party to the CBD. A sharp decrease in funding for fishery research since 1992 has completely shut down exploratory fishing in the oceans and cut the number of Black Sea cruises from 20-25 to 1-2 per year.⁸⁷

United States (contiguous states)⁷

Number of fish species in USA (contiguous)	
Freshwater	859
Endemic	305
Marine/Brackish	2033
Reef-associated	347
Commercially Important	117
Game Fish	410
Threatened	160
Introduced	59
Potential Aquarium	330
Aquaculture	11

Total Biodiversity-Value Index: 4431

FW:1164

Introduction

U.S. territorial waters take in more than one-fifth of the world's most productive marine waters.

Trends

Overfishing and overcapitalization in commercial and recreational fisheries have resulted in billions of dollars of potential economic benefits foregone, as well as in hundreds of thousands of jobs, countless recreational fishing opportunities, and potential reductions in the Nation's multi-billion dollar trade deficit in fishery products. Even those fisheries that are producing a large catch are doing so inefficiently.

Despite the riches of American waters, NOAA (National Oceanic and Atmospheric Administration) needs to do more research before it can move into comprehensive ecosystem management. Primarily, coastal fishery ecosystems have to be understood, non-fishing related anthropogenic stress has to be integrated into fishery assessments, and sampling technology must be advanced. Each year NOAA reviews the status of more than 231 fish, marine mammal, and sea turtle stocks, and has begun to develop a computer system to manage millions of individual observations in order to improve its fishery data collection. Of the 201 species assessed recently by the National Marine Fisheries Service, the status of stocks for 22% is unknown. For many species, especially newly exploited ones, biological knowledge is poor.

⁷ All material in this WFT summary unless otherwise cited is condensed from NOAA's *Plan to build Sustainable Fisheries, May 1997*

Response

Signed in 1993, the CBD has not yet been ratified. The UN Convention on the Law of the Sea has also been signed but not ratified. At the Earth Summit of 1995 Agenda 21 was adopted.

Allocating fish with the traditional fishery management tools has been clumsy and legally contentious. NOAA considers the ideal solution to be in combining traditional regulations to conserve the resource with free market methods to allocate fish, which could involve assigning negotiable shares to individuals. NOAA however lacks adequate social science data collection, management, and analytical capabilities to keep up with the growing need to evaluate such socioeconomic issues.

On the positive side, the collapsed striped bass fishery off the Atlantic coast has recovered and widespread fishing is once again allowed; the Atlantic group of Spanish mackerel, heavily overfished, is recovering, permitting larger harvests; NOAA's management of North Pacific groundfish has kept the fishery the most productive and wealthiest in U.S. waters; tuna and swordfish stocks fished in Western Pacific waters under U.S. jurisdiction remain healthy and yield enormous returns; and NOAA has made significant progress to restore many depleted fish stocks such as New England groundfish, Gulf of Mexico red snapper and Atlantic bluefin tuna.

NOAA proposes five management objectives: assess fishery resources, advance fishery predictions, manage for economic growth and sustainability, ensure adequate compliance, and provide research and services for fishery-dependent industries.

Since the 1972 enactment of the Coastal Zone Management Act, environmental assessments of coastal and marine areas are undertaken at least every two years. The U.S. measures improvements and changes in the coastal and marine environment primarily through the National Status and Trends Programme.²³³

Number of fish species in Vanuatu	
Freshwater	25
Endemic	-
Marine/Brackish	476
Reef-associated	314
Commercially Important	-
Game Fish	111
Threatened	2*
Introduced	1
Potential Aquarium	149
Aquaculture	-

Total Biodiversity-Value Index: 978

FW: 25

* Big-eye tuna (*Thunnus obesus*) and the whale shark (*Rhincodon typus*)

Introduction

Little is known about the full range of flora and fauna of Vanuatu. The waters in and adjacent to the EEZs of the Pacific island states account for about 45 per cent of world tuna production and 60 per cent of canned tuna consumed worldwide.³⁷ The majority of Vanuatu's catch is taken by the subsistence fishery, and is locally consumed throughout the archipelago. Inland fisheries in Vanuatu are of no commercial significance, and there is no aquaculture.⁸⁸

Trends

A deep-bottom fishery established in the 1970s became a significant source of rural income in certain islands, but only at a significant cost in government subsidies. Eventually donor support expired and most of the rural fishing centres were closed down. A fledgling domestic tuna longline fishery has begun to develop in recent years, involving small vessels which are either locally-owned or operate under charter arrangement with local or joint-venture companies.⁸⁸

The offshore tuna fishery is modest compared with other Western Central Pacific states, and the migratory tuna are thought to be only lightly exploited in Vanuatu's EEZ. Onshore foreign investment in this sector is hesitant. Some deep-bottom snappers and tuna are exported, but local demand for deep-bottom snapper is high and local marketing is almost as profitable as the export trade. Fishing access fees and export permits from Chinese longliners and revenues received through the US Multilateral Treaty appear beneficial from Vanuatu's viewpoint, since neither Chinese nor US vessels fish in Vanuatu very frequently.⁸⁸

Commercial fishing, limited knowledge of some resources, and subsistence fishing in areas of high population are all threats. The most common threat to marine biodiversity is commercial over-exploitation.

