A GLOBAL REPRESENTATIVE SYSTEM OF MARINE PROTECTED AREAS

Volume II:
Wider Caribbean, West Africa and South Atlantic

Great Barrier Reef Marine Park Authority
The World Bank
The World Conservation Union (IUCN)
## Contents

- **Introduction** 1
  - Objective 2
- **Methodology** 2
- **Selection of Priority Areas** 3
- **Priorities for Conservation** 3
- **Summary of Results** 5
- **Priorities for Marine Biodiversity Conservation** 8
- **General Recommendations** 8
- **The Way Forward** 11

7. **Wider Caribbean** 13
   - Biogeography and Marine Biodiversity 13
   - **Assessment of Existing MPAs** 17
   - Appendix 7.1 Ecological Features and Resource Problems of Caribbean Countries 35
   - Appendix 7.2 Distribution and Status of Threatened Caribbean Coastal and Marine Species 37
   - Appendix 7.3 Participation of Wider Caribbean Region in Major International Conventions and Programs 38
   - Appendix 7.4 Institutions Providing Regional Support Services 39
   - **Bibliography** 40

8. **West Africa** 43
   - Biogeography and Marine Biodiversity 43
   - **Assessment of Existing MPAs** 48
   - Priority Areas and Recommendations 56
   - **Bibliography** 68

9. **South Atlantic** 71
   - Biogeography and Marine Biodiversity 71
   - **Assessment of Existing MPAs** 76
   - Priority Areas and Recommendations 81
   - **Bibliography** 85

**Contributors** 87

**Index** 89

**Map Supplement**
Acronyms

AIMS
Australian Institute of Marine Science

CITES
Convention on International Trade in Endangered Species of Wild Fauna and Flora

CNPPA
Commission on National Parks and Protected Areas (IUCN)

GBRMPA
Great Barrier Reef Marine Park Authority

GEF
Global Environment Facility

GIS
Geographic Information System

HDU
Habitats Data Unit

ICLARM
International Center for Living Aquatic Resource Management

IMO
International Maritime Organization

IUCN
The World Conservation Union

LME
Large Marine Ecosystems

MPA
Marine Protected Area

MAB
Man and the Biosphere Programme

MARPOL
International Convention for the Prevention of Pollution from Ships

NGO
Nongovernmental Organization

PADU
Protected Areas Data Unit

SSC
Species Survival Commission

TNC
The Nature Conservancy

UNDP
United Nations Development Programme

UNCED
United Nations Conference on Environment and Development

UNESCO
United Nations Educational, Scientific, and Cultural Organization

WCMC
World Conservation Monitoring Centre

WWF
World Wildlife Fund

Data Note
Billion is a thousand million; trillion is a million million.
Introduction

This introduction is a summary of the comprehensive introductory chapter in Volume I. It provides a summary of the background, methodology, results, major conclusions and recommendations of the four volumes of this publication. An abbreviated summary of the major results of the 18 regional reports is also included. The full descriptions and full summaries of the results are included in the introductory chapter in Volume I.

The marine environment is critical to the natural and cultural heritage of the world. Not only do many marine areas support a great diversity of plants, animals, and natural habitats, but the oceans play an essential role in climatic cycles and other global processes. Marine ecosystems and resources are fundamental to the sustainable development of coastal countries, providing food, minerals, pharmaceuticals, construction materials, and a vast range of other products.

They often support growing tourism and recreation industries and play a vital role in transport and in the culture and lifestyle of coastal people. However, marine ecosystems throughout the world face increasingly serious threats from pollution, overexploitation, conflicting uses of resources, damage and destruction of habitat, and other harmful consequences of human development. Biodiversity is especially at risk. Conserving marine biodiversity is therefore a priority.

Since 1986 the IUCN Commission on National Parks and Protected Areas (CNPPA) has been promoting the establishment and management of a global representative system of marine protected areas (MPAs). The four volumes of this publication represent the conclusion of the latest phase of CNPPA's program and have been prepared through the collaboration of IUCN-CNPPA, the Great Barrier Reef Marine Park Authority (GBRMPA), the World Bank, and many other organizations and individuals (acknowledged in the contributors' section of each volume). This publication documents the biogeographic and ecological characteristics in each of 18 Marine Regions of the world and summarizes the range of marine biodiversity within each region and the major threats to its conservation. Based on a comprehensive set of selection criteria, including ecological, social and economic factors, marine protected area sites of national and re-
Regional priority for the conservation of marine biodiversity are proposed in each region. These sites include existing MPAs in need of improved management as well as new areas proposed to fill in the gaps in biogeographic representation within the existing marine protected area system.

The following definition has been adopted by IUCN for the term “marine protected area” (IUCN 1988):

Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.

Supporting information will be provided for each of the regions, including:
- An overview of the marine biodiversity and biogeography in each region, particularly as they relate to MPAs
- Available data on existing MPAs in each region, including assessments of their representativeness and management effectiveness
- Justification for the selection of priority areas
- Identification of further information required for completing a network of MPAs to cover each region’s marine biological and geographic diversity.

**Methodology**

The CNPPA has divided the marine areas of the world into 18 marine regions, largely on the basis of biogeographic criteria, but for practical reasons also considering political boundaries. In 1990, working groups were established in each region, consisting wherever possible of both marine resource managers and marine scientists. The aims of the working groups have been to:

- Summarize the main physical and biological characteristics of the marine environment
- Divide each marine region into its constituent biogeographic zones
- Make an inventory of existing MPAs
- Identify gaps in the representation of the biogeographic zones in MPAs
- Identify areas of national or regional priority for the establishment of new MPAs or for management strengthening and support to existing MPAs
- Determine other recommendations for establishing or improving the management of MPAs in each marine region.

Workshops were held in the East Asian Seas (February 1993), the Baltic (June 1993), North West Pacific (September 1993), the South Pacific (October 1993) and Latin Amer-
ica (January 1994) regions to allow marine resource managers and marine scientists to cooperate in the identification of priorities. In some regions this was the first time that these two groups had cooperated in this way for any purpose.

Information from the Protected Areas Data Unit and Habitats Data Unit at the World Conservation Monitoring Centre has been made available to GBRMPA and the World Bank for this project, and these organizations now maintain an identical computerized database on MPAs. This database, which has been substantially edited and updated for the purpose of this report by the Bank and GBRMPA, has been used to generate maps showing the location of MPAs worldwide, each region's biogeographic classification scheme, and the location of priority areas for the conservation of marine biodiversity of global significance.

**SELECTION OF PRIORITY AREAS**

The criteria used to identify priority areas in this report were developed by Kelleher and Kenchington (1992) and have been adopted by the International Maritime Organization for use in the identification of Particularly Sensitive Sea Areas and by the parties to the Helsinki Convention for identification of a system of marine protected areas for the Baltic Sea.

Priorities were identified primarily on the basis of ecological and biogeographic criteria using available data. Other, equally important, criteria were used to provide additional justification for or against the selection of a particular area and to help decide the feasibility of establishing and successfully managing a marine protected area. All priority areas were therefore assessed as having a reasonable chance of success as a marine protected area.

Within these guidelines, each working group applied the specific criteria shown in Box 1 for the selection of priority areas.

**PRIORITIES FOR CONSERVATION**

Priorities in this report have been identified for regional and national areas using available data. Only limited information has been available on some subjects in some regions and countries, and the report reflects this variability in data. Recommendations on the management of individual MPAs require detailed assessment of these sites. Unfortunately, the limitations of time and resources meant that such assessments were beyond the scope of this report.

The report concentrates on the subtidal marine environment in coastal areas and does not attempt to assess intertidal, estuarine, and wetland areas. In some instances, a lack of available information on the boundaries of protected areas that appear to have marine components made it difficult to determine the extent of any marine environment. It was therefore decided to identify only those areas that include a significant subtidal marine component.

Whenever possible national priority areas were identified by national representatives and regional priority areas were identified by the regional working group leader. This process of identification stretched over three years and every effort was made to incorporate contributions from marine resource managers and marine scientists in each country.

The selection of sites was to some extent subjective, and the lack of information and a well-tested and accepted global biogeographical classification system makes the determination of priorities between regions difficult. However, priorities in each region have been identified within the framework of a biogeographic classification system considered appropriate for that region.

Many nations are carrying out programs for conservation and development of the marine environment. As far as possible, the priorities identified in this report are consistent with expressed national priorities, as identified by national representatives or in documents such as National Environmental
Box 1. Criteria for Selection of Priority Areas

Biogeographic criteria
- presence of rare biogeographic qualities or representative of a biogeographic “type” or types
- unique or unusual geological features.

Ecological criteria
- an essential part of ecological processes or life-support systems (for example, is a source for larvae for downstream areas)
- area’s integrity, or the degree to which the area either by itself or in association with other protected areas, encompasses a complete ecosystem
- the variety of habitats
- presence of habitat for rare or endangered species
- nursery or juvenile areas
- feeding, breeding or rest areas
- rare or unique habitat for any species
- genetic diversity (is diverse or abundant in species terms).

Social importance
- existing or potential value to the local, national or international communities because of its heritage, historical, cultural, traditional aesthetic, educational or recreational qualities.

Scientific importance
- value for research and monitoring.

International or national significance
- potential to be listed on the World (or national) Heritage List, declared a Biosphere Reserve, or included on a list of areas of international or national importance, or is the subject of an international or national conservation agreement.

Practicality/or feasibility
- degree of insulation from external destructive influences
- social and political acceptability, degree of community support
- accessibility for education, tourism, recreation
- compatibility with existing uses, particularly by locals
- ease of management or compatibility with existing management regimes.

Action Plans or National Conservation Strategies.

Priorities for marine biodiversity conservation will change in the future as further information becomes available, as experience and education increase the awareness of communities and decisionmakers about the role and importance of marine environments and ecosystems, and as the priorities identified in this report are acted upon. This new information from management experience, community education, research and monitoring should be taken into account in making decisions and taking action. Regular review and updating of the priorities identified in this report is therefore to be welcomed.

It is beyond the scope of this report to deal with issues relating to broader coastal zone management. However, the close interaction between marine environments and be-
between the land and sea imposes an urgent need for the integration of protected area management and an overall conservation strategy in the coastal zone. This is a central challenge to governments and organizations working in coastal areas. MPAs are successful only if they are managed as part of broader programs that provide for management of all uses of the sea and adjacent land. Large, multiple-use MPAs covering complete ecosystems are a major step toward this goal. They can be examples of effectively protected Large Marine Ecosystems (LMEs). Smaller reserves, which are often community-based, also need to incorporate management of land-based activities that affect the viability of the MPA.

Although this report is concerned with sites of regional importance for marine biodiversity, it recommends that all countries within a region should attempt to conserve a biogeographically representative set of sites at the national level in accordance with Resolution 17.38 of the IUCN General Assembly.

### SUMMARY OF RESULTS

In terms of the number of MPAs, there are significant disparities between marine regions (Table 1).

<table>
<thead>
<tr>
<th>Marine Region</th>
<th>Number of MPAs</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Antarctic</td>
<td>17</td>
<td>1.3</td>
</tr>
<tr>
<td>2 Arctic</td>
<td>16</td>
<td>1.2</td>
</tr>
<tr>
<td>3 Mediterranean</td>
<td>53</td>
<td>4.0</td>
</tr>
<tr>
<td>4 Northwest Atlantic</td>
<td>89</td>
<td>6.8</td>
</tr>
<tr>
<td>5 Northeast Atlantic</td>
<td>41</td>
<td>3.1</td>
</tr>
<tr>
<td>6 Baltic</td>
<td>43</td>
<td>3.2</td>
</tr>
<tr>
<td>7 Wider Caribbean</td>
<td>104</td>
<td>7.9</td>
</tr>
<tr>
<td>8 West Africa</td>
<td>42</td>
<td>3.2</td>
</tr>
<tr>
<td>9 South Atlantic</td>
<td>19</td>
<td>1.4</td>
</tr>
<tr>
<td>10 Central Indian Ocean</td>
<td>15</td>
<td>1.1</td>
</tr>
<tr>
<td>11 Arabian Seas</td>
<td>19</td>
<td>1.4</td>
</tr>
<tr>
<td>12 East Africa</td>
<td>54</td>
<td>4.1</td>
</tr>
<tr>
<td>13 East Asian Seas</td>
<td>92</td>
<td>7.0</td>
</tr>
<tr>
<td>14 South Pacific</td>
<td>66</td>
<td>5.0</td>
</tr>
<tr>
<td>15 Northeast Pacific</td>
<td>168</td>
<td>12.8</td>
</tr>
<tr>
<td>16 Northwest Pacific</td>
<td>190</td>
<td>14.5</td>
</tr>
<tr>
<td>17 Southeast Pacific</td>
<td>18</td>
<td>1.3</td>
</tr>
<tr>
<td>18 Australia/New Zealand</td>
<td>260</td>
<td>19.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,306</strong></td>
<td></td>
</tr>
</tbody>
</table>

There is also wide variation in the size of MPAs. The mean size of the MPAs inventoried is over 100,000 hectares. However, this number is greatly skewed by a relatively small number of very large MPAs; a truer reflection may be given by the median size, which is 1,584 hectares. Table 2 shows the distribution of MPAs according to size classes.

Biogeographic classification systems have been adopted for use in 17 of the 18 marine regions, the exception being the Antarctic region, for which there is no general agreement on an appropriate classification system. These systems have been used in assessing the degree to which existing MPAs represent the major biogeographic types in each marine region. Table 3 lists the number of zones in each region that have at least
For the zones that have MPAs the mean number of MPAs per zone is approximately eleven. This number is skewed by a large number of MPAs in relatively few zones. The median number of MPAs per biogeographic zone is four.

Table 2 shows the number of biogeographic zones in relation to number of MPAs, according to frequency classes ranging from 0 to 26 or more.

The recommendations of the IVth World Congress on National Parks and Protected Areas (IUCN 1993) call for 10 percent of each biome of the world to be included in protected areas. Although the lack of an accepted global classification system makes comparison between marine regions difficult, broad conclusions may be drawn about the extent to which MPAs achieve this objective.

In the great majority of cases the area of each marine biogeographic zone that is included in MPAs is much less than 1 percent of its total area. Furthermore, most of the biogeographic zones are large areas that in-

Table 2. Distribution of MPAs by Size Class

<table>
<thead>
<tr>
<th>Size</th>
<th>Number of MPAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–10</td>
<td>41</td>
</tr>
<tr>
<td>11–100</td>
<td>175</td>
</tr>
<tr>
<td>101–1,000</td>
<td>226</td>
</tr>
<tr>
<td>1,001–10,000</td>
<td>242</td>
</tr>
<tr>
<td>10,001–100,000</td>
<td>206</td>
</tr>
<tr>
<td>100,001–1,000,000</td>
<td>79</td>
</tr>
<tr>
<td>&gt; 1,000,000</td>
<td>22</td>
</tr>
<tr>
<td>unknown</td>
<td>315</td>
</tr>
<tr>
<td>Total</td>
<td>1,306</td>
</tr>
</tbody>
</table>

Table 3. Representation of Biogeographic Zones

<table>
<thead>
<tr>
<th>Marine Region</th>
<th>Number of Biogeographic Zones with at least one MPA</th>
<th>Number of Biogeographic Zones with no MPAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Antarctic</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>2 Arctic</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>3 Mediterranean</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>4 Northwest Atlantic</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>5 Northeast Atlantic</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>6 Baltic</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7 Wider Caribbean</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>8 West Africa</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>9 South Atlantic</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>10 Central Indian Ocean</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>11 Arabian Seas</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>12 East Africa</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>13 East Asian Seas</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>14 South Pacific</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>15 Northeast Pacific</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>16 Northwest Pacific</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>17 Southeast Pacific</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>18 Australia/New Zealand</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>118</td>
<td>32</td>
</tr>
</tbody>
</table>
Table 4. Frequency of MPAs in Biogeographic Zones

<table>
<thead>
<tr>
<th>MPAs per Zone</th>
<th>Number of Zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>1–5</td>
<td>60</td>
</tr>
<tr>
<td>6–10</td>
<td>22</td>
</tr>
<tr>
<td>11–15</td>
<td>9</td>
</tr>
<tr>
<td>16–20</td>
<td>6</td>
</tr>
<tr>
<td>21–25</td>
<td>9</td>
</tr>
<tr>
<td>26+</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
</tr>
</tbody>
</table>

Table 5. Management Level of MPAs

<table>
<thead>
<tr>
<th>Management Level</th>
<th>Number of MPAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>117</td>
</tr>
<tr>
<td>Moderate</td>
<td>155</td>
</tr>
<tr>
<td>Low</td>
<td>111</td>
</tr>
<tr>
<td>Unknown</td>
<td>923</td>
</tr>
<tr>
<td>Total</td>
<td>1,306</td>
</tr>
</tbody>
</table>

clude a range of different ecosystem types. More detailed information on the range of ecosystem types present in each zone and in each MPA would be required to determine the extent to which the biodiversity of each zone is "represented." However, there must be doubts about the extent to which MPAs of a median size of 1,500 hectares can protect a representative sample of the biodiversity of a large zone, particularly given the interconnectedness of the sea and the degree to which material (pollutants, larvae, and so on) and impacts are transferred.

From the available information on the size, number and distribution of MPAs according to biogeographic type, it is clear that the coverage of existing MPAs falls well below a target figure of 10 percent of all marine biomes. About one-fifth of the marine biogeographic types identified have no MPAs. Although there is sure to be a degree of commonality of biogeographic types between some marine regions, these gaps would appear to be significant at the regional scale.

There are a few very large MPAs, but most are relatively small areas of less than a few thousand hectares. Many are threatened by activities beyond their boundaries that are beyond the scope of existing management control.

Questions about the degree of protection provided to marine biodiversity cannot be answered without information on the extent to which MPAs are achieving their conservation objectives. However, data on management effectiveness are sketchy. The difficulty of obtaining such information points to the general absence of evaluation of management effectiveness. Although field surveys could not be carried out to supplement available existing data, it has been possible to assess the management of 383 out of 1,306 MPAs (29 percent). The management level has been classified according to the following scheme:

- High: Generally achieve management objectives
- Moderate: Partially achieve management objectives
- Low: Generally fail to achieve management objectives

Table 5 shows the numbers of MPAs assessed as having high, moderate or low management level.

About 31 percent of those MPAs for which data were available were assessed as having a high management level and generally achieving their management objectives.

The reasons for MPAs failing to achieve their management objectives vary between marine regions. However, there are some commonly recurring themes that can be summarized as:

- Insufficient financial and technical resources to develop and implement management plans
- Lack of trained staff
- Lack of data on which to base management decisions including information on
the impacts of resource use and the status of biological resources
- Lack of public support and unwillingness of users to follow management rules, often because users have not been meaningfully involved in establishing these rules
- Inadequate commitment to enforcing management
- Unsustainable use of resources within MPAs
- Impacts from activities in land and sea areas outside the boundaries of MPAs, including pollution and overexploitation, lack of clear organizational responsibilities for management, and absence of coordination between agencies with responsibilities relevant to MPAs
- Lack of clear organizational responsibilities for management and absence of coordination between agencies with responsibilities relevant to MPAs.

Achieving effective management of existing MPAs is of equal priority to the establishment of new areas. In most regions a significant number of MPAs exist only on paper with no management plan and no management activity of any sort.

Priorities for Marine Biodiversity Conservation

A listing of regional priority areas for all regions covered in a volume is included in a table at the end of each volume. This is followed by a series of regional maps with digitized information on the location of each of these sites. National and regional priority areas for each Marine Region are included in the relevant regional report.

In all, 640 MPA sites have been identified as being of national priority for marine biodiversity conservation. Of these, 232 (36 percent) are existing areas that require support for improved management and 408 (64 percent) are proposed new MPAs. In total, 155 MPAs sites have been identified as being of regional priority for the conservation of marine biodiversity. Of these, 73 (47 percent) are existing areas that require support for improved management and 82 (53 percent) are proposed new MPAs.

General Recommendations

The recommendations in this publication specifically address priority issues for the establishment and effective management of a global representative system of marine protected areas for the protection and sustainable management of the world's marine biodiversity.

Key recommendations are outlined below, with the full text provided in the introductory chapter of Volume 1. The recommendations are based on an analysis of the 18 regional reports and a synthesis of the recommendations contained in these reports.

1. Achieving Integrated Management of the Marine Environment

The establishment and management of MPAs should occur within regimes that provide for integrated management of all uses of the adjacent land and sea areas. Thus, wherever possible, management of MPAs should be coordinated with the management of adjacent land areas.

Management responsibilities for MPAs must be clearly defined to avoid duplication and competition between agencies. These responsibilities must be accompanied by institutional and administrative mechanisms to ensure coordination of agencies with responsibilities relevant to the marine environment.

Achievement of ecological sustainability should be the overriding goal of MPA management.

The Large Marine Ecosystem and UNESCO Biosphere Reserve models should be applied where practicable in establishing and managing MPAs. In particular, a large multi-
ple-use MPA may provide the basis for integrated and sustainable management of a complete marine ecosystem, with the advantage that coordination of regulating different human activities can be automatically achieved when management responsibility rests with one agency.

2. Ensuring the Application of Science to Management

Increased research and monitoring are required to assist in making MPA management decisions. Available funds should be directed toward those areas of research that have a high likelihood of answering management questions.

The development of long-term monitoring program for all MPAs should be a priority. A fairly broad sweep will be needed for monitoring the changes brought about by the varied human activities and for providing enough information to develop appropriate management responses. This will require developing techniques that can be easily understood and widely applied.

Research is needed on the existing and planned uses of the marine environment and their likely effects. Such basic information is essential to keeping these activities compatible with the overriding goal of ecological sustainability.

There are two fundamental principles in ensuring effective application of science to management:

- Managers and scientists must work together in the identifying the environmental problems to be addressed by the scientific methods.
- Managers and scientists must work together in designing the research programs for addressing such problems and in interpreting and applying the results.

Any further developments in biogeographic classification resulting from this research or monitoring can proceed in parallel with the implementation of immediate MPA management priorities. Providing information of practical use to managers for the protection and management of marine biodiversity should be a primary objective of all these systems.

3. Securing Community Support

Where there is continuing use or custody of marine resources by local people, whether an effective MPA can be established will depend largely on the voluntary acceptance of management measures locally. MPA managers should therefore devolve some responsibility to local users, including involvement in planning and participation in management programs. The establishing of an effective MPA will depend very largely on voluntary acceptance of management measures, including involvement in planning and participation in management programs. The use of traditional knowledge and skills in the management of MPAs should be encouraged.

MPAs must provide for the continued welfare of people affected by their creation. Community support will depend on the development of management plans that are, to the extent feasible, compatible with traditional or customary practices for the use and conservation of marine resources. MPAs should be used for the economic well-being of coastal communities by providing a sustainable flow of benefits as well as achieving conservation objectives. Where appropriate to management objectives and within the limits of ecological sustainability, tourism and fisheries should be encouraged to provide sustainable financial benefits to local communities.

Ongoing consultation with local communities is required to determine economic, social, cultural and conservation priorities and to determine how MPAs can help achieve these priorities. MPAs should be integrated and compatible with ecological, social, and economic objectives at both the national and local levels. Local communities must be convinced of the importance of using marine re-
4. Developing the Human Capacity to Manage

International and other support for capacity development in marine management should emphasize the development of training capacity within regions and countries. Such an approach involves "training the trainers" and the establishment of regional and national training centers that can undertake further training to produce a multiplier effect.

Training should extend to all levels, from field staff to senior managers with the aim of equipping MPA managers with the skills required for their job. Training is required to increase the political awareness of the benefits of effective MPA systems.

There is a demand for a network in which managers of MPAs can share and learn from each other's experience and discuss and review management priorities.

5. Achieving a Balance Between Planning, Implementation and Evaluation

In total, 1,306 MPAs have been identified as established in all of the marine regions. Available data suggest that the number of MPAs that fail to achieve their management objectives is high. One reason for this is that the resources and emphasis on planning MPAs typically exceeds that given to implementation of management. There is even less attention given to evaluation of the success of management.

Effective implementation, monitoring and review are essential for MPAs to achieve their management goals, and should be part of all MPA management programs. MPA agencies should commence a coordinated scientific and administrative effort to ensure that existing MPAs meet their management objectives.

Programs that aim to support MPAs must provide sufficient financial and technical resources over a time frame long enough to allow for effective implementation, monitoring, and review of management plans.

6. Identifying Sources of Funding

Sufficient resources need to be mobilized for the development and implementation of management plans, for regulatory statutory review processes, interpretation, education, training, volunteer programs, research, monitoring, surveillance and enforcement programs. It is unlikely that governments alone can provide these resources now or in the future.

Sustainable financing for MPAs, therefore, must be developed if they are to function well in the long term. This will require innovative approaches and partnerships. Examples include revenue generation from taxes or "rent" from resource uses such as fisheries or tourism, as well as taxes on development projects that result in losses of marine or coastal biodiversity. In some countries the establishment of trust funds has proved to be a useful tool. Partnerships with NGOs and the private sector, which leverage management skills and investment capital for income generating enterprises consistent with conservation objectives should also be explored.

Research should be carried out to evaluate and publicize the economic benefits of MPAs and the feasibility of integrated conservation and development. (CNPPA is carrying out such research.)

In cooperation with local communities and other groups, management agencies should identify and establish facilities to promote ecotourism in MPAs and make use of MPAs as a tool for fisheries management.
Many developing countries will require financial assistance to establish national MPA systems, and there is a clear role for the international community to provide such support. However, in some cases the most effective use of resources might be made through the use of a regional fund or system of national environmental funds, particularly where there is a diversity of small governmental and nongovernmental organizations managing MPAs.

**THE WAY FORWARD**

This report recommends priority areas and actions for the creation of a global representative system of MPAs. It is intended to provide strategic guidance to the Global Environment Facility (GEF), World Bank, and other organizations for investment in marine biodiversity conservation. The next phase must focus on the development and implementation of specific proposals for the creation of new MPAs and for improved management arrangements for inadequately managed existing MPAs. Sites of highest priority in each region are identified in this report. At the same time, in some regions or countries additional investigation is required to refine priorities or to begin filling in the gaps in knowledge that will make it possible to set priorities.

It can be expected that developed countries will take the initiatives and provide the funding for further developing their national MPA systems, using funds and resources of their own. By identifying priorities, this report will help such countries make the most efficient use of their resources.

Few developing countries have the human or financial resources that are required to create and effectively manage new MPAs. These countries will require assistance internationally in terms of both expertise and the provision of funds. Possible sources of those funds include international financing institutions such as the GEF, World Bank, United Nations Development Programme (UNDP), regional banks, bilateral organizations, and nongovernmental sources.

Many of these agencies provide funding primarily on a national basis. It follows that the development of proposals for priority MPAs in developing countries should have a strong national focus and that all such proposals must be developed and implemented with the full involvement and support of the relevant national government authorities and other appropriate organizations and individuals. The importance of this principle has been recognized in this report, which has been developed with very wide participation of national representatives. Although in the majority of cases proposals probably will be country specific, in some instances they may be developed using regional institutions that have national support, such as the South Pacific Regional Environment Programme (SPREP) and the Coordinating Body for the Seas of East Asia (COBSEA). This pragmatic approach has advantages in promoting coordination between country efforts and in some cases may be more efficient in terms of administrative effort.

International organizations such as IUCN and CNPPA that already have a broad constituency of both governmental and nongovernmental organizations can also be used effectively. This report proposes that IUCN and CNPPA mobilize this constituency to consult with the governments of the developing countries where the priority areas identified in this study occur. It will be necessary to establish national working groups of scientists and managers to ensure coordination and cooperation between the management and scientific communities. NGOs and community groups should also be represented in the process. The purpose of the consultations will be to develop proposals for implementing the priorities that meet the criteria of funding organizations and that are compatible with national social and eco-
Box 2. Priority Actions for the Establishment of a Global Representative System of Marine Protected Areas

1. Develop and implement projects to address the priority areas and other recommendations in this report.
2. Establish national representative systems of MPAs which, as far as possible, encompass complete ecosystems or habitats and which are integrated with national policies and effective mechanisms for coastal zone management.
3. Develop institutional arrangements to achieve integrated management of each MPA and provide coordination mechanisms to ensure that adjacent land and sea areas are managed in a complementary way.
4. Actively involve local communities and marine resource users in the planning, management and maintenance of MPAs.
5. Bring managers and scientists together to conduct integrated, multi-disciplinary, management-oriented research and monitoring programs to provide a rational basis for selection, planning and management of MPAs.
6. Commence a coordinated effort to systematically monitor the effectiveness of existing MPAs.
7. Develop and disseminate tools and guidelines that can be widely understood and applied for carrying out monitoring and research in MPAs; achieve effective community support and participation in management of MPAs and strengthen the capacity and effectiveness for planning, administration and day-to-day management.
8. Carry out training programs that develop the capacity for MPA management in regions and countries. These programs should train trainers and develop training curricula and use these as a basis for regional- and country-based curricula and training.
9. Establish a global network to support marine resource managers, based on existing regional networks.
10. Carry out further investigations to address biogeographic and other information gaps necessary for the identification of priority areas as part of the global system of marine protected areas.
11. Mobilize domestic resources for marine protected area management from such sources as natural resource taxes and levies, user charges, joint ventures with the private sector, trust funds and endowments, and ecotourism.

Economic developmental priorities. The development of national and local management capacity must be key to all proposals. These activities will need to be complemented by a suite of other actions if a system of MPAs is to be developed that effectively represents the biogeographic zones of the world's seas and contributes to the maintenance of marine biodiversity as well as to the well-being of human communities. A flexible mechanism also must be found to reflect, for example, progress in refining the identification of biogeographic elements that will most likely reveal the need for additional MPAs to create a more representative system of MPAs. To begin this process, the study has identified various priority actions for the establishment of a global representative system of marine protected areas, outlined in Box 2.
BIODEIVERSITY AND MARINE BIOGEOGRAPHY

The Wider Caribbean Region is defined as the coastal and marine areas of the Caribbean Sea, the Gulf of Mexico, including the Greater and Lesser Antilles, the Bahamas, Turks and Caicos Islands, the Gulf Coasts of the United States and Mexico, and the Caribbean Coasts of Central and South America.

The region includes the following countries: Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Florida (U.S.), French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Martinique, Mexico, Montserrat, Netherlands Antilles (Curacao, Bonaire, Aruba, St. Maarten, St. Eustatius and Saba), Nicaragua, Panama, Puerto Rico (U.S.), St. Christopher and Nevis, St. Vincent and The Grenadines, St. Lucia, Suriname, Trinidad and Tobago, Turks and Caicos Islands, Venezuela, Virgin Islands (U.K.), and Virgin Islands (U.S.).

The region is characterized by socio-linguistic and economic diversity. Many economic and other activities necessitate maritime traffic that contributes to the vulnerability of marine species and habitats. Already, the Caribbean has been declared a “particularly sensitive area” by the International Maritime Organisation (IMO 1992).

OCEANOGRAPHY

The region is linked by the warm Guiana Current that sweeps northward from Recife on the coast of Brazil. This current joins the North Equatorial Current, flowing between the southern Caribbean islands and then north around the western end of Cuba and into the Eastern Gulf of Mexico. In the Gulf it forms a loop turning south then east through the Florida Straits, and thence north where it becomes the Gulf Stream above the Bahama Bank. Generally, currents sweep from east to west with coastal countercurrents and several gyres. Because most of the marine plants and animals in the Caribbean have a planktonic larval phase lasting from several weeks to more than a year and the propagules are carried long distances by the east-west current, the homogeneity of the
species associations is striking in these waters.

The ocean surface temperature in the tropical parts of the region averages 27°C and does not vary much during the year, seasonal fluctuations not exceeding 3°C. Temperatures in the southernmost part of the Gulf are similar, but the northernmost part shows strong seasonal changes from 16°C in winter to 28°C in summer. Salinity is relatively high between January and May and lower between June and December owing to the inflow in late autumn of low salinity water from the Orinoco and Amazon Rivers and from the equatorial convergence.

Of note are the potential effects of sea level rise in the region, increasing the need for protecting coastal habitats. The implications of sea level rise for the region should be seriously considered, particularly in the context of the role of MPAs.

Coastal Geography and Geology

With an estimated total surface area of 4.31 million square kilometers and an average depth of approximately 2,200 meters (UNEP/IUCN 1988), the Caribbean is characterized by high biological productivity along the coasts (providing rich feeding grounds for fish near coral reefs, seagrass beds and mangroves), but low productivity in the deep ocean regions. It includes both tropical and subtropical waters, with Cape Hatteras forming the northern limit of tropical fauna.

Most island and mainland coastlines drop precipitously to depths of 2,000 meters within a few kilometers of shore, although there are substantial shallow water areas in Belize, Cuba, and most notably in the Bahamas. Thus, the total area of coastal waters—the shallow water (less than 200 meters deep) on which humans are most dependent for food and the zone most susceptible to human influence—is relatively small. As is typical of tropical seas, however, the warm surface waters of the Caribbean rarely mix with the nutrient-rich cold waters below. Nutrients, particularly inorganic nitrogen and phosphorus, are regenerated from decaying plant and animal material and bacteria and are fertilizers of the plant growth that supports other life forms. Because these nutrients remain locked away in the deep, cold waters offshore and in calcareous sediments in the area, the primary productivity, or rate at which plant material is produced in photosynthesis, is low for the open sea.

The northern boundary of the Caribbean plate is aligned east-west, essentially parallel with the direction of movement of the plate, creating the Cayman Trough in the northwest and a zone of folding and thrust faulting to the northeast at Hispaniola. Stresses along the northern plate boundary have caused uplift in many of the islands and subsidence in some areas, resulting in exposure of marine limestones, reefs and terraces on land in many areas. The eastern boundary of the Caribbean plate is a subduction zone that creates an accretionary sediment pile. The sediments are initially shoved under the pile and eventually crumpled and faulted upward. The island of Barbados, for instance, is a ridge of deformed sediment extending above the sea surface. The Lesser Antilles, formed by subduction activity from the collision of the Caribbean and Atlantic plates, are volcanic islands bursting at the surface, some on coral platforms and others with high, rugged (volcanic) mountains.

Ecosystem Diversity

The marine seascape of the Caribbean supports a complex interaction of three distinct ecosystems: coral reefs, mangrove stands, and seagrass beds (see Appendix 7.1 for details on ecological features and resource problems). Distinct in their solutions to the ecological problems of obtaining nutrients lacking in warm surface waters, these tropical marine ecosystems are among the most productive in the world.
**Coral Reefs**

Coral reef faunas are the most diverse in the world, in terms of higher taxonomic variety. The framework built by corals and algae supports a variety of sponges, sea whips, sea anemones, worms, tube worms, shrimps, crabs, lobsters, snails, clams, starfish, brittlestars, feather-stars, sea urchins, sea cucumbers, and fish.

About 14 percent of the area of the world’s coral reefs are found in the region. Fringing and patch reefs are the most common around islands, on the side facing the prevailing winds. Of note are the long barrier reef system off Belize (approximately 220 kilometers) and the Andros barrier reef (approximately 176 kilometers) in the Bahamas. Bank or bank-barrier reefs are moderately common. Atoll-like structures are found in Belize, the Bahamas, and Colombian waters. Small atoll-like reefs, more commonly known as basin or cup reefs, are found in Puerto Rico, Bermuda, and off the coast of Mexico.

Reef development is often greater on the smaller, low islands with low rainfall and little sedimentary runoff such as Barbuda, Anegada, Antigua, St. Croix, Grande Terre and the Southern Grenadines. The Greater Antilles (Cuba, Hispaniola and Puerto Rico) generally have more extensive reefs than the Lesser Antilles (Putney 1982).

Reefs in the Caribbean are under severe threat. Problems include coastal erosion from dredging and construction, pollution from sewage wastes and fertilizers, removal of large quantities of fish (including use of toxic and hazardous materials to flush out fish), and resulting changes in fish populations, as well as damage from boat anchors and recreational misuse (Wilson 1987). Bermuda’s reefs are severely affected by coral diseases, particularly Black Band disease. In common with the rest of the Caribbean, Bermuda suffered mass mortality of the urchin *Diadema antillarum* in 1983.