Response

While Vanuatu has taken significant steps to manage biodiversity independently of the CBD, there has been no opportunity to assess these indigenous measures, which employ traditional tabus and permanent or temporary area closure or harvesting bans. Until UNEP helped financially with Biodiversity Conservation Planning in 1997 there had been no resources, staff or budget at either a national or provincial level dedicated to the CBD. Under the Vanuatu National Conservation Strategy and Action Planning Project (VNBSAP), an action plan should be finalised in mid-1999. Currently no single document brings together all the various legislative provisions relating to fisheries.⁸⁸

Numerous examples of localised resource depletion have raised awareness, and both government and resource users are showing renewed interest in customary marine tenure to conserve inshore resources.⁸⁸ Management measures include improving controls on commercial fishing, targeting community and industry to raise awareness about fisheries and resources, and planning a fishery census.

Since Independence the government has taken a number of important initiatives to manage biological resources. These have been sectorally based and narrowly focussed on specific resources, usually those of commercial value and vulnerable to local overharvesting. Under the “Convention on the Prohibition of Fishing with long drift nets in the South Pacific” foreign fishing vessels are not allowed to use drift nets or practice using such gear. Proposed changes to fisheries legislation will make the use of drift nets illegal.

The Fisheries Division operates a small hatchery for trochus shell (*Trochus niloticus*), producing juveniles for experiments on reef re-seeding to enhance the wild trochus fishery. Similar experimental work on green snail (*Turbo marmoratus*) is also carried out.⁸⁸

Number of fish species in Venezuela	
Freshwater	594
Endemic	19
Marine/Brackish	777
Reef-associated	244
Commercially Important	104
Game Fish	147
Threatened	22
Introduced	-
Potential Aquarium	239
Aquaculture	9

Total Biodiversity-Value Index: 2155

FW: 613

Summary Only

Introduction

Venezuela's ecosystems include Caribbean islands, reefs, wetlands, small barren islands and wetlands on the Atlantic coast, the Orinoco delta, the Amazon, with its own zone of megadiversity; deep marine river basins, and the continental shelf.²³⁴ The coastline runs for 2 800 km and the EEZ covers 364 km². There are 8 marine protected areas.

Living marine resources are, in decreasing order of production: fish, crustaceans and mollusks. From 1981 - 1995 total fishing production (marine and continental) practically tripled. Marine fishing has always been more than 90% of the total, but fell in 1995 to 88%, the lowest percentage since 1980. This was accompanied by a well-known decrease in very important landings such as tuna, calamary, squid, brown shrimp and, mainly, white shrimp. National fishing production overall in 1994-1995 reached 937 000 metric tons, the eastern zone of the country producing 75.8% of the production since 1980. From 1981-1995 artisanal fishing brought in two-thirds of this production, and industrial fishing the remaining third. The main artisanal catch is the sardine, whose production increased considerably as of 1993 (86 000 metric ton) rising to a record 153 000 metric ton in 1995. The 'pargo-mere' fishery is also included in this fishery.²³⁴

The industrial or high-seas fishing includes mainly the tuna and shrimp, this last declining from its 1992 peak of 42 500 metric tons to 30 000 metric tons in 1995, the lowest since 1985. Meanwhile, cultivated shrimp production has been quickly increasing, tending to supplant the traditional drag fishing.²³⁴

Trends

Key environmental concerns are sewage pollution of Lago de Valencia, oil and urban pollution of Lago de Maracaibo, deforestation, soil degradation, and urban and industrial pollution, especially along the Caribbean coast.⁶⁰ The percentage of wetlands still in their natural state was unavailable to the WRI.²⁴⁸

The marine and coastal atmospheres are being degraded by cutting and burning in the river basins that drain to the sea, the dredging and filling of coastal wetlands, of marine prairies of 'fanerógamas' and coral reefs, as well as by fishing during prohibited times and/or zones and with illegal gear. They are also being degraded by marine and coastal contamination from fecal wastes, solid garbage and other wastes; liquid effluents of domestic origin; petroleum and its derivatives; biocides and/or fertilizers; mercury and or other heavy metals and wastes from mining and metallurgical activity; by thermal waste; radioactive wastes, particularly in suspension or on the submarine bed; atmosphere pollution; noise pollution; and by eyesores.²³⁴

Venezuela claims all of Guyana west of the Essequibo River, and is disputing its maritime boundary with Colombia in the Gulf of Venezuela.⁶⁰

Response

As of May 2001 Venezuela had not submitted a report to the CBD, which it ratified in 1994.

Venezuela is party to international treaties covering the Antarctic, Climate Change, Desertification, Endangered Species, Hazardous Wastes, Marine Life Conservation, Nuclear Test Ban, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling. It has signed but not ratified Marine Dumping.⁶⁰ The Convention of the Nations United on the Right of the Sea has also not been ratified.²³⁴

The Ministry of the Environment and Renewable Natural Resources (MARNR) maintains a registry of activities that can degrade the atmosphere. This registry includes, among others, activities generating liquid effluents. The Registry of Environmental Laboratories increases MARNR's capacity to make evaluations, controls and special analyses of routine and, if possible, investigations at the national level. In 1995 there were 60 environmental laboratories enabled to analyse water polluting agents. MARNR has concentrated on the basins of Valencia and Maracaibo lakes and the river basins of the rios Manzanares, Neveri, Tocuyo, Cloudy, Tuy and Yaracuy as much for deterioration as for their importance as sources of water for important populations of the country.²³⁴

Viet Nam

Number of fish species in Viet Nam	
Freshwater	318
Endemic	1
Marine/Brackish	688
Reef-associated	224
Commercially Important	11
Game Fish	173
Threatened	22
Introduced	12
Potential Aquarium	180
Aquaculture	14

Total Biodiversity-Value Index: 1643

FW: 319

Introduction

Vietnamese fisheries total about 1 000 000 tons live weight yearly. They bring in over 10% of the total export earnings, provide about half the animal protein in the population's diet, and directly employ almost 3 million people, of whom nearly 10% get their main income from fisheries. In 1995 the total exploitable marine resources were estimated at 1.1 million tons. Almost all of the freshwater production is consumed domestically.⁸⁹ In 1995, Vietnam was the fifth largest producer in the Eastern Hemisphere of farmed shrimp⁸ and is ranked 20th among maritime nations for landings.¹³⁹

Trends

Human population increase places enormous pressure on fishery resources. Ecosystems have been over-exploited and some parts seriously damaged; mangroves have been over-exploited by the conversion of land to shrimp culture and wet rice farming. Over-exploitation of coastal nearshore waters is coupled with increasing marine pollution (estuary sedimentation, oil spills from maritime activities and pollutants from industrial wastes, etc.) Fish production has fallen and habitats or feeding nurseries of several threatened fish species have been lost. This degradation of biodiversity has not yet been assessed.

Neither inshore nor offshore resources are assessed with any regularity. Recently, Japanese semi-commercial vessels have surveyed deep-water pelagic resources (mainly tuna stocks) in distant waters off Central Viet Nam. However, these highly migratory resources are in Vietnamese waters only a short time. The exploitation of the inshore and most shallow water offshore resources by a fast-growing fleet has reached its maximum and is close to overexploitation. The growing human population, no enforced regulations and low economic barriers to entry to the business are major factors. Government policy is to ease the pressure on

coastal resources and to develop the industry through better use of deep-sea resources. Problems include monitoring and control of deep-water fishing grounds, as well as illegal fishing by vessels from other nations.⁸⁹

Response

A number of laws have been passed, including an Ordinance on Fisheries Resources Protection. The Government has also approved development aimed at rehabilitating lost forests, planning a nearshore watershed protection belt, and building up a buffer zone for human settlement stabilization and sustainable agricultural development including shrimp cultures. Since 1991, the rate of forest loss has indeed dropped, and the Government has launched a reforestation program in the watershed protection forest lands and around the protected areas. To conserve wetlands biodiversity, 60 wetlands have been proposed as protected areas, and in 1998 a wetlands conservation plan was to be submitted to the Government for consideration within the integrated national program of protected areas. National scientists have also proposed 12 areas to be established as marine protection areas. These were to be considered and approved by the Government as a national system of marine protected areas in 1998.

DANIDA, NORAD, JICA and CIDA are presently operating in the fisheries sector in Vietnam. The Asian Development Bank (ADB) is involved in infrastructure projects and plans to join ICLARM in a project covering sustainable utilization of coastal fish stocks. CIDA is involved in a project to support sustainability of near-shore fisheries, including more balanced policy objectives and management activities.⁸⁹

Viet Nam has ratified the UN Convention on the Law of the Sea.²³⁵

Number of fish species in Zambia	
Freshwater	370
Endemic	4
Marine/Brackish	-
Reef-associated	-
Commercially Important	19
Game Fish	41
Threatened	1
Introduced	9
Potential Aquarium	189
Aquaculture	6

Total Biodiversity-Value Index: 639

FW: 374

Introduction

Its dependence on biodiversity encouraged Zambia to be among the first countries to ratify the CBD. Zambia's relative success in biological diversity conservation is owed partly to low population density.