**Mangroves**

In the Wider Caribbean mangroves are found on almost every coastline, although there are wide variations in mangrove coverage depending on the geographic characteristics of each island or continental area. Low-relief coastal plains with ample freshwater inflows foster the most complex and largest forests. The most impressive forests are found along the coasts of Central and South America and the Greater Antilles, which have extensive river systems. In the Eastern Caribbean, steep shorelines, limited freshwater runoff of low dry islands, and exposure of a large portion of the shorelines to powerful waves impose limits on mangrove development. Nevertheless, small sheltered pockets at protected river mouths occur in 40–50 areas.

Of the true mangrove species occurring in the Wider Caribbean, the red (*Rhizophora mangle*), black (*Avicennia germinans*) and white (*Laguncularia racemosa*) mangroves are the most widely distributed. Depending on the environment where they develop, mangroves can grow into trees taller than 40 meters (such as those in the estuary of the Rio San Juan in Venezuela) or can remain scrubby growth of only 1–2 meters in marginal environments.

Several proposed reserves in Martinique, Antigua and Barbuda feature some of the largest unspoiled mangrove stands in the eastern Caribbean. Of the largest islands, Cuba has the largest mangrove coverage, estimated at 4,000 square kilometers, with trees reaching 25 meters in height. Continental areas rimming the Caribbean such as Florida, have extensive mangrove stands on the west and south coasts and on the Keys. Similarly the Gulf coast of Mexico has many large mangrove-fringed coastal lagoons. Other mangroves are found along the Caribbean coasts of Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Venezuela and Panama. Along the coasts of Belize and Guate-
mala, mangroves, seagrasses and coral reefs are intimately linked in what is considered the largest continuous reef in the Caribbean. This largely undisturbed but heavily fished area is a sanctuary for migrating birds and endangered marine animals. Elsewhere along the coasts of Guyana, Suriname and French Guiana, mangroves cover vast stretches of the low coastal plain influenced by the inland penetration of sea water.

Problems affecting mangrove ecosystems include clear-cutting for tourism development, creation of aquaculture ponds, and the filling in of watersheds for development projects, causing loss of habitats (Wilson 1987).

**Seagrass Beds**

Both mangroves and seagrasses show similar distribution patterns as related to generic richness, with the Caribbean being one of the areas of greatest diversity. In the Greater Caribbean, seagrass meadows are usually composed of *Thalassia testudinum*, or turtlegrass, that is the dominant species. They are coated with numerous epiphytes, both microscopic and macroscopic, and are interspersed with other seagrasses such as *Halodule wrightii* and *Syringodium filiforme*, and major benthically rooted algae like *Halimeda*, *Penicillus*, *Udotea*, *Rhizophyllum*, and *Caulerpa* (Thoragu 1981). The seagrass beds stabilize bottom sediments that could otherwise damage corals. They contribute to the retardation of coastal erosion, and species such as *Thalassia* provide grazing for sea turtles, manatees, fish and invertebrates.

The main problem affecting seagrass beds is increasing sedimentation (Wilson 1987).

**Other Ecosystems**

Coastal lagoons are an important mainland feature in the Wider Caribbean region. Common to many islands are salinas, or shallow tidal ponds. Both systems protect reefs by trapping sediments, serve as nursery areas for fish, and provide wetland habitats for birds, crocodiles and manatees.

**Species Diversity**

Appendix 7.2 lists the distribution and status of threatened Caribbean coastal and marine animal species.

**Fish**

Reefs play a major role in supporting the artisanal fisheries of many island and mainland states in the region. The main fisheries throughout the region are of small pelagics (menhaden, flyingfish, mackerel), large pelagics (tuna, billfish and shark), reef fish (snapper and grouper), coastal demersal fish (drum, weakfish, croaker), crustaceans (shrimp, lobster, crab) and mollusks (oyster, scallop, and conch). There are some underutilized resources like cephalopods (squid and octopus), small pelagics, deepwater shrimp, and deepwater snapper.

In general, knowledge of the status of reef fish stocks is very poor. It is known though, that fisheries in the region are extremely overexploited, and many islands are now utilizing for consumption the less desirable species. There is great concern also for the high level of artisanal effort and the use of unselective gear (fish traps). Two exceptions, Belize and the Bahamas, are of note, because they have the lowest human population per unit area and are the two areas where the most substantial fishery resources remain, despite increasing fishing pressure.

**Birds**

Various species of waders and seabirds make their home in the Wider Caribbean region. One species of shearwater, two of petrels, two tropic birds, one pelican, one frigate, three boobies, eight terns, one gull, numerous egrets, herons and flamingos, and
many species of migratory waders (shore birds) (IUCN 1979; CMC 1992; Sprunt 1984).

**Invertebrates**

Jellies, lamp shells, sponges, molluscs and crustaceans, chordates, sponges, echinoderms, anthropods, coelenterates, and bryozoans (CMC 1992) are examples of the wide array of invertebrates found in the Wider Caribbean.

**Reptiles**

Turtle species found in the region include the green, hawksbill, Kemp's and olive Ridley, leatherback, Central American River and loggerhead. The largest turtle nesting areas are in Suriname, but occur all over the region. Most areas have had significant reductions in turtle populations as a result of exploitation for commercial purposes.

Crocodiles, including the Spectacled Caiman, Brown Caiman and the American Crocodile, are found in the region. Many island wetlands house breeding populations, much reduced in recent years, of the American Crocodile. There are also several species of iguanas in the region. Rock Iguanas found include Allen's Cay, Andros Rock, Bertsch's Rock, Crooked/Acklins, San Salvador, Central Exuma and White Cay Iguanas.

**Marine Mammals**

The West Indian Monk Seal used to breed on Jamaican offshore cays throughout the Caribbean. The last sighting of this extinct species was in Jamaican waters. The West Indian Manatee is at home in wetlands and shallow seas primarily in the Greater Antilles and coastal areas of the continents.

**Biogeographic Classification**

There is no single ecosystem, vegetation, biodiversity, habitat, or life zone classification system that has been applied uniformly to the Caribbean. For the purposes of this report the question of coverage has therefore been handled in subregions. The boundaries of these subregions are shown on Map 7.

**Assessment of Existing MPAs**

Although its focus is on MPAs, this report emphasizes that they are successfully managed only if they are part of a broader program to conserve natural resources and the biological support systems of the world.

**Description of National MPA Systems**

The concept of protected areas is not new to the region. The very first protected areas in the insular Caribbean were established over 200 years ago out of a concern for watershed protection. The Main Ridge Reserve of Tobago was set aside in 1765 as "woods for protection of the rain" (Cross 1991), and the Kings Hill Reserve was established on St. Vincent in 1791 for "the purpose of attracting the clouds and rain . . . for the benefit and advantage of the owners and possessors of lands in the neighborhood thereof" (Birdsey, Weaver and Nicholls 1986). Both of these reserves are still in existence today.

IUCN uses a system of categories to classify protected areas according to management objectives. This classification was recently revised in 1994, and protected areas in the Caribbean have not yet been categorized according to the new system. The categories referred to below therefore are those of the previous, 1982, version of IUCN classification.

According to the WCMC and IUCN (insular Caribbean [WCMC 1991] and Suriname, Guyana and Belize [IUCN 1992]), equivalents of all of the IUCN categories from I to V are found in the Caribbean. Of the protected areas (marine, coastal and terrestrial) that have been classified by the WCMC, 60 percent are category IV (Nature Conservation Reserve/Managed Nature Reserve/Wildlife Sanc-
A Global Representative System of Marine Protected Areas

There are substantial numbers of protected areas in the region that include marine or coastal elements. An assessment has been carried out to identify those that meet the IUCN definition of an MPA and include significant marine elements (van't Hof, personal communication). Table 7.1 lists the number of MPAs with a significant marine component and the number of other coastal protected areas (with coastal terrestrial or intertidal elements but no subtidal component) in countries in the Wider Caribbean. Data are obtained from OAS/NPS (1988).

### Assessment of Representation of Biogeographic Zones

Using a variety of sources (OAS/NPS 1988; IUCN 1978; IUCN 1982; WCMC 1991) provides a relatively good information base for determining the coverage of marine protected areas. Not only is there an up-to-date inventory, but there are also relatively good data concerning the ecosystems and management effectiveness for each area.

Table 7.2 identifies habitats within protected areas that are rated as fully managed (OAS/NPS 1988). The location of the subregions is shown in Map 7.

The analysis indicates that all of the major ecosystems of each of the subregions are included within marine or coastal protected areas that are rated as fully managed. Areas are considered "fully managed" when the objectives for which the area was created are being achieved.

The subregion of greatest concern is the Guianan. Of the three countries of this subregion, only Suriname has established protected areas in the coastal zone. None of these areas includes a significant subtidal marine component.

Cuba has the richest biota in the Caribbean with about 50–65 percent of the fauna and flora being endemic. Most MPAs in this region are not exclusively marine, but constitute an extension of coastal protected areas.

### Management Level

The information in this section is based on the OAS/NPS 1988 Report, modified by infor-

### Table 7.1 Number of MPAs in the Wider Caribbean Marine Region

<table>
<thead>
<tr>
<th>Area</th>
<th>MPAs</th>
<th>Other Coastal Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua and Barbuda</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Bahamas</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Barbados</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Belize</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Cayman Islands</td>
<td>1\textsuperscript{a}</td>
<td>3</td>
</tr>
<tr>
<td>Colombia</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Cuba</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Dominica</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Guadeloupe</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Guatemala</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Honduras</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Jamaica</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Martinique</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Mexico</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Montserrat</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Netherlands Antilles</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Panama</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Saint Lucia</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Saint Vincent and the Grenadines</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>United States</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Venezuela</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Virgin Islands (U.K.)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Virgin Islands (U.S.)</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Total 96 58

\textsuperscript{a} System of 24 noncontiguous units.
### Table 7.2 Habitats within Protected Areas Rated as Fully Managed

<table>
<thead>
<tr>
<th>Subregion</th>
<th>MPA</th>
<th>Habitats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antillian</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virgin Islands (U.K.)</td>
<td>Wreck of the Rhone M.P.</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>Buck Island National Monument</td>
<td>C,G,R,B,H</td>
</tr>
<tr>
<td></td>
<td>Saba Underwater Park</td>
<td>C,G,R</td>
</tr>
<tr>
<td></td>
<td>Maria Islands Nature Reserve</td>
<td>C,G,B</td>
</tr>
<tr>
<td></td>
<td>Barbados Marine Reserve</td>
<td>C,G,B</td>
</tr>
<tr>
<td><strong>Continental</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>P.N. Corales del Rosario</td>
<td>C,G,W,B,L,H</td>
</tr>
<tr>
<td></td>
<td>P.N. Tayrona</td>
<td>C,G,W,B,L,H</td>
</tr>
<tr>
<td></td>
<td>Bonaire Underwater Park</td>
<td>C,G,W,R,B,L</td>
</tr>
<tr>
<td></td>
<td>Curacao Underwater Park</td>
<td>C,G,W,R,B,L</td>
</tr>
<tr>
<td><strong>Northwest</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>Parque Submarino Cozumel</td>
<td>C,G</td>
</tr>
<tr>
<td></td>
<td>Res. Ecologica Isla de Contoy</td>
<td>W,B</td>
</tr>
<tr>
<td></td>
<td>Las Salinas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Desembarco del Cranma*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pta.Frances-Pta.pedernales</td>
<td></td>
</tr>
<tr>
<td><strong>Gulf</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Looe Cay National Marine Sanctuary</td>
<td>C,G</td>
</tr>
<tr>
<td></td>
<td>Key Largo National Marine Sanctuary</td>
<td>C,G</td>
</tr>
<tr>
<td></td>
<td>Everglades National Park</td>
<td>W,B,L,H</td>
</tr>
<tr>
<td></td>
<td>Rockery Bay N.E.R.R.</td>
<td>W,L</td>
</tr>
<tr>
<td><strong>Bahamian</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Union Creek Reserve</td>
<td>G,W,B,L,H</td>
</tr>
<tr>
<td><strong>Guianan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suriname</td>
<td>Wia Wia Nature Reserve*</td>
<td>G,W,B,L,H</td>
</tr>
<tr>
<td></td>
<td>Coppename-Mouth National Reserve*</td>
<td>G,W,L,H</td>
</tr>
</tbody>
</table>

*Note: All areas are fully marine except those marked with an asterisk (*), which have a terrestrial or intertidal component, but no major subtidal component.*

*Key: B=beaches; C=coral reef; G=seagrass beds; H=critical habitat for endangered species; L=bays, lagoons, or estuaries; R=rocky beds; W=wetlands.*

*Source: OAS/NPS (1988).*
mation obtained during the preparation of this report.

Generally, two-thirds of Caribbean pro-
ected areas are not achieving full manage-
ment capacity (OAS/NPS 1988). This is not
surprising since many personnel of the Carib-
bean region do not consider themselves to
be adequately trained for their job at any
level in the management of protected areas.
A survey by Gardner (1991) indicated this to
be a full 80 percent. The lack of training in-
stitutions regionally for protected area man-
agement is a major contributing factor.

It should be pointed out that none of the
areas rated as fully managed by the
OAS/NPS (1988) are managed by local gov-
ernment agencies. Either they are managed
by an agency of a metropolitan government
such as in Puerto Rico, the U.S. Virgin Is-
lands, and Guadeloupe or by nongovern-
mental organizations such as the
Netherlands Antilles Parks Foundation
(STINAPA) or the National Trusts of the Ba-
hamas, British Virgin Islands, Jamaica and St.
Lucia.

System Plans

From country to country, system plans have
gained the respect of governments and vari-
ous other organizations involved in pro-
tected areas management. System plans
ensure that management objectives specific
to a particular country are clearly defined.
System plans have been developed for sev-
eral countries in the region. Plans, or their
equivalent, have been developed for the Do-
minican Republic (Departamento de Vida Sil-
vestre 1990), the British Virgin Islands (BVI
National Parks Trust/CANARI 1986), Anguilla
(marine only) (Jackson 1987), Antigua and
Barbuda (Robinson 1979), Dominica
(Shanks and Putney 1979), Grenada
(GOG/OAS 1988), and Trinidad and Tobago
(GOTT/OAS 1980). System plans are cur-
rently in their final stages of development in
Jamaica and St. Lucia where recommenda-
tions are already being implemented. Of
note is the Soufriere Marine Management
Area Plan in St. Lucia. In countries where
plans have not yet been endorsed, their rec-
ommendations have been incorporated in
other policy documents.

The Wider Caribbean countries of Pan-
amo, Honduras, Guatemala, and Belize have
documents, but these have not yet become
system plans (IUCN 1992). Costa Rica, the
country with the best consolidated system,
has documents that have separately ana-
lyzed its subsystems, including current man-
gement status. There is also a Central
American System (SICAP) of protected areas
in which there are a few coastal marine
parks, protected areas and wetlands in-
cluded from Costa Rica, Honduras, Guate-
mania and Belize. Generally these areas are
poorly managed (IUCN 1992). Venezuela is
presently adjusting its system of national
parks according to current international crite-
ria (IUCN 1992).

International and Regional Initiatives
Relating to MPAs

World Heritage Convention

Appendix 7.3 lists the signatories from the
Wider Caribbean to the World Heritage Con-
vention and other major conventions. There
are three existing World Heritage sites in the
Wider Caribbean that include marine ele-
ments: the Everglades National Park in the
United States (Florida), Rio Platano Bios-
phere Reserve (Honduras) and Sian Ka’an
Biosphere Reserve (Mexico).

Listing of a World Heritage Site (natural)
is being pursued by St. Lucia. Recent adjust-
ments in the criteria for cultural landscapes
made at the Meeting of the Parties in Santa
Fe, New Mexico (U.S.) in 1992 may increase
opportunities for World Heritage listings in
the region.
UNESCO Man and the Biosphere Programme

In contrast with Central America where MAB enjoys wide application, in insular Caribbean the program has not been broadly employed. With the exception of terrestrial activities in Cuba, the majority of MAB applications in the insular region occur in territories of the United States. There are five existing Biosphere Reserves with marine components: Sierra Nevada de Santa Marta (including Tayrona NP, Colombia), Guadeloupe Archipelago (Guadeloupe), Sian Ka'an (Mexico), Virgin Islands National Park (U.S.), and Everglades National Park (U.S.).

The establishment of Biosphere Reserves with marine components is actively being pursued in the Dominican Republic.

Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar)

Appendix 7.3 lists signatories from the Wider Caribbean to Ramsar.

Program for Specially Protected Areas and Wildlife

A Protocol on Specially Protected Areas and Wildlife for the Wider Caribbean was adopted by governments of the region in January 1990 as part of the Cartagena Convention, under the framework of the Caribbean Environment Program (CEP). In pursuance of the Protocol, CEP has developed a regional program for Specially Protected Areas and Wildlife (SPAW). The budget and workplan of the SPAW Regional Program for each biennium are developed and reviewed every year by government experts through the Interim Scientific and Technical Advisory Committee (ISTAC) pursuant to the provisions of the Protocol. Final governmental approval to the SPAW workplan and budget is provided every year by inter-

governmental meetings of CEP. The SPAW program is currently implementing specific projects to strengthen a Wider Caribbean Parks and Protected Areas Network and to promote revenue generation, training, regional management guidelines, and evaluation and assessment of protected areas. In addition, funding is being sought for priority conservation activities for species of regional concern as listed in the Protocol.

Convention on Intervention on Nature Protection and Wildlife Preservation in the Western Hemisphere

The Western Hemisphere Convention has been the framework for north-south technical assistance between protected area agencies in North America, especially the U.S. National Park Service and Fish and Wildlife Service, and those in the Caribbean.

IUCN Marine Conservation Strategy

In 1976–77, the Marine Steering Committee (MSC) of IUCN identified the Caribbean as a priority region within the IUCN Marine Program. A "Strategy for the Conservation of Living Marine Resources and Processes in the Caribbean Region" was undertaken during 1978 and completed in 1979 through two projects by IUCN that were financed by the World Wildlife Fund (WWF).