Zambia, which belongs to the Zambezi River Drainage System, currently produces over 70 000 tonnes of fish annually and is estimated to have over 200 fish species. A highly vascularized river system along with water bodies covers as much as 6% of the total land area. Fishing represents the third-largest occupational sector after farming and mining. Some 40 000 small-scale fishers are active, and some 70 commercial fishing companies operate on the Kariba reservoir or on Lake Tanganyika.

Trends

Over-fishing is the major threat to sustainable production, caused by too many fishermen and bad fishing methods including destructive fishing gear, poisoning and dynamite. Other sectors harm fisheries, especially farming and industry.

On Lake Tanganyika, industrial fishing in the Zambian sector and destructive beach seining have increased alarmingly. The industrial fishery has shown a marked increase since the early 1980s (from 3 to 23 units) as more operations have migrated to Zambian waters from former bases in Burundi and the Democratic Republic of Congo (DRC).⁹⁰

The impact of pollution has not been quantified. Production from the Kafue Flats area on the Zambezi River has been adversely affected by dam construction and by persistently heavy fishing pressure. Lake Mweru Luapula has seen rapid growth in effort, lack of effective

control, the progressive decline of favoured species, and the maintenance of production levels through resort to less valuable species and the development of the small pelagic fishery. In central Zambia, water hyacinth in the Kafue system seriously threatens the fishery.⁹⁰

Response

The FAO-executed Lake Tanganyika Research (LTR) Project has studied hydrodynamics, limnology, fish and zooplankton biology, remote sensing, fish genetics, and fisheries statistics. Complementary socio-economic and legal-institutional investigations set the stage for a regional Framework Fisheries Management Plan (FFMP) for the lake. Since 1995, the Lake Tanganyika Biodiversity Project (LTBP) has worked on a sustainable regional management plan. The International Decade of the East African Lakes (IDEAL) Project was established (effective 1992-93) as a ten-year project for the investigation of the biological, geological, chemical and physical limnology of the Great Lakes of the East African Rift. Under IDEAL the Nyanza Project was started in 1998 to encourage African and USA-based undergraduates and early career professionals to enter tropical lake science, based on Lake Tanganyika. Major technical assistance efforts related to capture fisheries include three associated with Lake Tanganyika. For Lake Kariba, the SADC project (Management of the Lake Kariba Inshore Fisheries Zambia) is trying to develop community-based fisheries management structures. Similar work is planned for the northern fisheries regions, beginning with Mweru-Luapula.⁹⁰

Zambia is implementing joint resource management programmes in shared water course systems along the Zambezi River basin; in particular, co-operating with Zimbabwe in developing regional programmes for Lake Kariba. The first project in Zambia funded by GEF for the conservation and sustainable use of regional resources is the Lake Tanganyika Biodiversity and Pollution Control Studies (LTBP) which has been underway since mid-1995. This project is being implemented alongside the Fisheries Management Programme by Zambia, Tanzania, Burundi, and the Democratic Republic of Congo.

Forty Zambian officers have recently been trained in environmental policy and legislation. The Ministry of Environment and Natural Resources, with the help of the Zambia Institute of Advanced Legal Education, trained the prosecutors in environmental law, investigation of environmental crimes and prosecution of offenders. The training comes under the government's program of managing natural resources and protecting these resources through the active participation of local communities.¹⁸²

Appendix I: Total Biodiversity-Value Index for Selected Important Islands or Maritime Nations Not Covered by this WFT Report

Alaska

Number of fish species in Alaska	
Freshwater	55
Endemic	2
Marine/Brackish	475
Reef-associated	11
Commercially Important	43
Game Fish	104
Threatened	9
Introduced	2
Potential Aquarium	6
Aquaculture	-

Total Biodiversity-Value Index: 707

FW: 57

Angola

Number of fish species in Angola	
Freshwater	252
Endemic	2
Marine/Brackish	606
Reef-associated	33
Commercially Important	25
Game Fish	150
Threatened	10
Introduced	1
Potential Aquarium	84
Aquaculture	-

Total Biodiversity-Value Index: 1163

FW: 254

Antarctica

Number of fish species in Antarctica	
Freshwater	
Endemic	1
Marine/Brackish	141
Reef-associated	
Commercially Important	3
Game Fish	1
Threatened	
Introduced	
Potential Aquarium	
Aquaculture	

Total Biodiversity-Value Index: 146

Azores Islands

Number of fish species in Azores Islands	
Freshwater	2
Endemic	-
Marine/Brackish	303
Reef-associated	19
Commercially Important	-
Game Fish	44
Threatened	4
Introduced	-
Potential Aquarium	15
Aquaculture	-

Total Biodiversity-Value Index: 387

FW: 2

Cape Verde

Number of fish species in Cape Verde	
Freshwater	1
Endemic	13
Marine/Brackish	627
Reef-associated	64
Commercially Important	2
Game Fish	129
Threatened	16
Introduced	-
Potential Aquarium	43
Aquaculture	-

Total Biodiversity-Value Index: 798

FW: 14

Chile

Number of fish species in Chile	
Freshwater	64
Endemic	26
Marine/Brackish	687
Reef-associated	47
Commercially Important	32
Game Fish	60
Threatened	9
Introduced	20
Potential Aquarium	28
Aquaculture	6

Total Biodiversity-Value Index: 979

FW: 90

Cuba

Number of fish species in Cuba	
Freshwater	68
Endemic	22
Marine/Brackish	933
Reef-associated	295
Commercially Important	131
Game Fish	146
Threatened	26
Introduced	20
Potential Aquarium	198
Aquaculture	6

Total Biodiversity-Value Index: 1845

FW: 90

Egypt

Number of fish species in Egypt	
Freshwater	106
Endemic	-
Marine/Brackish	729
Reef-associated	354
Commercially Important	11
Game Fish	218
Threatened	17
Introduced	13
Potential Aquarium	202
Aquaculture	6

Total Biodiversity-Value Index: 1656

FW: 106

Equatorial Guinea

Number of fish species in Equatorial Guinea	
Freshwater	73
Endemic	1
Marine/Brackish	457
Reef-associated	31
Commercially Important	1
Game Fish	85
Threatened	9
Introduced	-
Potential Aquarium	34
Aquaculture	-

Total Biodiversity-Value Index: 691

FW: 74

France

Number of fish species in France	
Freshwater	103
Endemic	1
Marine/Brackish	528
Reef-associated	25
Commercially Important	45
Game Fish	185
Threatened	19
Introduced	31
Potential Aquarium	51
Aquaculture	24

Total Biodiversity-Value Index: 1012

FW: 104

French Polynesia

Number of fish species in French Polynesia	
Freshwater	31
Endemic	2
Marine/Brackish	639
Reef-associated	495
Commercially Important	3
Game Fish	108
Threatened	7
Introduced	3
Potential Aquarium	276
Aquaculture	1

Total Biodiversity-Value Index: 1565

FW: 33

Galapagos Islands

Number of fish species in Galapagos Islands	
Freshwater	7
Endemic	24
Marine/Brackish	433
Reef-associated	181
Commercially Important	9
Game Fish	77
Threatened	5
Introduced	-
Potential Aquarium	64
Aquaculture	-

Total Biodiversity-Value Index: 800

FW: 31

Haiti

Number of fish species in Haiti	
Freshwater	41
Endemic	11
Marine/Brackish	491
Reef-associated	232
Commercially Important	2
Game Fish	105
Threatened	13
Introduced	4
Potential Aquarium	159
Aquaculture	-

Total Biodiversity-Value Index: 1058

FW: 52

Hawaii (USA)

Number of fish species in Hawaii	
Freshwater	55
Endemic	38
Marine/Brackish	838
Reef-associated	363
Commercially Important	4
Game Fish	126
Threatened	8
Introduced	59
Potential Aquarium	272
Aquaculture	2

Total Biodiversity-Value Index: 1765

FW: 93

Iceland

(No National Biodiversity Strategy and Action Plan submitted.)

Number of fish species in Iceland	
Freshwater	12
Endemic	-
Marine/Brackish	300
Reef-associated	2
Commercially Important	21
Game Fish	49
Threatened	8
Introduced	2
Potential Aquarium	1
Aquaculture	5

Total Biodiversity-Value Index: 400

FW: 12

Korea, Democratic People's Republic

(No National Biodiversity Strategy and Action Plan.)

Number of fish species in Korea, Democratic People's Republic	
Freshwater	67
Endemic	2
Marine/Brackish	162
Reef-associated	15
Commercially Important	8
Game Fish	42
Threatened	5
Introduced	-
Potential Aquarium	11
Aquaculture	3

Total Biodiversity-Value Index: 315

FW: 69

Korea, Republic of (South)

(Unreadable National Biodiversity Strategy and Action Plan.)

Number of fish species in Korea, Republic of	
Freshwater	114
Endemic	22
Marine/Brackish	265
Reef-associated	29
Commercially Important	28
Game Fish	70
Threatened	11
Introduced	14
Potential Aquarium	35
Aquaculture	14

Total Biodiversity-Value Index: 602

FW: 136

Kuril Islands

Number of fish species in Kuril Islands	
Freshwater	31
Endemic	2
Marine/Brackish	75
Reef-associated	-
Commercially Important	-
Game Fish	14
Threatened	-
Introduced	-
Potential Aquarium	1
Aquaculture	5*

Total Biodiversity-Value Index: 128

FW: 33

*Native salmon species, noted as being used 'never/rarely'.