A strategic planning process was used at the scale of the Wider Caribbean that involved the collection, mapping, and field verification of data on the general marine environment, habitats, species, socio-economic information, and legal jurisdictions. Study areas that were representative of resource types and particular problems were visited to gain insights at the field level. Graphic information was analyzed by map overlay methods to identify concentrations of living resources and their support systems, and socio-economic activities. Superimposition of
these two data sets indicated areas of conflict and compatibility for the human and natural systems. Areas of multiple natural resources and of singular importance were identified. Priorities for action were outlined based on the general graphic information and specific recommendations gained from the field visits to the representative study areas.

Through the strategic planning process, the following was produced: a data bank for the Caribbean Region with resources, references (these data have been updated and digitized by the CEP), a bibliography to support the data bank, a data atlas for the Caribbean Region, analysis and synthesis models, profiles of the study areas, and representative priorities for action in the study areas, including protected areas.

The Convention on Biological Diversity

Implementation of the Biodiversity Convention, a product of the 1992 Earth Summit (United Nations Conference on Environment and Development, Rio de Janeiro) is beginning concurrent with the preparation of this report, and few conclusions can be drawn at this early stage. Actions called for in the Convention include: the preparation of national plans, programs and strategies for conservation and sustainable use of biodiversity; establishment of systems of protected areas for in situ conservation and promotion of environmentally sound development around protected areas; rehabilitation of degraded ecosystems; research and monitoring; and prevention of the introduction of exotic species. The Convention is also expected to promote participatory conservation involving communities in and around sites critical for the protection of biological resources. It also provides a framework for international cooperation, especially in the area of exchange of information relevant to conservation, including technology transfer and training.

While it is too early to assess the Convention's importance to the Caribbean, it may be significant to note that small island states constitute most of the early ratifiers of the Convention.

The Barbados Declaration

In May 1994, the Barbados Declaration was signed by the 41 small island developing states of the world to reaffirm the principles and commitments to sustainable development embodied in Agenda 21. Complementing the Declaration is a program of action that includes measures for enhancing the development of integrated coastal zone planning and management, and within this framework, for protecting coastal and marine resources. The need for improved management and broader representation of marine protected areas is clearly implicated.

USAID Training Strategy

During 1979-80, the U.S. Agency for International Development supported the development of the “Study of Requirements for Training in Natural Resources and the Environment in Latin America and the Caribbean,” which was carried out by the World Wildlife Fund-US. Many of the region’s experts and institutions relating to natural resource management participated in the study. The study documented the status and trends for natural resources in the region and current and planned training programs. Target groups were identified together with current gaps in training opportunities. A wide variety of training methods was proposed, as well as actions required to support training in the region. The study resulted in the preparation of eight volumes of background material, three of which were on the Caribbean, and a detailed “Strategy for Training in Natural Resources and Environment: A Proposal for Development of Personnel and Institutions in Latin America and the Caribbean.”

The proposal was never accepted for funding by USAID. The background documents
have, however, been a major reference on the subject and have served as background material when the Consortium of Caribbean Universities for Resource Management was established in 1988.

**Neotropical Action Plan**

A Strategy for Protected Areas of the Neotropical Realm was adopted at the 27th Working Session of IUCN's Commission on National Parks and Protected Areas held in the Nahuel Huapi National Park, Argentina, 9–14 March 1986. Caribbean participation in the session was limited. The strategy aimed at providing a regional overview of actions needed to more effectively plan and manage protected areas of the Neotropical Realm. The Strategy was directed at the governments of the region and international organizations including IUCN, WWF, UNEP, FAO, OAS, World Bank, and bilateral development agencies. It outlined 4 goals, 5 objectives, and 125 activities. No specific follow-up mechanism for dissemination or implementation of the Strategy was put in place. While it provides a checklist for required actions in the larger region, there is no evidence that it has been used in the Caribbean to stimulate, fund, or guide implementation of protected area programs.

**European Union Strategy for Protected Areas in the Caribbean**

The European Union (EU) has committed itself, through Article 33 of the Lome IV convention, to supporting the African Caribbean and Pacific (ACP) states in their efforts to achieve “the protection and enhancement of the environment and natural resources, the halting of deterioration of land and forests, the restoration of ecological balances, the preservation of natural resources and their rational exploitation.” A strategy for the management and development of protected areas has been developed. A review of EU and other support to protected areas and biodiversity conservation in ACP countries over the last 20 years constituted one of the first activities. Based on the review, priorities in the ACP states and the possibilities for offering support were identified.

The strategy proposed builds on the regional action plan that was developed by IUCN/CNPPA, as well as the existing SPAW Regional Program of UNEP. The main aim of the strategy is to increase the number of effectively managed national parks and protected areas in the insular Caribbean. This is to be achieved by:

- Increasing local capacity for managing protected areas through networking, regional support, technical cooperation, and demonstration
- Promoting collaboration and regional self-sufficiency
- Collecting and analyzing information and opinions in the region so that priorities can be updated and effective programs defined, funded, and implemented.

**Canadian International Development Agency**

CIDA has had a strong presence in the Wider Caribbean from the early 1980s. Projects designed to fight water pollution and protect the natural resource base are presently underway in Jamaica, Honduras, Costa Rica, Guatemala and other countries throughout the Wider Caribbean. CIDA has, for instance, provided funding to the Montego Bay Marine Park, Jamaica, for purchase of equipment to enhance the protection of coral resources. Its recently launched Green Fund provides an additional source of funding for various conservation projects.

**International Nongovernmental Conservation Organizations with Initiatives in the Region**

The Nature Conservancy (TNC), a U.S.-based NGO, has a regional program for the Caribbean that targets development and
management of the important parks of the region. TNC works with partner conservation organizations in the region to improve the information base for conservation, enhance local management capacity, and obtain the financial resources needed for protected area management. TNC is working with local organizations in Jamaica and the Dominican Republic to establish national trust funds to support park management. TNC’s major funding initiative for park management in Latin America and the Caribbean, entitled “Parks In Peril,” is an emergency effort to safeguard the most important and most imperiled natural areas in the hemisphere by bringing onsite management to 20 critical parks and reserves each year for a ten year period (TNC 1990). Some 37 “critical parks and reserves” and another 30 “proposed and unprotected sites” of the Wider Caribbean have been identified for inclusion in the program. Marine/coastal sites with an active TNC presence under this initiative include:

- Ria Lagartos/Celes, Mexico
- Sian Ka’an, Mexico
- Maya Mountain/marine, Belize
- Tempisque-Nicoya, Costa Rica
- Corcovado/OSA, Costa Rica
- Marino Ballano, Costa Rica
- Montego Bay Marine Park, Jamaica
- Jaragua, Dominican Republic
- Parque del Este, Dominican Republic
- Salt River Bay, U.S. Virgin Islands
- St. Croix, U.S. Virgin Islands
- Sierra Nevada, Colombia
- Utria, Colombia
- Bastimentos, Panama
- Darien, Panama

**World Wildlife Fund**

The WWF/US responds to project requests submitted by local organizations. Current protected area projects support resource assessment, infrastructure development, and educational activities. The budget (projects and administration) related to insular Caribbean protected areas for fiscal 1991 was about US$150,000. In Belize, WWF/US has provided 46 disbursements for funding of project activities in the period between 1979 and 1992. These activities address protected area conservation and management, protection of species of special concern, and strengthening of conservation institutions.

**Wildlife Conservation Society**

WCS is the conservation arm of the New York Zoological Society. WCS or its predecessors have been active in Caribbean conservation since the early part of the century, undertaking biological surveys in Trinidad and Guyana and establishing a pioneering biological research center, the Asa Wright Research Centre, in Trinidad. WCS is currently active in Belize, where it provides technical assistance to the GEF project in coastal zone management, supports research, and monitors avifauna in the lowland forests.

**Conservation International**

CI is a U.S.-based NGO active in Suriname, Guyana, and Belize in the Wider Caribbean Region. In Suriname and Guyana, CI maintains national offices that provide technical assistance, project development, and aid in coordination between national and international organizations. Activities have concentrated on improving the capacity of indigenous communities to protect resources and on rapid appraisals of biological resources to assess conservation priorities. In Guyana, a rapid assessment of the Kanuku Mountains has led to increased protection for habitat of the Harpy Eagle. In Belize, CI undertook a biological assessment of the Columbia River Forest Reserve as part of its Rapid Appraisal Program (Parker et al 1993). CI has participated in the creation of Chiquibul N.P. and is active in the development of a transboundary protected area link-
ing Chiquibul and adjacent lands in Guate-
mala. It is now assisting in the design of a
biosphere reserve to link four key protected
areas. CI has also provided support for the
development of the technical report on the
expansion of the Coxcomb Basin Wildlife Re-
serve (CI 1992).

Regional Organizations and Initiatives

Marine Parks Program, Caribbean
Conservation Association

The Caribbean Conservation Association,
supported by Canada’s CIDA and partially at
times by UNEP’s Caribbean Environment Pro-
gram, has developed a marine parks pro-
gram that focuses on pilot projects in
Anguilla, Barbados, British Virgin Islands,
Dominica, Grenada, Jamaica, Montserrat, St.
Lucia, St. Kitts and Nevis, and Trinidad and
Tobago. The program also is designed to dis-
seminate information, train personnel, estab-
lish a database, develop materials for public
awareness and education, and publish tech-
nical articles.

Parks and Protected Areas Program,
Caribbean Natural Resources Institute

CANARI is a regional nongovernmental or-
ganization dedicated to the study and promo-
tion of mechanisms and policies that
enhance the formal participation of commu-
nities and their institutions in conservation
and management. Protected areas are an im-
portant part of CANARI’s program, which in-
cludes a range of field research, information,
training and extension activities. In the field
of marine protected areas, CANARI supports
a number of experimental field projects im-
plemented by local and national institutions,
such as the establishment of a co-manage-
ment system for the Soufriere region of St.
Lucia and the ecodevelopment of the
Samana Bay in the Dominican Republic. Sub-
jects covered by CANARI’s training activities
that are directly relevant to MPAs include
coral reef monitoring techniques, conflict
resolution, participatory planning, revenue
generation, and ecotourism for rural develop-
ment. Partial financial support to some CA-
NARI programs has been provided by the
CEP.

Organization of Eastern Caribbean
States

The OECS Natural Resources Management
Unit has identified protected areas (marine
and terrestrial) as a program focus. The pro-
gram concentrates on training and informa-
tion exchanges at the regional level and on
a demonstration project in St. Vincent.

Caribbean Environment Program

The Protocol on Specially Protected Areas
and Wildlife (see above) was adopted by
the Governments of the Wider Caribbean in
January 1990 as part of the Caribbean Envi-
ronment Program of UNEP. In follow-up,
CEP has developed a regional program for
SPAW that includes networking, revenue
generation, training, development and imple-
mentation of regional guidelines and criteria,
monitoring, evaluation, and assessment of
protected areas and wildlife (UNEP 1994).
An overall budget of US$756,500 has been al-
located for SPAW for the 1994–95 biennium
and US$400,000 in counterpart funding is be-
ing sought.

Central American Commission for
Environmental and Development

CCAD was established in 1989 and is com-
posed of ministers assigned by each govern-
ment. It meets regularly to review regional
agreements and has produced a regional
agenda that defines its environmental policy
and proposes a number of projects and ac-
tivities on sustainable development.
Paseo Pantera

In addition to working to preserve terrestrial ecosystems, PP strongly emphasizes protection and wise management of coastal and marine ecosystems. Regional components of its program include regional ecotourism, environmental education, and a regional conservation strategy. In Honduras, PP is presently establishing working relations with the Honduran Government and nongovernmental organizations to protect and improve management of coastal resources of the Bay Islands. In Belize, Costa Rica and Panama similar efforts are underway for conservation of wetlands and coastal marine environments.

Latin American Technical Network on Protected Areas and Wildlife

Under the coordination of the FAO Regional Office for Latin America and the Caribbean, this network prepared the Nahuel-Huapi Action Plan for Protected Areas in 1987. The network proposed ideas for the improvement of MPAs in the region and in 1988 held a regional workshop in the Dominican Republic on Marine and Coastal Protected Areas. The network presently satisfies some of the needs for improved information flow by attempting to compile information on protected areas for dissemination. (See Appendix 7.4 for a listing of some institutions and the support services they provide.)

The Audubon Society

At its inaugural meeting at the turn of the century, the Audubon Society of the United States expressed concern for the West Indian flamingo flocks in the Bahamas. The Society has actively worked on its concern since the 1950s and has guided a research and monitoring program in partnership with the Bahamas National Trust. This successful program has restored this species throughout the Wider Caribbean.

Priority Areas and Recommendations

National Priorities for the Establishment and Management of MPAs

With two-thirds of the protected areas in the Caribbean not achieving the objectives for which they were established, considerable investment will have to be made before they can be considered to be true protected areas. Enhancing the local capacity to manage should thus be given priority at least equal to that of establishing more areas, especially if they would not have proper management. The areas listed as requiring management support are those identified by OAS/NPS (1988) as being only "partially" or "legally" (on paper only) protected (as opposed to the third category used by OAS, "fully" protected).

Existing MPAs that require management support (an asterisk * indicates that the area has both a marine and a terrestrial component):

- Palaster Reef Marine National Park (Antigua and Barbuda)
- Salt Fish Tail Reef (Diamond Reef) Marine National Park (Antigua and Barbuda)
- Black Sound Cay National Park (Bahamas)
- Conception Island National Park (Bahamas)
- Pelican Cays Land and Sea Park National Park (Bahamas)
- Peterson Cay National Park (Bahamas)
- Union Creek (within Inagua NP) Managed Nature Reserve (Bahamas)
- Barbados Marine Reserve (Barbados)
- Half Moon Caye National Monument (Belize)
- Santuario de Fauna y Flora Cienaga Grande de Santa Marta (Colombia)
- Reserva Natural Haines Cay to Cotton Cay (Colombia)
- Parque Nacional Natural Isla de Salamanca (Colombia)
- Santuario de Fauna y Flora Los Flamencos (Colombia)
Refugio de Vida Silvestre Barra del Colorado (Costa Rica)
Parque Nacional Cahuita (Costa Rica)
Parque Nacional Tortuguero (Costa Rica)
Refugio Nacional Vida Silvestre Gondoca Manzanillo (Costa Rica)
Bacacoa (Cubá)
Parque Nacional Marino Bahía del Naranjo (Cubá)
Cayo Blanco de Casilda (Cubá)
Parque Nacional Marino Cayo Caguana (Cubá)
Reserva Florística Manejada Cayo Caguases/Cayos de Piedra (Cubá)
Parque Natural Cayo Romano (Cubá)
Area Natural Turística Cayo Saetía (Cubá)
Refugio de Fauna Cayos de Ana María (Cubá)
Delta del Canto (Cubá)
La Isleta-Nuevas Grandes (Cubá)
Península Guanahacabibes* (Cubá)
Parque Natural Sur Isla de la Juventud (Cubá)
National Park* Cabrits (Dominica)
Soufriere Scott’s Head Marine Reserve (Dominica)
Santuario de Fauna Banco de la Plata (Dominican Republic)
Reserva Scientifica Natural Lagunas Redonda y Limon (Dominican Republic)
Parque Nacional Los Haitises (Dominican Republic)
Parque Nacional Del Este (Dominican Republic)
Parque Nacional Jaragua (Dominican Republic)
Parque Nacional Submarino La Caleta (Dominican Republic)
Parque Nacional Monte Cristi (Dominican Republic)
Reserve Naturelle du Grand Cul de Sac Martin (Guadeloupe)
Biotopo Punta de Manabique (Guatemala)
Parque Nacional Rio Dulce (Guatemala)
Biosphere Reserve Rio Platano (Honduras)
Parque Nacional Marino Turtle Harbor (Honduras)
Middle Morant Cay NR/SciR Nature Reserve (Jamaica)
Ocho Ríos Protected Area (Jamaica)
Montego Bay Marine Park (Jamaica)
Southeast Pedro Cay NR/SciR Nature Reserve (Jamaica)
Caravelle Littoral Conservation Area (Martinique)
Reserva Especial de la Biosfera Ria Celestún (Mexico)
Reserva Fauna El Garrafón (Mexico)
Reserva Marina La Blanquilla (Mexico)
Fox’s Bay Bird Sanctuary Private Reserve (Montserrat)
Comarca Indígena Kuna Yala (San Blas) (Panama)
Parque Nacional Portobelo (Panama)
Reserva Natural Estuarina Nacional Bahía Jobos (Puerto Rico)
Maria Islands NR (St. Lucia)
Soufriere Marine Management Area* (St. Lucia)
Tobago Cays Marine Park* (St. Vincent and the Grenadines)
Buccoo Reef Marine Parks* (Trinidad and Tobago)
Parque Nacional Archipelago Los Roques (Venezuela)
Parque Nacional Laguna de la Restinga (Venezuela)
Refugio de Fauna Silvestre Isla de Aves (Venezuela)
Parque Nacional Laguna de Tacarigua (Venezuela)
Parque Nacional Mochima (Venezuela)
Parque Nacional Morrocoy (Venezuela)

Regional protected area specialists, P. Rosabal (IUCN), A. Smith (CANARD), WCMC, L. Holowesko (IUCN/CNPPA), and Sue Wells (UNDP/GEP consultant) identified the areas of national priority for the establishment of new MPAs.
Proposed new MPAs:
- Barbuda (Antigua and Barbuda)
- Andros Barrier Reef (Bahamas)
- Bacalar Chico (Belize)
- Caye Caulker (Belize)
- Laughing Bird Caye National Park extension (Belize)
- Port Honduras (Belize)
- Sapodilla Cayes (Belize)
- Southern Lagoon (Belize)
- Southwater Caye (Belize)
- Turneffe Atoll (Belize)
- Tortuguero/Miskito Marine System (Costa Rica)
- Zapata Swamp (Cuba)
- Los Canarreos Archipelago (Cuba)

Regional Priorities for the Establishment and Management of MPAs

Past Efforts

From 1978 to 1981, the Eastern Caribbean Natural Area Management Program (ECNAMP), the forerunner of the Caribbean Natural Resources Institute (CANARI), undertook a survey of conservation priorities in the Lesser Antilles to devise a logical, systematic and effective strategy for conservation action. The results of the survey are in data atlases for the 25 islands and island groups of the region and an overall report on priorities and recommendations.

The final report made specific recommendations on area-specific priorities for the implementation of a system of protected areas representative of the major ecosystems of the Lesser Antilles. These included existing protected areas in Dominica and Guadeloupe and proposed new areas in Barbuda, St. Kitts, and Anegada. Initiatives for the establishment and development of these new areas, in cooperation with local governments and conservation organizations, have been pursued by ECNAMP/CANARI and the Caribbean Conservation Association. The data atlases have served as basic references within the region and for databases on islands, wetlands, and protected areas of the World Conservation Monitoring Centre (WCMC) at Cambridge, U.K. A series of maps was developed from these atlases illustrating the areas of multiple resources. The maps were prepared using overlays, with areas of importance being indicated by areas of greatest overlap. They are obtainable from the WCMC.

The Strategy for the Conservation of Living Marine Resources and Processes in the Caribbean Region (IUCN 1979) proposed priority areas for marine resources conservation. These areas are shown on Map 7. A list of the areas with multiple resources is as follows:
- South Florida (U.S.)
- Louisianan-Texan Coastal Zone (U.S.)
- Campeche (Mexico)
- Cancun (Mexico)
- Gulf of Honduras (Belize, Guatemala and Honduras)
- Mosquitia (Honduras and Nicaragua)
- Orinoco River Delta Area (Venezuela and Trinidad)
- Arrecife Alacran (Mexico)
- Bocas del Toro (Panama)
- Magdalena River Delta Area (Colombia)
- Vieques-Virgin Islands-Anguilla
- Turks and Caicos Islands
- Crooked-Aklins Bank (Bahamas)
- Inagua and Little Inagua (Bahamas)
- Samana Area (Dominican Republic)
- Artibonite River Delta and the Gulf of Gonaive (Haiti)

Areas of singular resources:
- Kemp’s Ridley Turtle Nesting Area (Tampico, Mexico)
- Humpback Whale Calving Area (Silver/Mouchoir/Navidad Banks)
- Crocodylus rhombifer Area (Western Cuba)
- Olive Ridley Nesting Area (Suriname)

Current Priorities

The following sites were identified by Lynn Holowesko (IUCN/CNPPA), Pedro Rosabal
(IUCN), Yves Renard (CANARI) and Sixto Inchaustegui (IUCN/CNPPA and UNDP) as being of regional priority according to the criteria listed in the introduction of this report.

Proposed new MPAs:
- Barbuda (Antigua and Barbuda)
- Andros Barrier Reef (the Bahamas)
- Belize Barrier Reef (several representative sites)
- Tortuguero/Miskito Marine System (Costa Rica)

Existing MPAs that require management support:
- Archipélago de los Canarreos (Cuba)
- Manzanillo-Monte Cristi (Dominican Republic)
- Silver Bank (Dominican Republic)
- Soufriere Marine Management Area (St. Lucia)

The justification for the selection of these sites is outlined in the following discussion.

**Barbuda (Antigua and Barbuda)**

Antigua and Barbuda is a two-state nation located in the Lesser Antilles. Barbuda is a low, limestone island of about 174 square kilometers with a coastline formed by lagoons, mangroves and coral reefs. The latter are reportedly in excellent condition. This site consists of a group of very well-conserved biotypes (coral reefs, sandy beaches and lagoons) of particularly high species richness, most notably in the mangroves that provide a nesting area of numerous protected birds such as pelicans and frigates. The island of Barbuda is small and has a small population; however, tourism is rapidly increasing the risk of modification of biotypes that are not institutionally protected.

**The Andros Barrier Reef (the Bahamas)**

This reef is located 2–5 kilometers offshore of the island of Andros in the western Bahamas. A line of low cays runs parallel to the shore in some areas, mostly in the center. To the south and north the reef comprises scattered patch reef and massive corals. In some areas the reef is nearly 1 kilometer wide. The outer edge of the system drops off to the Tongue of the Atlantic Ocean at about 2 meters and from there abruptly to the ocean floor at 1,200 meters.

The lagoon between the reef and the shore contains isolated heads of *Siderastrea radians*, and gorgonians are also abundant in some areas, as well as extensive patch reefs. Conchs (*Strombus gigas*) and helmet shells (*Cassis tuberosa*) are also found in the lagoon. loggerhead (*Caretta caretta*), green (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*) all nest along the beaches of Andros, although all are under tremendous pressure from the local population.

Colonies of seabirds, including the white-tailed tropic bird, sooty tern, bridled tern, and brown noddy tern are found in the cays that make up the reef systems. Green Cay, east of the main island of Andros, is an important nesting site of the white crowned pigeon, a much favored, locally limited species.

The reef is considered one of the finest barrier reefs in the Caribbean and is the third largest reef system in the world. It is an extremely important resource for the fishing industry, both local and national, particularly as a source of grouper, snapper and other commercial fish, spiny lobster and conch.

The barrier reef is also of emerging importance to the nation's tourism industry, with its new emphasis on ecotourism, and these increasing pressures are adversely affecting the reef system. Illegal commercial fishing by foreign poachers has also degraded the reef's resources, as has the use of toxic substances to collect crayfish.

In 1984 the Bahamas National Trust recommended to the government that the reef system be declared a national reserve under the protection of the Trust that also manages the country's national parks. This proposal is currently under consideration.
Representative Sites on the Belize Barrier Reef (Belize)

With a length of 720 kilometers, the Belize Barrier Reef is the second largest in the world after Australia's Great Barrier Reef. The country's reef system is also unique in featuring three atolls, of which Glovers Atoll is considered to be the best example of an atoll in the Caribbean. Species diversity is high for the Caribbean and, in general, reef condition is good, although there are rapidly growing pressures from coastal development, tourism, watersports, sedimentation from changes in land use, and overfishing. Associated with the barrier reef ecosystem are extensive areas of relatively pristine coastal wetlands, lagoons, seagrass beds and mangrove forest, which provide critical habitat for threatened species such as sea turtles and manatees. In view of its exceptional character, there is growing support for the designation of the Belize Barrier Reef as a World Heritage site.

There are proposals for a number of new protected areas that would substantially increase the amount of protected subtidal habitat and the representativeness of different types of marine habitat within the national system of protected areas (see proposed new MPAs under national priorities). While Belize's reputation as one of the last "untouched wildernesses" has led to substantial international donor support, the country still lacks the full capacity to adequately protect its outstanding marine biodiversity. Management plans for existing MPAs have not been fully implemented and there remains concern about the long-term sustainability of many projects once current sources of funding are exhausted.

Tortuguero/Miskito Manne System (Costa Rica)

Tortuguero Beach in Costa Rica, became well known through both scientific and popular publications by Dr. Archie Carr. Known as the most important nesting beach in the area for green turtles and other species such as hawksbill and leatherbacks, it has been studied since the 1950s. Turtles nesting in Tortuguero, although able to disperse through most of the Atlantic, remain mostly in feeding grounds in nearby waters along the coast of Nicaragua.

The area is not only important as the main Caribbean nesting ground for green turtles, but also harbors a wealth of biological diversity. The coastal area has an excellent tropical forest with a significant portion of Costa Rica's biodiversity represented. The marine part includes coral reefs, turtle grass flats, and important fishing grounds for the local population.

The area warrants high priority for the establishment of a marine protected area and seems particularly suited to a multiple-use zoned MPA such as a Biosphere Reserve.

Archipiélag de los Canarreos (Cuba)

This is one of the most important marine and coastal wildlife areas of Cuba, with a combination of limestone, sandy and mangrove small islands, as well as a large coral reef that has been very well preserved. The islands have a number of threatened and endemic species of plants, mammals, reptiles and birds. Some of the islands are very important as seabird nesting areas, especially for migratory birds. More than 500 species of fish, 60 species of coral, and more than 100 species of sponges have been recorded from the coral reef. There are 64 submarine archaeological sites, mainly shipwrecks from the 17th and 18th centuries. There is also a particularly important and interesting system of underwater caves.

This area is included in the Cuban National Protected Areas System, and there are many scientific studies on its ecology and biodiversity. However, despite its importance as a conservation area, it is not under proper management. There is a lack of resources and personnel for the protection of the areas, and there is no integrated management plan for the area as a complete marine and coastal unit. This area is under great pressure for tourism development and fisher-
Marine Region 7: Wider Caribbean

ies activities and requires adequate resources for its conservation on a long-term basis.

**Manzanillo-Monte Cristi Area (Dominican Republic)**

This coastal marine area is located in the northwestern corner of the Dominican Republic along the border with Haiti. The area has extensive mangroves and brackish and freshwater lagoons that connect with the Yaque del Norte River, making a complex system of wetlands.

The site includes habitat of the endangered American crocodile (*Crocodylus acutus*) where a very dispersed, low-density population remains. The area is rich in waterfowl, including flamingos, roseate spoonbills, black and white ibises, ducks, and sandpipers. It is also the habitat of the Hispaniolan slider and the rhinoceros iguana.

All four marine turtles present in Hispaniolan waters—the green, hawksbill, loggerback, and leatherback—nest on the vast beaches. Due to the extensive turtle grass habitat, the area supports a relatively important segment of the local manatee population. There are extensive shallow water reefs, and in a complex of seven offshore keys, regionally important colonies of marine birds breed.

The area was declared a National Park by the Dominican Republic in 1983. While the area has not been managed as a protected area, neither has it been subject to much development pressure.

**Silver Bank (Banco de la Plata) Marine Sanctuary (Dominican Republic)**

Silver Bank is located in the northern territorial waters of the Dominican Republic, long known to navigators due to its multiple "coral heads" that have caused ships to founder. It was not until the 1970s that Silver Bank was recognized as the main Atlantic breeding ground for humpback whales.

Studies by the Center for Coastal Studies and the Center for Marine Biology (CIBINA-UASD) have verified that this is the most important breeding ground for the species.

Each year 80 percent of the known Atlantic population migrates here during winter. From January to April pregnant females come to whelp, and males come to court and mate receptive females. Newborn calves start to grow and gain sufficient strength to migrate north with the rest of the population. The area, previously an important fishing ground for local fishermen, has been declared as the Silver Bank Marine Sanctuary by the Dominican Government.

Although the area has been established as a marine sanctuary for over 10 years and has a broadly representative governing commission, it has been difficult to manage the area due to lack of resources. This is the only non-coastal marine sanctuary in the Dominican Republic.

**Soufriere Marine Management Area (SMMA) (St. Lucia)**

St. Lucia is one of the northern Windward Island in the eastern Caribbean. The Soufriere region is located on the southwest coast of the island and is important for its reef resources and the quality of its coastal landscapes—and the economic activities these resources support. The management area is legally established and includes marine reserves, fishing priority areas, and multiple-use areas, with a precise zoning system that seeks to respond to the various management issues and achieve compatible conservation and development objectives. It was established through a process of participatory planning and conflict resolution that involved all stakeholders and sought to define a consensus among all the interest groups. The management of the area is the responsibility of a local nongovernmental organization, the Soufriere Regional Development Foundation, acting under the authority of the Department of Fisheries of the Ministry of Agriculture. Financial and technical support could allow the SMMA to expand and consolidate its management structure and activities, design and conduct a comprehensive research and monitoring program, and
link the marine protected areas to planning and management initiatives in adjacent terrestrial environments. The design of activities in the SMMA should be carried out by the Government of St. Lucia, Ministry of Agriculture, Department of Fisheries, and Soufrière Regional Development Foundation.

Regional Strategy for Marine Biodiversity Conservation

Although the focus of this report is on MPAs, the areas of highest regional priority identified for this report are common to both the terrestrial and marine protected areas, particularly, but not exclusively, because some MPAs are a part of larger systems that include terrestrial areas.

Institutional Capacity to Manage, Not Gap Analysis

Worldwide, there is legitimate concern over the legal protection of representative samples of the earth’s ecosystems. There is thus a preoccupation with identifying gaps in representation and focusing resources in filling those gaps. While in theory this may be an appropriate response, in the Caribbean situation at least, it should be accompanied by a program to ensure effective management of protected areas. Two-thirds of the protected areas in the Caribbean are not effectively managed. International and regional assistance to local programs should focus on developing the local capacity to manage as well as the identification and filling of gaps in theoretical representation.

The reports in this series have identified as priorities both existing MPAs that require improved management and potential new MPAs. In the Wider Caribbean the emphasis is strongly on the former category.

Issues of Scale

One of the biggest problems facing protected area programs in the insular Caribbean is that local organizations do not have the human and financial resources to effectively implement their programs. An important share of the resources for local programs comes through international assistance. Much of this project assistance is administered by individuals who do not have a grasp of the scale of small islands. They find it difficult to relate to the requirements of resource management institutions that will never be larger than a handful of people. The smaller the island, the more acute the problem. Many of the implementation requirements of development assistance programs are not appropriate for staffs of five or ten.

The Caribbean islands collectively have the human, and in some respects, the financial resources to establish and manage a representative system of protected areas. They do not have these resources on an individual basis, however, and therein lies the problem. The multiplicity of national jurisdictions in the region severely hampers the flow of human and financial resources between islands. Regional cooperation based on stable regional structures for supporting national programs is absolutely essential. This is difficult to put into place, however, because the costs are high, donors seldom work together, and most technical assistance programs draw on human and financial resources from outside the region. While this approach may temporarily solve some immediate problems at specific sites, it tends to block the development of longer-term solutions based on the use of the human and financial resources of the region.

Effective Cooperation and Unimpeded Information Flow

Effective cooperation can be obtained only when there are effective mechanisms for stimulating and maintaining a flow of information between the islands. While considerable exploratory work has been carried out to develop databases and communication networks linked by computers, these have
not worked satisfactorily. The most effective, and most expensive, mechanism for information transfer is periodic meetings of regional park professionals. Next in effectiveness is the transfer of information through a central communication point such as a traveling consultant, the offices of regional organizations, or computer links. Newsletters are perhaps next in line in effectiveness, although they tend to be focussed on only a few topics.

Sources for Increased Support

None of the major actors in protected areas management—government agencies, international organizations, nongovernmental conservation groups, local communities, or the business sector—can provide the full range and volume of resources needed to manage systems of protected areas. Government budgets in the Caribbean are declining, not increasing. Thus, sources for increased support of protected areas will have to come from one or more of the other actors.

Balance between Planning, Implementation, and Evaluation

At both the regional and national levels, there has been an emphasis on planning, much less of a focus on implementation, and almost no attention paid to evaluation. Yet these three elements of the project cycle are intimately linked and essential for success.

Other Recommendations

Without the essential building blocks of management, it is difficult to address critical issues such as community participation and awareness, involvement in the private sector, development of buffer zones, application of science, amelioration of immediate threats, and trans-frontier initiatives.

Perhaps the most important building block for the management and development of Caribbean protected areas is the identification and mobilization of a committed constituency. Since it is clear that the potential for increased support to protected area management by governments is limited, the real key to improved management is the mobilization of civil society through NGOs, community groups, and businesses.

Regional and National Environmental Funds

Protected areas have the potential to conserve much of the region's biodiversity, maintain many of its ecological systems, and protect important water resources for human consumption. Because lack of funding is the main reason that two-thirds of the 218 protected areas (marine and terrestrial) of the Caribbean are undermanaged, a priority is the establishment of mechanisms (such as a regional fund or system of national environmental funds) to improve and stabilize protected area management. Given the diversity of small governmental and nongovernmental organizations managing protected areas in the region, regional support and technical cooperation between countries are essential for the success of national efforts.

Training and Education

A fundamental building block of management capacity is skilled manpower. None of the tools for protected area management can be applied effectively without trained and capable staff. Yet even the most capable people cannot implement protected area programs on their own. The solutions to the training and education needs of the region are not simple. However, there is no way that protected areas can develop without solving these problems.

Trained staff for the management of protected areas, at any level, are in general not available in the Caribbean region. This is evidenced by the Gardner survey that found that 80 percent of the protected area personnel of the Caribbean region do not consider themselves to be adequately trained for their
job. Details about the number of individuals employed in the management of protected areas in the Caribbean is sketchy, but estimates run at about 150 professionals and 600–700 technicians (Putney 1993).

The training needs of the region are complex, but the following are paramount:

- An institutional and financial framework that allows for a regular and systematic park training program
- Recognition of the training program by resource management institutions of the region so that successful completion of courses leads to career advancement for trainees
- Course content that recognizes the special institutional requirements and biophysical characteristics of insular Caribbean
- Regular training programs available in English, Spanish, and French
- Practical program content that emphasizes field work and actual case studies in the Caribbean island context
- Low-cost training facilities

Recent meetings of the Caribbean Steering Committee of IUCN’s Commission of National Parks and Protected Areas (CNPPA) have endorsed these needs and have recommended the following actions for attaining the necessary training:

- Definition of a regional nongovernmental institutional framework, set up with the active participation of the region’s park management agencies, tourist industry, other interested corporations, and bi- and multilateral assistance agencies
- Development of a financial framework, such as trust funds at both the regional and national levels, that guarantees a stable stream of income and that is acceptable to governments, the private sector, and bi- and multilateral assistance agencies
- Development of syllabuses and course modules for professionals and technicians to provide specialized training on protected area management
- Identification of “centers of excellence” around the region to teach individual specialized courses on their subject of excellence
- Design of study programs that allow professionals to take series of courses at the centers of excellence and earn a training certificate
- Negotiation of agreements with the civil services of the region so that the training certificates are recognized for career advancement and pay increases at protected area management agencies
- Development of course materials and the training of trainers for in-country training of park guards. This is of paramount importance.

Conclusion

Marine protected areas help maintain ecosystem productivity, safeguarding essential ecological processes by controlling activities that disrupt them or that physically damage the environment. Some of these processes are physical, such as the movement of water, food, and organisms by gravity, waves, or currents. Others are chemical, such as concentration and exchange of gases and minerals, or biological, such as nutrient transfer from one trophic level to another. Some, such as nutrient cycling, are of all three types. It is these processes that maintain ecosystem integrity and diversity. Success of these systems depends on the existence and implementation of appropriate legal frameworks, general acceptance by local people through education and participation, and an effective and well-supported management system.