Madiera Islands

Number of fish species in Madiera Islands	
Freshwater	4
Endemic	-
Marine/Brackish	491
Reef-associated	25
Commercially Important	2
Game Fish	85
Threatened	8
Introduced	-
Potential Aquarium	19
Aquaculture	-

Total Biodiversity-Value Index: 634

FW: 4

Malawi

Number of fish species in Malawi	
Freshwater	412
Endemic	126
Marine/Brackish	
Reef-associated	
Commercially Important	-
Game Fish	21
Threatened	3
Introduced	6
Potential Aquarium	310
Aquaculture	4

Total Biodiversity-Value Index: 882

FW:536

Mali

Number of fish species in Mali	
Freshwater	126
Endemic	1
Marine/Brackish	-
Reef-associated	-
Commercially Important	3
Game Fish	6
Threatened	1
Introduced	-
Potential Aquarium	25
Aquaculture	3

Total Biodiversity-Value Index: 165

FW: 127

Marshall Islands

Number of fish species in Marshall Islands	
Freshwater	4
Endemic	1
Marine/Brackish	790
Reef-associated	661
Commercially Important	2
Game Fish	99
Threatened	5
Introduced	1
Potential Aquarium	350
Aquaculture	-

Total Biodiversity-Value Index: 1913

FW: 5

Mauritania

Number of fish species in Mauritania	
Freshwater	17
Endemic	-
Marine/Brackish	613
Reef-associated	22
Commercially Important	16
Game Fish	125
Threatened	14
Introduced	-
Potential Aquarium	24
Aquaculture	-

Total Biodiversity-Value Index: 831

FW: 17

Mauritius

Number of fish species in Mauritius	
Freshwater	44
Endemic	8
Marine/Brackish	914
Reef-associated	594
Commercially Important	23
Game Fish	183
Threatened	14
Introduced	21
Potential Aquarium	324
Aquaculture	1

Total Biodiversity-Value Index: 2126

FW: 52

Micronesia, Fed. States of

Number of fish species in Micronesia, Fed. States of	
Freshwater	21
Endemic	1
Marine/Brackish	676
Reef-associated	543
Commercially Important	2
Game Fish	118
Threatened	6
Introduced	2
Potential Aquarium	301
Aquaculture	3

Total Biodiversity-Value Index: 1673

FW: 22

Midway Islands

Number of fish species in Midway Islands	
Freshwater	-
Endemic	1
Marine/Brackish	67
Reef-associated	48
Commercially Important	-
Game Fish	13
Threatened	2
Introduced	-
Potential Aquarium	35
Aquaculture	-

Total Biodiversity-Value Index: 166

Morocco

Number of fish species in Morocco	
Freshwater	54
Endemic	-
Marine/Brackish	625
Reef-associated	27
Commercially Important	14
Game Fish	159
Threatened	18
Introduced	21
Potential Aquarium	41
Aquaculture	5

Total Biodiversity-Value Index: 964

FW: 54

Netherlands Antilles

Number of fish species in Netherlands Antilles	
Freshwater	10
Endemic	-
Marine/Brackish	154
Reef-associated	78
Commercially Important	-
Game Fish	50
Threatened	10
Introduced	4
Potential Aquarium	45
Aquaculture	-

Total Biodiversity-Value Index: 351

FW: 10

New Caledonia

Number of fish species in New Caledonia	
Freshwater	83
Endemic	3
Marine/Brackish	1442
Reef-associated	943
Commercially Important	61
Game Fish	182
Threatened	12
Introduced	9
Potential Aquarium	487
Aquaculture	1

Total Biodiversity-Value Index: 3223

FW: 86

Newfoundland (Canada)

Number of fish species in Newfoundland (Canada)	
Freshwater	22
Endemic	-
Marine/Brackish	105
Reef-associated	2
Commercially Important	7
Game Fish	31
Threatened	5
Introduced	1
Potential Aquarium	8
Aquaculture	-

Total Biodiversity-Value Index: 181

FW: 22

Nicaragua

Number of fish species in Nicaragua	
Freshwater	81
Endemic	3
Marine/Brackish	1008
Reef-associated	265
Commercially Important	12
Game Fish	198
Threatened	81
Introduced	6
Potential Aquarium	123
Aquaculture	2

Total Biodiversity-Value Index: 1779

FW: 84

Nieu

Number of fish species in Nieu	
Freshwater	2
Endemic	-
Marine/Brackish	217
Reef-associated	172
Commercially Important	-
Game Fish	64
Threatened	3
Introduced	1
Potential Aquarium	121
Aquaculture	-

Total Biodiversity-Value Index: 580

FW: 2

North Marianas

Number of fish species in North Marianas	
Freshwater	15
Endemic	-
Marine/Brackish	648
Reef-associated	510
Commercially Important	2
Game Fish	132
Threatened	4
Introduced	2
Potential Aquarium	291
Aquaculture	-

Total Biodiversity-Value Index: 1604

FW: 15

Ogasawara Islands

Number of fish species in Ogasawara Islands	
Freshwater	1
Endemic	-
Marine/Brackish	764
Reef-associated	530
Commercially Important	-
Game Fish	131
Threatened	6
Introduced	-
Potential Aquarium	321
Aquaculture	-

Total Biodiversity-Value Index: 1753

Pacific Islands (Trust Territories)

Number of fish species in Pacific Islands (Trust)	
Freshwater	2
Endemic	-
Marine/Brackish	27
Reef-associated	11
Commercially Important	-
Game Fish	16
Threatened	1
Introduced	1
Potential Aquarium	9
Aquaculture	-

Total Biodiversity-Value Index: 67

Paraguay

Number of fish species in Paraguay	
Freshwater	187
Endemic	5
Marine/Brackish	-
Reef-associated	-
Commercially Important	-
Game Fish	7
Threatened	-
Introduced	1
Potential Aquarium	46
Aquaculture	1

Total Biodiversity-Value Index: 247

FW: 192

Portugal

Number of fish species in Portugal	
Freshwater	63
Endemic	3
Marine/Brackish	479
Reef-associated	23
Commercially Important	22
Game	144
Threatened	21
Introduced	11
Potential Aquarium	34
Aquaculture	9

Total Biodiversity-Value Index: 813

Fw: 66

Ryukyu Islands

Number of fish species in Ryukyu Islands	
Freshwater	40
Endemic	6
Marine/Brackish	1200
Reef-associated	736
Commercially Important	14
Game	158
Threatened	7
Introduced	-
Potential Aquarium	348
Aquaculture	1

Total Biodiversity-Value Index: 2510

FW: 40

Saint Kitts and Nevis

Number of fish species in Saint Kitts and Nevis	
Freshwater	8
Endemic	-
Marine/Brackish	460
Reef-associated	213
Commercially Important	-
Game	96
Threatened	12
Introduced	-
Potential Aquarium	140
Aquaculture	-

Total Biodiversity-Value Index: 929

FW: 8

Saint Lucia

Number of fish species in Saint Lucia	
Freshwater	14
Endemic	-
Marine/Brackish	487
Reef-associated	229
Commercially Important	1
Game	100
Threatened	13
Introduced	3
Potential Aquarium	151
Aquaculture	1

Total Biodiversity-Value Index: 999

FW: 14

Saint Vincent and the Grenadines

Number of fish species in Saint Vincent and the Grenadines	
Freshwater	12
Endemic	-
Marine/Brackish	477
Reef-associated	224
Commercially Important	-
Game	99
Threatened	12
Introduced	1
Potential Aquarium	145
Aquaculture	-

Total Biodiversity-Value Index: 970

FW: 12

Samoa

Number of fish species in Samoa	
Freshwater	31
Endemic	-
Marine/Brackish	935
Reef-associated	691
Commercially Important	2
Game	144
Threatened	9
Introduced	5
Potential Aquarium	377
Aquaculture	1

Total Biodiversity-Value Index: 2195

FW: 31

Sao Tome and Principe

Number of fish species in Sao Tome and Principe	
Freshwater	4
Endemic	1
Marine/Brackish	345
Reef-associated	55
Commercially Important	1
Game	87
Threatened	11
Introduced	-
Potential Aquarium	40
Aquaculture	-

Total Biodiversity-Value Index: 544

FW: 5

Seychelles

Number of fish species in Seychelles	
Freshwater	15
Endemic	2
Marine/Brackish	1152
Reef-associated	749
Commercially Important	9
Game	184
Threatened	11
Introduced	1
Potential Aquarium	390
Aquaculture	-

Total Biodiversity-Value Index: 2513

FW: 15

Solomon Islands

Number of fish species in Solomon Islands	
Freshwater	27
Endemic	-
Marine/Brackish	637
Reef-associated	467
Commercially Important	5
Game	106
Threatened	5
Introduced	2
Potential Aquarium	216
Aquaculture	1

Total Biodiversity-Value Index: 1466

Fw: 27

Tahiti

Number of fish species in Tahiti	
Freshwater	27
Endemic	-
Marine/Brackish	273
Reef-associated	196
Commercially Important	2
Game	74
Threatened	5
Introduced	5
Potential Aquarium	121
Aquaculture	2

Total Biodiversity-Value Index: 705

Fw: 27

Taiwan (Province of China)

Number of fish species in Taiwan	
Freshwater	146
Endemic	17
Marine/Brackish	2259
Reef-associated	1065
Commercially Important	68
Game	268
Threatened	22
Introduced	27
Potential Aquarium	594
Aquaculture	27

Total Biodiversity-Value Index: 4493

Fw: 163

Togo

Number of fish species in Togo	
Freshwater	116
Endemic	2
Marine/Brackish	443
Reef-associated	27
Commercially Important	2
Game	103
Threatened	10
Introduced	3
Potential Aquarium	49
Aquaculture	1

Total Biodiversity-Value Index: 756

Fw: 118

Tonga

Number of fish species in Tonga	
Freshwater	2
Endemic	3
Marine/Brackish	294
Reef-associated	192
Commercially Important	1*
Game	69
Threatened	5
Introduced	1*
Potential Aquarium	80
Aquaculture	3

Total Biodiversity-Value Index: 650

FW: 5

*The introduced *Oreochromis mossambicus*, Mozambique tilapia.