Essentially a continuous, participatory, interrelated, financially sustainable framework is needed to achieve sustained capabilities of marine and other protected areas in the region to continue their support of life systems today and in the future.
### APPENDIX 7.1 ECOLOGICAL FEATURES AND RESOURCE PROBLEMS OF CARIBBEAN COUNTRIES

<table>
<thead>
<tr>
<th>Small Islands</th>
<th>Antigua/Barbuda</th>
<th>Excessive sand removal destroying reefs; overexploitation of lobster population; resort building on beaches.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahamas</td>
<td>Low flat volcanic island on coral platforms and narrow submarine shelves; white sand beaches, seagrass, bays, fringing reefs.</td>
<td>Exploitation of fisheries; pollution from boats; boat anchor damaging reefs.</td>
</tr>
<tr>
<td>Barbados</td>
<td>Low flat volcanic island on coral platforms, narrow submarine shelves; white sand beaches, mangroves, seagrass, bays, fringing reefs.</td>
<td>Near-shore fisheries overexploited; coastal erosion from dredging and construction stressing reefs, changing water circulation patterns and quality; pollution from sewage, wastes, fertilizers.</td>
</tr>
<tr>
<td>British Virgin Islands</td>
<td>Small clusters of low, hilly volcanic islands; mangroves, seagrasses, salt ponds, coral reefs.</td>
<td>Mangroves cleared for tourism’s development causing loss of habitats and increasing sedimentation in seagrass and reef areas; boat anchors damaging reefs; domestic sewage problems.</td>
</tr>
<tr>
<td>Dominica</td>
<td>High rugged volcanic mountains, no coastal plain, numerous rivers and rain forest cover.</td>
<td>Hurricane devastation to reefs; maintenance of primary coastal road encouraging shoreline erosion, oil pollution and ship-based wastes.</td>
</tr>
<tr>
<td>Grenada</td>
<td>Numerous steep, volcanic islands; mangroves, seagrass (sponge) beds. reefs.</td>
<td>Overexploitation of all fisheries; beach erosion near tourism centers and airport, coastal tree removal and sand mining increasing erosion; seaborne and solid waste pollution.</td>
</tr>
<tr>
<td>Montserrat</td>
<td>High rugged, volcanic island; black sand beaches, rainforest.</td>
<td>Overexploitation of fisheries.</td>
</tr>
<tr>
<td>Netherlands Antilles</td>
<td>Two island groups: leeward (Curacao, Bonaire, Aruba), low hills and bays with mangroves, seagrass beds, fringing reefs; windward (St. Maarten, St. Eustatius, Saba), high rugged, volcanic with coral reefs and seagrass areas.</td>
<td>Marine habitats suffering from heavy industrial and recreational use; depletion of fisheries off Saba bank; sewage pollution and dumping.</td>
</tr>
<tr>
<td>St. Kitts/Nevis</td>
<td>High volcanic, narrow coastal shelves.</td>
<td>Near-shore fisheries overexploited; coastal erosion from sand removal; sewage pollution from tourism activities; inadequate port facilities.</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>High, rugged, volcanic island with extensive seagrass beds, coral reefs, few beaches.</td>
<td>Erosion from forest clearing and sand mining affecting reef and seagrass habitats; tourism-related construction stressing habitats.</td>
</tr>
<tr>
<td>St. Vincent/Grenadines</td>
<td>Volcanic, mountainous, reefs, black sand beaches; Grenadines have largest shelf area in Lesser Antilles.</td>
<td>Seaborne tar pollution on beaches; excessive sand mining for construction; waste from yachts.</td>
</tr>
<tr>
<td>Trinidad/Tobago</td>
<td>Tropical forests, swamps, white sand beaches, reefs.</td>
<td>Pollution pressure and recreational misuse of Caroni Swamp; coastal zone resource use conflicts; over collecting of turtles and shells.</td>
</tr>
</tbody>
</table>

<p>| Large Islands | Cuba | Largest archipelago, largest marine platform, karstic and marine plains, mountainous, 20 percent wetlands, extensive mangroves forests. | Domestic and industrial pollution, illegal fishing, hunting and collecting of corals; rapid tourism development. |</p>
<table>
<thead>
<tr>
<th>Country</th>
<th>Description</th>
<th>Issues/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominican Republic</td>
<td>Mountainous, extensive mangrove areas.</td>
<td>Dependence on fisheries imports; new tourism development without environmental assessments; mangrove destruction for fuelwood; ciguatoxic reef fish; overfishing of lobster; illegal collecting of corals, birds, and turtles; sewage from tourism development.</td>
</tr>
<tr>
<td>Haiti</td>
<td>Western third of Hispaniola Island, low mountains, numerous beaches, bays, mangroves, seagrasses, coral reefs.</td>
<td>Few inventories of marine resources; pollution near urban centers; mangrove destruction for fuelwood; overexploitation of fish, invertebrate and shell export trade.</td>
</tr>
<tr>
<td>Jamaica</td>
<td>Large mountainous island with coastal plain areas; mangroves and coral reefs.</td>
<td>Extreme overfishing; domestic and industrial pollution; high sediment loading from bauxite mining; coastal erosion from sand removal; dredge spoils into mangrove areas; unregulated coastal activities including tourism and collection of reef curios.</td>
</tr>
<tr>
<td>Central America</td>
<td>Belize Second largest barrier reef in the world, extensive flat swampy coast, cays and offshore atolls.</td>
<td>Poaching of turtles, lobster and conch by foreigners; saltwater intrusion into freshwater wells; unregulated coastal activities; seaborne pollution; sewage dumping in mangroves.</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>Rugged mountains, extensive streams and rivers, wide coastal plain, fewer reef and mangrove areas than pacific coast.</td>
<td>Mangrove clearing for fuel and shrimp ponds; fewer disturbance than Pacific side; some siltation and pollution from pesticides and oil.</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Coast dominated by beaches, mangroves, estuaries.</td>
<td>Oil spills, inadequate training in marine resources.</td>
</tr>
<tr>
<td>Honduras</td>
<td>Mountainous, long coast with wide submarine shelves; mangroves abundant; coral reefs and seagrasses in outlying island areas.</td>
<td>Tourism activity without prior environmental assessments; fragmentation of coastal authorities; tourist related sewage; overfishing.</td>
</tr>
<tr>
<td>Mexico</td>
<td>Few mangroves; wide lagoons with undisturbed seagrasses and reef areas.</td>
<td>Extent of marine resources needs investigation.</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>Large continental shelf; coastal areas uninhabited due to extensive jungles, rivers, and swamps.</td>
<td>Extent of marine resources needs investigation.</td>
</tr>
<tr>
<td>Panama</td>
<td>Mountainous, long coast, wide shelf, sparse mangroves.</td>
<td>Overfishing and collecting of turtles; limited information on coastal resources.</td>
</tr>
<tr>
<td>South America</td>
<td>Colombia Extensive coastal areas influenced by major rivers; island archipelagos offshore.</td>
<td>Few marine inventories; water and oil pollution; sedimentation; collecting of endangered turtles species; mangroves filling.</td>
</tr>
<tr>
<td>Venezuela</td>
<td>Extensive coast that is one-quarter mangroves.</td>
<td>Conflicting demands on coastal areas; destruction of natural habitats; construction causing coastal erosion; filling in of mangroves swamps; overfishing of turtles and lobsters; river dams altering hydrologic regimes causing sedimentation of lagoons.</td>
</tr>
</tbody>
</table>
### APPENDIX 7.2 Distribution and Status of Threatened Caribbean Coastal and Marine Species

<table>
<thead>
<tr>
<th>Species (common names)</th>
<th>Status Key</th>
<th>Status</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichechus inunguis (Amazonian manatee, S. American manatee)</td>
<td>V</td>
<td>Mex, Bah, Cuba, D.Rep, Haiti, Jam, P.Rico, Trin/Tob, Belize, C.Rica, Guat, Hond, Nica, Pan, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Trichechus manatus (Caribbean manatee, N. American manatee)</td>
<td>V</td>
<td>Mex, Bah, Cuba, D.Rep, Haiti, Jam, P.Rico, Trin/Tob, Belize, C.Rica, Guat, Hond, Nica, Pan, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Pterodroma basitata (Black-capped petrel, Diablotin)</td>
<td>V</td>
<td>Haiti</td>
<td></td>
</tr>
<tr>
<td>Caretta caretta (Loggerhead turtle, Torugaverde del Atlantico and Pacifico, Tortuga Blanca)</td>
<td>V</td>
<td>Mex, Antig, Bah, Cuba, D.Rep, Jam, Ne.Ant, P.Rico, Trin/Tob, C.Rica, Guat, Hond, Nica, Pan, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Chelonina mydas (Green sea turtles, Torugaverde del Atlantico and Pacifico, Tortuga Blanca)</td>
<td>E</td>
<td>Mex, Antig/Barbud, Bah, Cay.IsI, D.Rep, Gren, Guad, Haiti, Jam, Mart, Ne.Ant, P.Rico, St.Luc, St.Vin, Trin/Tob, USVI, Belize, C.Rica, Guat, Hond, Nica, Pan, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Eretmochelys imbricata (Hawksbill turtle, Carley, Tortuga Carey, Tataruga verdadera and de Pente)</td>
<td>E</td>
<td>Mex, Antig/Barbud, Bah, Cay.IsI, D.Rep, Gren, Guad, Haiti, Jam, Ne.Ant, P.Rico, St.Luc, St.Vin, Trin/Tob, USVI, Belize, C.Rica, Guat, Hond, Nica, Pan, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Lepidochelys kempi (Kemp's Ridley, Alt. Ridley sea turtle, Tortuga Lora)</td>
<td>E</td>
<td>Mex</td>
<td></td>
</tr>
<tr>
<td>Lepidochelys olivacea (Olive Ridley turtle, Pacific Ridley turtle, Torugaverde, Parlama)</td>
<td>E</td>
<td>Mex, Cuba, P.Rico, C.Rica, Guat, Hond, Nica, Pan, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Dermatemys mawii (Central American river turtle)</td>
<td>V</td>
<td>Mex, Belize, Guat, Hond, Pan, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Caiman crocodylus crocodylus (Spectacled Caiman)</td>
<td>V</td>
<td>Trin/Tob, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Caiman crocodylus fuscus (Brown Caiman)</td>
<td>V</td>
<td>Mex, Cuba, Nica, Pan, Col, Ven</td>
<td></td>
</tr>
<tr>
<td>Crocodylus acutus (American crocodile, Crocodilo, Lagarto Negro)</td>
<td>V</td>
<td>Jam, Ne.Ant, Belize, C.Rica, Guat, Hond, Nica, Pan, Col, Ven</td>
<td></td>
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<tr>
<td>Ameiva polops (St. Croix ground lizard)</td>
<td>E</td>
<td>USVI</td>
<td></td>
</tr>
<tr>
<td>Family Antipathidae (Black corals)</td>
<td>CT</td>
<td>Caribbean Region</td>
<td></td>
</tr>
<tr>
<td>Strombus gigas (Queen conch)</td>
<td>CT</td>
<td>Caribbean Region</td>
<td></td>
</tr>
<tr>
<td>Panulirus argus, P.Guttulus (Spotted spiny lobster)</td>
<td>CT</td>
<td>Caribbean Region</td>
<td></td>
</tr>
</tbody>
</table>

*Status Key: E=endangered, V=vulnerable, CT=commercially threatened.*

### Appendix 7.3 Participation of Wider Caribbean Region in Major International Conventions and Programs

<table>
<thead>
<tr>
<th>Country</th>
<th>WH</th>
<th>NS</th>
<th>RA</th>
<th>RS</th>
<th>BR</th>
<th>WHM</th>
<th>CC</th>
<th>BD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anguilla (U.K.)</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Antigua and Barbuda</td>
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<tr>
<td>Aruba (Netherlands)</td>
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<tr>
<td>Bahamas</td>
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<td>X</td>
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<tr>
<td>Barbados</td>
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<td>X</td>
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<tr>
<td>Bermuda</td>
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<tr>
<td>Belize</td>
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<tr>
<td>British Virgin Islands</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Cayman Islands (U.K.)</td>
<td>X</td>
<td>X</td>
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<td></td>
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</tr>
<tr>
<td>Columbia</td>
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<td></td>
<td>X</td>
</tr>
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**WH** Signatory to the World Heritage Convention.

**NS** Has inscribed natural sites under the World Heritage Convention.

**RA** Signatory to the Ramsar Convention.

**RS** Has established Ramsar sites.

**BR** Has established biosphere reserves under the UNESCO Man and the Biosphere Programme.

**CC** Signatory to the Cartagena Convention's Specially Protected Areas and Wildlife Protocol only.

**BD** Signatory to the Biodiversity Convention.

**X** Currently established.

**P** Establishment being actively pursued.

## APPENDIX 7.4  INSTITUTIONS PROVIDING REGIONAL SUPPORT SERVICES

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CON PRO  Conventions and protocols  
ASE  Assessments and surveys  
NET  Networking  
TEC AST  Technical Assistance  
TRA  Training  
INF  Infrastructure development  
REV GEN  Revenue generation  
MGT ID  Institutional development of resource management agencies  
NGO ID  Institutional development of nongovernmental organizations  
SUB REG  Subregions (G=Greater Antilles; L=Lesser Antilles; ALL=Whole region)
BIBLIOGRAPHY


BIODEDIVERSITY AND MARINE BIODIVERSITY

The West African Marine Region covers the south and west coast of Africa from the Mozambique/South Africa border to the Straits of Gibraltar. It includes the following countries: Angola, Benin, Cameroon, Congo, Cote d'Ivoire, Equatorial Guinea, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mauritania, Morocco, Namibia, Nigeria, Senegal, Sierra Leone, South Africa, Togo, and Western Sahara. It also includes the following groups of oceanic islands: Canary Islands (Spain), Cape Verdes (Portugal), Sao Tome and Principe, Ascension (U.K.), St. Helena (U.K.), Tristan da Cunha (U.K.), and Bouvet (Norway).

The region covers a huge area: the entire length of the West African coast, from the arid, sandy coastlines of Morocco and the Western Sahara in the north, through the tropical, deltaic and mangrove-fringed shores of central Africa, to the southern arid coastlines of Angola and Namibia. For the purpose of this report, the region also includes the east coast of South Africa, up to the border with Mozambique. It also includes a number of oceanic islands that have very different characteristics from the mainland.

Oceanography

Except as noted the following description is drawn from Portmann and others (1989).

On the west coast of Africa five distinct and relatively persistent oceanic currents are of importance in respect of the transport of substances, water temperature, meteorology and biological conditions. They are the Benguela Current flowing along the coast of the southwest African zone veering offshore at about 6°S; the Guinea Current flowing eastward and southeastward along the coast of the Gulf of Guinea, almost to the equator, essentially constituting a continuation of the Equatorial Counter-Current; the South Equatorial Current that flows west some distance from the coast between about 10°S and the equator and the Canary Current that flows southwestward along the coast in the northern part of the region feeding both the Guinea Current and the North Equatorial Current. Both the Canary Current and the Benguela Current transport cool water to-
ward the equator with current speeds of about 20 centimeters per second. The Guinea Current carries warm water toward the coast at speeds of 1–3 knots with the highest currents in the summer months. All the currents are essentially wind-driven.

On the east coast of South Africa the warm surface waters of the Agulhas Current flow south to the southern tip of the African continent.

The prevailing regional winds along the west coast of the region generate an offshore flow component in the surface layer of the sea through the combined action of the wind stress and the rotation of the earth. The offshore transport is compensated by onshore flow at intermediate, 50–300 meters depths and vertical flow toward the surface layer (upwelling) in band of some tens of kilometers adjacent to the coast. This is a very important feature along large parts of the coastline: along the northwest part from October to April, along limited parts of the northern Gulf of Guinea coast in summer months, and along the southern coastline in the Benguela current system with very strong upwelling in winter (August) and weaker upwelling in summer (November to February).

High precipitation and numerous rivers on the central West African coast result in large masses of warm (above 24°C) and low salinity (less than 35°/0) water, known as Guinean waters circulating in the Gulf of Guinea, that rest on colder water. These waters are permanent off Sierra Leone and Liberia and in the Bight of Biafra (Nigeria, Cameroon and Gabon), but occur seasonally in other areas where they are replaced by colder and more saline waters at certain times of year due to other currents and upwellings (UNEP/IUCN 1988).

**Coastal Geography and Geology**

The western coast of Africa has been strongly influenced by the deposition of sediments as sandbars and deltas during and since the last glaciation. Sandy beaches dominate much of the coastline, with extensive lagoon systems sometimes found behind them. Such sandy beaches are constantly changing their profiles due to beach erosion and build-up of sand. Rocky outcrops occur at intervals; some of the most extensive and continuous rocky shores occur in the Cape Verde area where they are volcanic in origin (Schwartz 1982).

The northwest coast from Morocco to Senegal is sandy and relatively unindented. From Dakar, southeast to Monrovia it becomes very indented and there are a number of offshore islands. Further east, it is more deltaic in nature, low lying and sandy, with large lagoons separated from the sea by dunes, interspersed with rocky areas from Monrovia to Cape Palmas and in Ghana. The eastern area is dominated by the delta of the Niger River, the second largest delta in the world, covering 36,260 square kilometers (Hughes and Hughes 1992). The 3,000-kilometer coastline of South Africa includes many habitats affected by the different ocean currents running parallel to the coast in the east (warm water) and west (cold water). The southern region is a transition zone between these water masses, having fauna and flora representative of both systems as well as its own endemic species.