Trinidad and Tobago

Number of fish species in Trinidad and Tobago	
Freshwater	86
Endemic	-
Marine/Brackish	949
Reef-associated	280
Commercially Important	60
Game	141
Threatened	20
Introduced	8
Potential Aquarium	196
Aquaculture	6

Total Biodiversity-Value Index: 1746

FW: 86

Tuvalu

Number of fish species in Tuvalu	
Freshwater	1
Endemic	-
Marine/Brackish	183
Reef-associated	86
Commercially Important	-
Game	103
Threatened	4
Introduced	1
Potential Aquarium	28
Aquaculture	-

Total Biodiversity-Value Index: 406

FW: 1

US Virgin Islands

Number of fish species in US Virgin Islands	
Freshwater	11
Endemic	-
Marine/Brackish	529
Reef-associated	251
Commercially Important	1
Game	105
Threatened	11
Introduced	6
Potential Aquarium	160
Aquaculture	-

Total Biodiversity-Value Index: 1074

FW: 11

Virgin Islands (UK)

Number of fish species in Virgin Islands (UK)	
Freshwater	2
Endemic	-
Marine/Brackish	346
Reef-associated	216
Commercially Important	1
Game	85
Threatened	11
Introduced	-
Potential Aquarium	136
Aquaculture	2

Total Biodiversity-Value Index: 799

FW:2

Appendix II: Total Biodiversity-Value Index Ranking by Country

Boldface indicates countries whose National Biodiversity Strategy and Action Plans or other information sources have been summarized by WFT.

Australia	7070
Indonesia	6691
Japan	6016
Philippines	5472
Papua New Guinea	4783
Taiwan (Province of China)	4493
United States	4431
Brazil	3887
South Africa	3663
Mozambique	3613
Mexico	3573
<i>New Caledonia (France)</i>	3223
India	2837
Colombia	2616
Tanzania	2791
Thailand	2599
Malaysia	2594
Seychelles	2513
<i>Ryukyu Islands (Jap.)</i>	2510
Maldives	2435
China	2239
<i>Samoa</i>	2195
Venezuela	2155
Mauritius	2126
Madagascar	1989
Sri Lanka	1973
Marshall Islands	1913
Kenya	1899

Congo-Kinshasa	1851
Cuba	1845
Nicaragua	1779
<i>Hawaii (U.S.)</i>	<i>1765</i>
<i>Ogasawara Islands (Jap.)</i>	<i>1753</i>
Trinidad and Tobago	1746
Fiji	1693
Peru	1681
Micronesia, Fed. St.	1673
Egypt	1656
<i>North Mariana</i>	<i>1604</i>
<i>French Polynesia (Fr.)</i>	<i>1565</i>
New Zealand	1511
Solomon Islands	1466
Suriname	1413
Myanmar	1293
Canada	1265
Belize	1204
Cameroon	1176
Angola	1163
Russian Federation	1153
Ecuador	1098
<i>U.S. Virgin Islands</i>	<i>1074</i>
Haiti	1058
Congo-Brazzaville	1031
Barbados	1016
France	1012
Saint Lucia	999
Spain	982
Chile	979
Saint Vincent and Grenadines	970
Vanuatu	967

Morocco	964
Nigeria	962
Namibia	903
Guinea	883
Malawi	862
Bangladesh	848
Mauritania	831
Portugal	813
<i>Galapagos (Ec.)</i>	<i>800</i>
<i>Virgin Islands (UK)</i>	<i>799</i>
Cape Verde	798
Togo	756
<i>Alaska (US)</i>	<i>707</i>
Tahiti	705
Equatorial Guinea	691
Argentina	676
Tonga	650
Zambia	639
<i>Madeira Islands (Port.)</i>	<i>634</i>
Korea, Republic of	602
Iran	594
Nieu	580
Lao	571
Sao Tome	544
Norway	492
Tuvalu	406
Iceland	400
<i>Azores (Port.)</i>	<i>387</i>
Burundi	372
<i>Netherlands Antilles</i>	<i>351</i>
Uganda	337
Ukraine	324

Korea, North	315
Bolivia	302
Poland	250
Paraguay	247
<i>Newfoundland (Can.)</i>	<i>181</i>
<i>Midway Island (US)</i>	<i>166</i>
Mali	165
<i>Antarctica</i>	<i>146</i>
<i>Kuril Islands (Russia)</i>	<i>128</i>
Belarus	78
Pacific Islands (US)	67

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