Much of Guinea-Bissau is below 100 meters and has a very indented submerged coastline (274 kilometers, but measuring at least 1,000 kilometers if all the inlets are included) with long, branched flooded valleys, estuaries and offshore islands harboring large mangrove communities (Hughes and Hughes 1992). This is the largest continental shelf in West Africa covering an estimated 53,000 square kilometers. Nigeria has a coastline of 853 kilometers and includes some of the most extensive and valuable coastal wetlands in West Africa, few of which receive sufficient protection (Hughes and Hughes 1992; Robinson and de Graaff 1992). Ghana has 540 kilometers of sandy coast backed by
a broad coastal plain, with an estimated 50. lagoons (Robinson and de Graaff 1992).

The Micronesian Islands in the Northeast Atlantic include the Azores, Madeira and the Salvages (see Region 5: Northeast Atlantic in Volume I), the Canary Islands and the Cape Verde. The Cape Verde archipelago comprises 14 islands off the west coast of Africa, with rocky coastlines; the Canary Islands and Madeira also comprise a number of volcanic islands.

The South Atlantic has relatively few island groups compared with other major ocean areas. St. Helena and Ascension are both isolated volcanic islands with exposed rocky shores. The Tristan da Cunha group comprises three small volcanic islands (Tristan, Inaccessible and Nightingale) in one group and Gough Island that lies 400 kilometers to the southeast. They have rocky shores with kelp. Bouvet Island (Bouvetoya) lies southwest of Cape Town and is one of the most isolated islands in the world.

The islands of São Tomé, Principe and An- nobon (Equatorial Guinea) lie in the Gulf of Guinea.

**Ecosystem Diversity**

**Coral Reefs**

Due to the cool waters of the Benguela Current and the Canary Current, there are no true reefs along the West African coast or in the archipelagos of the Gulf of Guinea and Cape Verde. However, there are a number of sites with rich coral communities where hard substrate and suitable clear water is available, for example, around the oceanic islands and along some of the rocky mainland coasts. Some of the main areas include the Cape Verde Islands, the Islands in the Gulf of Guinea (Fernando Po, Principe, São Tomé, Annobon), and in isolated areas on the mainland coast (including sites in Ghana, Gabon and Cameroon). These communities need further investigation. Although diversity is low, there are a number of rare and endemic species, some of which are most closely related to Brazilian species (UNEP/IUCN 1988).

Coral communities are present off the Maputoland coast on the northeast coast of South Africa. All of these areas fall within MPAs (UNEP/IUCN 1988; WCMC 1992).

**Mangroves**

Over 25,000 square kilometers of mangroves extend along the West African coast from Senegal to Angola, in many areas forming a band up to 50 kilometers wide between the seaward and landward faces and extending far upstream on many rivers. Diversity is lower than in the Indian Ocean, and there are only six species of mangroves; these are in the same group as those of western Atlantic shores and the Caribbean. The cold waters of the southern tip and Namibia have formed an effective barrier to migration between the east and west coasts of Africa. The northern limit of mangrove distribution is just north of Tidra Island in Mauritania; further north the cold Canary Current and the lack of coastal alluvium due to the aridity of the hinterland inhibits mangrove growth (CEC 1992; Hughes and Hughes 1992). The southern limit occurs around Lobito in Angola (approximately 12°30'S) (Schwartz 1982).

Despite the lower diversity, the West African coast has the best developed and most extensive mangroves in Africa. The most extensive areas are in Guinea and Guinea-Bissau, both of which were formerly almost entirely fringed with mangroves; although much has been cleared they still have some 285,000 hectares and 100,000 hectares, respectively. Nigeria has more than 35 percent of all West African mangroves (about 9.7 million hectares) and still has large stands, particularly in the Niger Delta (500,000 hectares). There are some 300,000 hectares in Cameroon, mainly in the north and a similar area in Gabon. Large areas are also found in the Gambia and Sierra Leone (Stu-

Despite the importance of this region for mangroves, relatively few are protected, although the Parc National Delta du Saloum was created specifically to protect mangroves in Senegal, and Guinea now has a mangrove management program (CEC 1992).

**Other Wetlands**

There are a number of regional reviews of West African wetlands: Hughes and Hughes (1992), Altenburg (1987), Burgis and Symoens (1987). These provide a very good basis for identifying regional and global sites of importance for coastal wetlands, including mangroves.

There are numerous deltas, including several major ones. These deltas may have extensive associated wetlands, such as those of the River Gambia where permanent tidal swamps extend in a semi-continuous belt that reaches nearly 200 kilometers upstream, and extensive mangroves in the lower reaches. Examples of these deltas are: the Volta River in Ghana that has a complex lagoon system including Keta and Songaw (Songor) lagoons, surrounded by mangroves and important to migrants; Niger delta in Nigeria with an area of over 36,000 square kilometers—the largest delta in the world; and Congo River in Zaire (Altenburg 1987; Stuart, Adams, and Jenkins 1990; Schwartz 1992).

**Beaches, Dunes, Cliffs**

Steep, sandy fringing and barrier beaches predominate in much of the region. Rocky headlands are more restricted and coastal dunes are rare except in the south.

Sandy beaches are extensive along the coast of Morocco, Mauritania, the Western Sahara and the north coast of Senegal, where the coastline is influenced by long-shore drift. The Sahara desert reaches the coast along a broad front of the coasts of Morocco and Mauritania.

Between Monrovia and Cape Palmas and also in Ghana the coast is rocky and of high relief. Elsewhere along the Gulf of Guinea it is low lying and sandy and characterized by a series of large and relatively deep lagoons that are separated from the sea by dune-covered barriers (Schwartz 1992).

In the south the Namibian coast is dominated for long distances by sandy beaches and sand dunes, broken by bare rocky shores.

**Open Ocean, Deep Sea, Upwellings**

There are permanent areas of upwelling off Senegal, Zaire and Namibia, driven by the Canary and Benguela currents. The areas of upwelling are characterized by high productivity, and the southern part of the region is a particularly rich fish production area. In the northern area the pelagic fish population is dominated by *Sardinina pilchardus*, whereas in the Benguela Current regime it is *Sardinops ocellata*. Two groups of pelagic species are found throughout the region: *Sardinella aurita* mainly in the intertropical waters and various *Trachurus* sp. Demersal fish include a wide variety of species, but in the equatorial zone fisheries their exploitation is not important. Various species of crustacea are found in the area and there are important fisheries for lobsters in the northern and southern zones, deepwater shrimp off the coast of Senegal and Angola, and prawns in the Gulf of Guinea. In the coastal regions and in the lagoons unaffected by human activities, exploitable marine resources are abundant with fish species and prawns and mollusks (Portmann and others 1989).

**Species Diversity**

In contrast to the shores of East Africa and the western Atlantic, the tropical Atlantic
coast of Africa has an impoverished biota. Coral reefs and the rich and varied life they support are largely absent from the western coast of Africa. Similarly lacking are the extensive meadows of seagrasses that often occur in the lee of fringing reefs. At the same time, in many groups there are relatively high levels of endemism.

The marine resources of the West African region play an important role in the local, national and regional economies, especially the densely populated areas. The region’s climate tends to be damp and humid (especially the equatorial areas) and away from the beaches that are increasingly being developed, the coastal West African countries have limited facilities for tourism. Fauna and flora of the coastal wetlands, including mangroves, are described in Hughes and Hughes (1992).

Seaweeds

The tropical west coast of Africa is one of the least diverse regions for seaweeds. There is also low diversity around isolated oceanic islands such as St. Helena. However, relatively high levels of endemism are found in algae around the oceanic islands (St. Helena and Ascension), at the northern (Senegal) and southern (Angola) limits of tropical West Africa, and around the southwest Cape of South Africa (WCMC 1992; Norse 1993).

Invertebrates

Lobsters are fished throughout the region while deepwater shrimp and prawns are trawled, with intertidal mollusks being harvested on a daily basis. These marine resources represent a significant source of protein—in Ghana, for instance, consumption of marine products exceeds that of meat derived from terrestrial resources.

Fish

The botanical wealth of estuaries and lagoons makes a major contribution to the diversity of fish life, as does the high primary productivity based on upwellings of cold, nutrient-rich waters, off Senegal, Zaire, and Namibia, and in the outflow of the Congo/Zaire River drainage system.

The most important fish are the sardine (Sardinops ocellata) in the southern Benguela upwelling and the pilchard (Sardina pilchardus) in the north. The horse mackerel (Trachurus sp.) is found throughout the region, with the hake (Merluccius sp.) the most important demersal fish. Fishing for pelagic fish such as tuna is an important industry in many of the oceanic islands including the Cape Verdes and Canary Islands.

Several of the oceanic islands have high levels of endemism in their fish fauna. Of the 80 shore fish found around St. Helena, 10 (12 percent) are endemic to these waters alone, and 16 (20 percent) are found only in the waters of St. Helena and Ascension (Edwards 1990; Oldfield 1987). Relatively high levels of endemism are found in the fish faunas of Ascension.

The tropical west coast of West Africa has an estimated 239 species of reef fish, of which over 70 percent are endemic (Nunan 1992). The Gulf of Guinea islands probably have a particularly high level of endemism within the shore fish (McAllister and others, in press).

Reptiles

Several beaches provide important nesting sites for the green and Olive Ridley turtles (Chelonia midas and Lepidochelys olivacea) as well as for three other turtle species. Ascension Island is a globally important nesting beach for green turtles, with 1,800–2,000 females nesting each year; hawksbills also nest there (Mortimer and Carr 1984).

Birds

The West African mainland coast is visited seasonally by millions of migratory birds (especially waders). Descriptions of important
sites can be found in Hughes and Hughes (1992). The characteristics—coastal silt deposition with mangrove development—that make this area so important for waders means that there are relatively few areas where seabirds can safely breed. The only large concentrations of seabirds are in Mauritania, the Gambia and Senegal where the hinterland is arid and coastal deposition of sand creates predator-free islets (Cooper, Williams, and Britton 1984).

There are important seabird colonies off the coast of South Africa, the most important areas being Shark Island, Namibia and Bird Island, Lambert's Bay and Marcus Island. Many of the oceanic islands have important seabird nesting sites, although in many places populations are declining, for example, on the Cape Verdes and in several other Micronesian islands (Le Grand, Emmerson, and Martin 1984). The Canary Islands have six breeding seabird species, including frigate birds and shearwaters—the four islands north of Lanzarote being particularly important; the Salvages have major colonies (Le Grand, Emmerson, and Martin 1984).

Ascension is the single most important seabird nesting site in the South Atlantic in terms of both diversity and abundance, with Boatswain Bird Island being particularly notable. St. Helena used to support 15 breeding seabirds, but nine of these no longer breed and two species (Pterodroma rupinicarum and Bulweria bifrax) are extinct (Williams 1984). Tristan da Cunha, especially on Nightingale and Gough, and Bouvet also have important seabird colonies.

On the Gulf of Guinea islands, the Tinhosas islets near Principe, are the most important nesting sites, and the Sette Pedras Islets of São Tomé are also important (Williams 1984).

**Marine mammals**

Cetaceans are fairly abundant, while the West African manatee (*Trichechus senegalensis*) occurs in suitable habitat from Senegal to Angola. Otherwise, both sirenians and cetaceans, despite local protection in places, are threatened by hunting and trapping in shark nets.

Fur seals and elephant seals occur around the southern oceanic islands, such as Gough and Bouvet. The endangered Mediterranean Monk Seal occurs in the Madeiran archipelago and as far south as northern Mauritania.

**Biogeographic Classification**

The work of Hayden and others (1984) has been used to classify this region. It includes five Oceanic Realms, four Coastal Realms (Western Subtropical divided into a northern and a southern component, Western Tropi-cal, Western Intertropical, and Eastern Subtropical), and 5 faunal provinces (Lusitanian, West African, Southwestern African, Agulhas, and Western Indian Ocean).

**Assessment of Existing MPAs**

**Description of National MPA Systems**

There are substantial numbers of coastal protected areas in the region, although for many it has been difficult to determine how far the boundaries extend and to distinguish whether marine elements are included. Nevertheless, an attempt has been made to identify those having some marine focus and which are primarily coastal land. Map 8 shows the MPAs that have been recorded as including a subtidal component (noted in the national sections below). Other coastal protected areas are also listed. Table 8.1 shows the number of marine and coastal protected areas by country.

There is very limited information available on the management of most areas.

There are no marine or coastal protected areas in Benin, Ghana, Guinea, Liberia, Nigeria, Togo, Western Sahara. Several of these countries, such as Ghana and Guinea, have designated Ramsar sites, although they have...
Table 8.1 Number of Existing MPAs in the West African Marine Region

<table>
<thead>
<tr>
<th>Country</th>
<th>Marine Areas</th>
<th>Coastal Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Cameroon</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Congo</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Cote d'Ivoire</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Gabon</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>The Gambia</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Mauritania</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Morocco</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Namibia</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>South Africa</td>
<td>22</td>
<td>96</td>
</tr>
<tr>
<td>Tristan da Cunha</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Zaire</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>131</td>
</tr>
</tbody>
</table>

No formal protection. Apart from Gough Island in the Tristan da Cunha group (that includes intertidal areas but not subtidal terrain), none of the island states (Ascension, Canary Islands, Cape Verde Islands, Sao Tome and Principe, St. Helena) have designated MPAs.

Angola

The following MPAs include a subtidal component:
- **Kisama National Park**: Mangroves and marshes; manatees, green and loggerhead nesting turtles, Cape fur seal, waterfowl (Robinson and de Graaff 1992; World Bank 1993d); site account in IUCN/UNEP (1987).
- **Ilheu dos Passaros Integral Nature Reserve**: A tidally inundated island of mudflats and mangroves; important for waterbirds (Robinson and de Graaff 1992; World Bank 1993d); site account in IUCN/UNEP (1987).
- **Iona National Park**: high sand dunes; Cape fur seal, manatee, green and loggerhead nesting turtles (Robinson and de Graaff 1992; World Bank 1993d); site account in IUCN/UNEP (1987).

Additional coastal areas include:
- **Mocamedes Partial Reserve**: No evidence that this includes intertidal habitat (Robinson and de Graaff 1992; World Bank 1993d; IUCN/UNEP 1987).

Benin

No existing marine or coastal protected areas are recorded.

Cameroon

There is one MPA that includes a subtidal component:
- **Douala-Edea Faunal Reserve**: At mouth of Sanaga River (between Sanage and Nyong Rivers); (World Bank 1993s; Robinson and de Graaff 1992); estuarine, mangroves along coast and in coastal lagoons; manatee; rainforest and terrestrial vertebrates; site account in IUCN/UNEP (1987).

Additional coastal areas include:
- **Campo Faunal Reserve**: This site may not include intertidal habitat; mentioned in World Bank (1993a) and site account in IUCN/UNEP (1987).

Congo

There are no MPAs with a subtidal component recorded. There is one coastal area with intertidal terrain:
- **Conkouati Faunal Reserve**: Littoral eco-type with mangroves, sandy beaches, lagoons, manatee and other mammals; fully marine area to be added but funding lacking (Robinson and de Graaff 1992; World Bank 1993a; IUCN 1989; IUCN/UNEP 1987); site account in IUCN/UNEP (1987).

Cote d'Ivoire

There are no MPAs with a subtidal component recorded. Other coastal areas include:
Parc National d’Azagny: Includes the Bandama River and Ebrié lagoon; estuarine areas, swamps, mangroves and terrestrial habitat; manatee, crocodile (low numbers) and terrestrial vertebrates (IUCN/UNEP 1987; World Bank 1993a; Robinson and de Graaff 1992); site account in IUCN/UNEP (1987).

Parc National du Banco: Rainforest and mammals, with coastal lagoons, although these may not include intertidal habitat (Robinson and de Graaff 1992; World Bank 1993a); site account in IUCN/UNEP (1987).

Iles Ehotile National Park: Southern half of main Aby Lagoon (World Bank 1993a).

**Equatorial Guinea**

There are no MPAs with a subtidal component recorded. Other coastal areas include:
- Estuario de Rio Muni Protected Area: Mangroves and riparian forest; only known manatee habitat in country (World Bank 1993a; Stuart, Adams, and Jenkins 1990).
- Estuario de Rio Ntem (Campo) Protected Area: Estuarine habitat with mangroves, coastal areas, birds, crocodiles, and so on (World Bank 1993a; Stuart, Adams, and Jenkins 1990).
- Isla de Annobon Protected Area: Probably does not include intertidal habitat (World Bank 1993a).

**Gabon**

There is one MPA that includes a subtidal component:
- Sette-Cama Reserves: Complex covering 700,000 hectares divided between two Ramsar sites—Petit Loango comprising Iguela Hunting Reserve (180,000 hectares) and Ngoue-Ndogo Hunting Reserve (250,000 hectares; Petit Loango Faunal Reserve (50,000 hectares); and Sette-Cama comprising Sette-Cama Hunting Area (200,000 hectares) and Ouanga Plain Faunal Reserve (20,000 hectares). Sandy coastal plain with lagoon; important for manatee and terrestrial fauna (IUCN/UNEP 1987; World Bank 1993a; Jones 1993); site account in IUCN/UNEP (1987).

Additional coastal areas include:
- Wonga-Wongue Presidential Reserve (spelling variable): May not include intertidal habitat; Ramsar site; (World Bank 1993a; Jones 1993); site account in IUCN/UNEP (1987).

**The Gambia**

The following MPAs include a subtidal component:
- Niumi/Sine Saloum National Park: Islands, lagoons and coastal waters; important mangroves (especially *Avicennia africana*) and wetland, with breeding waterbirds; nursery sites for many fish species; manatee, humpbacked dolphin, olive ridley turtle, green turtle, loggerhead turtle (IUCN 1987; Stuart, Adams, and Jenkins 1990; World Bank 1993c); cooperative conservation exercise with Senegal (see priority areas under Senegal).
- Gambia River National Park: Estuarine, five islands within the river; some areas of mangrove and mudflat protected (World Bank 1993c; Hughes and Hughes 1992); site account in IUCN/UNEP (1987).
- Kiang West National Park: Estuarine, protects some areas of mangrove (World Bank 1993c; Hughes and Hughes 1992); site account in IUCN/UNEP (1987).

Additional coastal areas include:
- WCMC database also lists Baubolon Nature Reserve and Coastal Reserve: Further details needed (for instance, whether Abuko Nature Reserve is coastal;
Marine Region 8: West Africa

not coastal according to World Bank 1993c).

Ghana

No marine or coastal protected areas are recorded.

Guinea

No marine or coastal protected areas are recorded.

Guinea-Bissau

There is one MPA that includes subtidal elements:

- Arquipelago dos Bijagos Hunting Reserve: This MPA is a high priority for further conservation action and is described below.

Other coastal protected areas include:
- Ilha de Cofra Hunting Reserve
- Rio Mansoa Hunting Reserve: Within an area of high conservation importance and described below.
- Sector Administrativa de Boe Hunting Reserve: Mangroves, manatees (IUCN 1987; World Bank 1993b).
- Lagoa de Cufada: Hunting Reserve: Mangroves, extensive tidal mudflats along Rio Combal (although main area consists of freshwater lakes and marshes); important for migratory birds; also a Ramsar Site (World Bank 1993b; Jones 1993).

Liberia

No marine or coastal protected areas are recorded.

Mauritania

The following MPAs include a subtidal component:

- Banc d'Arguin National Park: Priority site for conservation action; described below.
- Diawling National Park: In Senegal delta, adjacent to Djoudj National Park in Senegal; includes significant estuarine and intertidal areas, important breeding ground for fish and crustaceans, for overwintering migrant birds; saline flats, dunes, mangroves (5 hectares) (Robinson and de Graaff 1992); site account in IUCN/UNEP (1987).

Additional coastal areas include:
- Las Cuevecillas Integral Reserve: Contiguous with Banc d’Arguin; important for waders (World Bank 1993c; Stuart, Adams, and Jenkins 1990; Robinson and de Graaff 1992).

Morocco

The following MPAs include a subtidal component:

- Baie de Khnifiss Biological Reserve and Ramsar site: Shallow tidal coastal lagoon with salt flats, cliffs, open water, mud flats and saltmarsh; abundant fish due to offshore upwelling; important for migrant birds (Jones 1993).
- Merja Zerga Biological Reserve and Ramsar site: Large coastal lagoon with extensive intertidal mudflats and fringing marshes; important wintering area for more than 50,000 birds (Jones 1993).

Additional coastal areas include:
- Souss-Massa National Park
- Sidi Boughaba Biological Reserve and Permanent Hunting Reserve; Merja Sidi Boughaba Ramsar Site (also listed as a proposed site by WCMC): Permanent brackish freshwater lagoon, separated from sea by dune system (may not contain intertidal water); important for migrant birds (Jones 1993).
- Oualidia Lagoon Hunting Reserve: Also listed by WCMC as a proposed site.
- Nador Nature Reserve
- Oued Chebeika Nature Reserve
- Sebkhet Sidi Bou Areg Nature Reserve
- Sidi Moussa Nature Reserve: Also listed by WCMC as a proposed site.
- Ile de Skhirate Permanent Hunting Reserve
- Ile d’Essaouira (Ile de Mogador) Reserve


Namibia

There are no MPAs with a subtidal component recorded. Other coastal areas include:
- Namib Naukluft Game Park: Extensive sand dunes along coast; includes Sandvis (Sandwich Harbor), internationally important wetland with saline lagoons and overwintering migrants and 20,000 Cape Cormorants; also flamingoes, gulls, herons and other birds (Robinson and de Graaff 1992); site account in IUCN/UNEP (1987).
- Skeleton Coast Game Park: Sandy beaches, rocky shores, high dunes in north; seals; interesting marine fauna due to overlap of cold and warm water masses (Robinson and de Graaff 1992); site account in IUCN/UNEP (1987).
- Cape Cross Seal Nature Reserve: National West Coast Tourist Recreation Area.

Nigeria

No marine or coastal protected areas are recorded.

Senegal

The following MPAs include a subtidal component:

- Delta du Saloum National Park and Biosphere Reserve: In the delta of the Sine and Saloum Rivers; four-fifths of the 76,000 hectares MPA is marine; biosphere reserve covers lagoon; 73,000 hectares is a Ramsar Site; mangroves predominate; also sand islands, lagoons; manatee, dolphins, four turtle species, important fish spawning ground, major bird colonies on islands (World Bank 1993c; Robinson and de Graaff 1992); site account in IUCN/UNEP (1987) and Jones (1993); see below for recommendations.
- Langue de Barbarie National Park: Includes 20-kilometer long sand dune spit with marine waters, intertidal flat across the mouth of the Senegal River and three sandy islands; seabird colonies (especially Little Terns, Gull-billed terns and Royal Terns), four species of nesting turtles, manatee, dolphins (World Bank 1993c; Robinson and de Graaff 1992); site account in IUCN/UNEP (1987).
- Iles de la Madeleine National Park: Three volcanic islands, and the area within 50 meters of the shore; diverse avifauna, nesting seabirds; three dolphin species; breeding loggerheads (World Bank 1993c; Robinson and de Graaff 1992); site account in IUCN/UNEP (1987).
- Gueumbeul Special Faunal Reserve: Saline lagoon with relict mangroves; important for waders and migrants; Ramsar Site (World Bank 1993c; Robinson and de Graaff 1992); site account in Jones (1993).
- Basse-Casamance National Park: 5,000 hectares with numerous tidal channels, mangroves, bare salt flats; manatee (World Bank 1993c; Robinson and de
Kalissaye Special Reserve: Headland and two sandy islands at mouth of R. Kalissaye; seabird colonies, nesting green and loggerhead turtles, manatee (World Bank 1993c; Robinson and de Graaff 1992); site account in IUCN/UNEP (1987).

Additional coastal areas include:

- Popenguine Special Faunal Reserve: Includes 2.5-kilometer shoreline of eroded cliffs; not clear if intertidal habitat included (World Bank 1993c).
- Island of Goree: World Heritage Site; further information needed; not listed in World Bank (1993c).

Robinson and de Graaff (1992) include the Djoudj National Park and the Ndiael Faunal Reserve, but it is not clear whether these contain intertidal areas—a dike has been built all round the Djoudj NP and the map in Jones (1993) suggests they both lie inland. Both Robinson and de Graaff and WCMC list the Foret Classe de Samba Dia as an MPA, but there is no data to indicate this includes intertidal areas.

**Sierra-Leone**

There are no MPAs with a subtidal component recorded. Other coastal areas include:

- Western Forest Reserve (described in Schwartz 1992).

**South Africa**

A full description of the MPAs of South Africa can be found in Robinson and de Graaff (1993).

Although South Africa has a long record of terrestrial nature conservation, protection of coastal and marine habitats has only comparatively recently received noteworthy attention. The recent establishment of a Council for the Environment was a major step forward toward regulated and efficient coastal zone management in South Africa. The Council is advised by a number of dedicated committees, including the Committee for Coastal and Marine Systems.

There are some 118 protected areas along the South African coast. The degree to which they conserve the marine environment varies; with a few exceptions most Nature Reserves (that are proclaimed at the national level) do not extend below high water mark. The Seashore Act (1935) provides ownership of the coast below high water mark to State Authorities. Conservation of the marine environment can be achieved through the National Parks Act (1976) or by designation as a Marine Reserve under fisheries legislation.

There are site accounts for some areas in IUCN/UNEP (1987) and many more site accounts in Robinson and de Graaff (1993). The more important MPAs are:

**West Coast Province:**

- Cape of Good Hope Marine Reserve
- Elephant Rock Marine Reserve
- Glencairn Marine Reserve
- Gxulu Marine Reserve
- Kalk Bay Marine Reserve
- Miller's Point Marine Reserve
- Kommetjie Rock Lobster Reserve
- McDougall's Bay Rock Lobster Reserve
- Saldanha Bay Rock Lobster Sanctuary
- St. Helena Bay Rock Lobster Sanctuary
- Table Bay Rock Lobster Sanctuary
- Orange River Mouth Wetland Ramsar
- Verlorenvlei Wetland (Elands Bay) Ramsar
- West Coast National Park

**South Coast Province:**

- De Hoop Marine Reserve
- Gonubie Nature (Marine) Reserve
- Robberg Marine Reserve
- Tsitsikamma National Park
- East Coast Province:
- Sodwana Bay National Park
- St. Lucia Marine Reserve
Trafalgar Marine Reserve
Umdoni Park Marine Reserve

Togo

No marine or coastal protected areas are recorded.

Western Sabara

No marine or coastal protected areas are recorded.

Zaire

There is one MPA with a subtidal component recorded:
Parc National Marine

There is one other coastal area:

Tristan da Cunha

The are no MPAs with a subtidal component recorded. Other coastal areas include:
- Gough Island Wildlife Reserve: Intertidal terrain.

Ascension

No marine or coastal protected areas are recorded.

Canary Islands

No marine or coastal protected areas are recorded.

Cape Verde Islands

No marine or coastal protected areas are recorded.

Sao Tome and Principe

No marine or coastal protected areas are recorded.

St. Helena

No marine or coastal protected areas are recorded.

International and Regional Initiatives Relating to MPAs

World Heritage Convention

Thirteen countries in the region are party to this convention: Benin, Cameroon, Cape Verdes, Congo, Cote d'Ivoire, Gabon, Gambia, Ghana, Guinea, Mauritania, Nigeria, Senegal and Zaire. However, there are only two marine/coastal World Heritage Sites: the Island of Goree in Senegal, and part of the Banc d'Arguin National Park in Mauritania. Only the latter includes subtidal elements. Gough Island, in the Tristan da Cunha group, is to be nominated as a World Heritage Site.

Ramsar Convention

Eight countries are party to this convention: Gabon, Gambia, Ghana, Guinea-Bissau, Mauritania, Morocco, Senegal, South Africa. St. Helena, Ascension and Tristan da Cunha are included in the U.K.'s ratification of Ramsar, but sites have yet to be designated (Hepburn, Oldfield, and Thompson 1992). A large number of Ramsar sites have been designated on the mainland coast and many others recommended for designation. However, many do not yet have full protection under national legislation.

The following Ramsar sites have been established along the West African Coast:
- Gabon: Wongha-Wonghe (Petit Loango and Sette Cama).
- Ghana: Owabi (Muni Lagoon, Densu Delta, Sakumo Lagoon, Songor Lagoon, and Anlo-Keta Lagoon Complex).
- Guinea: Owabi (Guineale Alcatras, Iles Tristao, Rio Kapatchez, Rio Pongo, Konkoure, and Ile Blanche).
- Guinea-Bissau: Lagoa de Cufada.
- Mauritania: Banc d'Arguin.
- Morocco: Merja Zerga, Merja Sidi Boughaba, and Baie de Knifiss.
• Senegal: Delta du Saloum and Gueumbeul.
• South Africa: De Hoop Vlei (De Mond (Heuningnes Estuary), Turtle Beaches/Coral Reefs of Tongaland, St. Lucia System, Langebaan, Wilderness Lakes, Verlorenvlei, Orange River Mouth, Kosi Bay, and Lake Sibaya).

It has not been possible to determine which of these sites include a marine component.

**MARPOL**

No areas in the region are listed under MARPOL.

**Biosphere Reserves**

Part of the Delta du Saloum National Park in Senegal is a Biosphere Reserve. St. Helena has been recommended as a Biosphere Reserve (Report 1993).

**UNEP Regional Seas Program**

The Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region, and its associated Protocol on Combating Pollution in Cases of Emergency, came into force in 1984. The Action Plan has been adopted and a number of initiatives have been undertaken that focus mainly on combating pollution and developing the infrastructure, legislation and training for management of the marine environment. The Convention has been ratified by Cameroon, Gambia, Ghana, Guinea, Cote d’Ivoire, Nigeria, Senegal and Togo (UNEP 1989). Robinson and de Graaff (1992) also list Congo, Gabon, Mauritania, Morocco, Sierra Leone, Liberia, Angola, Cape Verdes and São Tomé as participating.

**Assessment of Representation of Biogeographic Zones within MPAs**

The degree to which MPAs in the West African region represent the biogeographic zones proposed by Hayden and others (1984) is discussed below. (Table 8.2 provides an overview of MPA distribution.) This assessment considers only those areas recorded with a subtidal component.

The two largest coastal realms, the northern and southern components of the Western Subtropical Realm, include 31 MPAs (about 74 percent of the total number). These two components include more than 60 percent of the coastline in the region. For the latter component it should be noted that 13 of the 17 areas lie along the South African coast; there are no marine areas in Namibia (although long stretches of coastal land are protected in Game Parks), three in Angola and one in Zaire. The northern component is better represented by MPAs in Guinea-Bissau, Senegal, the Gambia, Mauritania and Morocco, although there are no MPAs along the coast of Western Sahara.

Marine areas in the Western Tropical and Intertropical Realms are very poorly represented with none in the former and two in the latter (in Cameroon and Gabon). There are no MPAs along the tropical stretch of coast running from Guinea to Nigeria, a distance of more than 3,000 kilometers.

The southern and eastern part of the region, which falls in the Eastern Subtropical Realm, is included in 9 South African MPAs. A substantial length of the South African coast is protected in some form, although in only relatively few instances does this protection extend to intertidal and subtidal areas. South Africa, with 22 MPAs, accounts for 50 percent of the MPAs in the region.

**Table 8.2 MPAs in Major Coastal Realms of the West African Marine Region**

<table>
<thead>
<tr>
<th>Coastal Realm</th>
<th>Number of MPAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Tropical</td>
<td>0</td>
</tr>
<tr>
<td>Western Intertropical</td>
<td>2</td>
</tr>
<tr>
<td>Western Subtropical (North)</td>
<td>14</td>
</tr>
<tr>
<td>Western Subtropical (South)</td>
<td>17</td>
</tr>
<tr>
<td>Eastern Subtropical</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
</tr>
</tbody>
</table>
The marine areas around offshore islands in the region are not well represented; no subtidal MPAs were recorded in any of the island groups, with the exception of the Bijagós Archipelago.

**PRIORITY AREAS AND RECOMMENDATIONS**

**National Priorities for the Establishment and Management of MPAs**

**Angola**

Existing MPAs that require management support:

There is no information concerning management requirements for the three existing MPAs.

Proposed new MPAs:


**Benin**

Existing MPAs that require management support:

There are no existing MPAs.

Proposed new MPAs:

- Proposed Reserve de la Biosphere du Djessin (10,000 hectares): A littoral eco-type with stands of mangrove (World Bank 1993a; Schwartz 1992).
- Wetlands of the coastal plains (6°4'N 2°6'E) (proposed MPA; 2,500 hectares open water, 26,500 hectares seasonal wetland): Estuarine, diverse fish and birds; sitatunga may survive (Stuart, Adams, and Jenkins 1990; World Bank 1993a; Robinson and de Graaff 1992); semi-continuous line of narrow, weakly tidal lagoons and swamps that connect at the mouth of the Mono River on the Togo border with those that surround lakes Nokoué and Lake Porto-Novo on the Nigerian border; lower swamps are tidal and support scattered mangroves: Several marine fish species and prawns enter the lagoons to breed and juveniles use the area as a nursery; site description in Hughes and Hughes (1992).
- Lake Nokoué and Porto Novo (6°25’N, 2°27’E); (proposed MPA 103,600 hectares including 17,600 open water): Lake opens to sea via 5-kilometer long channel; surrounded by brackish freshwater marshes and some mangroves; important for waders and waterfowl (Altenburg 1987; Schwartz 1992); site description in Hughes and Hughes (1992).

**Cameroon**

Existing MPAs that require management support:

- Douala-Edea Faunal Reserve

Proposed new MPAs:

- Bakossi Peninsula Mangroves (4°32’N, 8°35’E): Extensive areas of mangroves at mouth of estuary of Rio del Rey and Akwayafe River (IUCN 1987; World Bank 1993a).
- Rio del Rey (4°20’–4°56’N, 8°32’–9°02’E): 180,000 hectares mangrove and 4,000 hectares mudflats; important estuary for waders and waterfowl, major mangrove fauna, fish (Altenburg 1987; Stuart, Adams, and Jenkins 1990).
Congo

Existing MPAs that require management support:
There are no existing MPAs.

Proposed new MPAs:
- Kouilou Estuary Mangroves (4°25'S, 11°56'E) (World Bank 1993a)

Cote d'Ivoire

Schwartz (1992) noted that the Cote d'Ivoire protected area system is well developed with the exception of marine ecosystems that are at risk and need to be included in conservation priorities.

Existing MPAs that require management support:
There are no existing MPAs.

Proposed new MPAs:
- Hughes and Hughes (1992) describes the series of lagoons and marshes on the eastern coast composed of four large complexes: Fresco, Tadio, Ebrie and Aby Lagoons. In other publications important sites are identified as follows:
  - Azagny National Park: This area could be expanded to include marine elements; a management plan should be developed and infrastructure strengthened (Schwartz 1992).
  - Aby Lagoon (5°18'N, 3°13'W): Large brackish lagoon fringed with freshwater marshes, swamp forest and mangroves; important for waterfowl (World Bank 1993a; Altenburg 1987; Robinson and de Graaff 1992).
  - Azuretti Mangroves (5°12'N, 3°48'W): Extensive mangrove and swamp forests around mouth of Ebrie lagoon; important for waterbirds (Altenburg 1987; World Bank 1993a).

Equatorial Guinea

Existing MPAs that require management support:
There are no existing MPAs.

Proposed new MPAs:
- South coast of Isla de Bioko (3°10'-3°50'N, 8°25'-9°00'E): Coast with adjacent volcanic caldera and forests proposed for protection; nesting green and hawksbill turtles; important endemic terrestrial fauna (World Bank 1993a; Stuart, Adams, and Jenkins 1990; IUCN 1987).
- Sette-Cama Hunting Area

Gabon

Existing MPAs that require management support:
- Sette-Cama Hunting Area

Proposed new MPAs:
- Akanda Mangroves (0°35'-0°40'N, 9°26'-9°33'E): 7,500 hectares network
of mangrove-covered islands and tidal channels with forest on higher ground; diverse fauna, including waterbirds (World Bank 1993a; IUCN 1990).

- **Elobey Islands (1°00′N, 9°31′E):** Coral reefs (World Bank 1993a; IUCN/CNPPA 1991).

- **Mondah Reserve (0°34′N, 9°20′E):** Includes Cape Esterias that has coral reefs; proposed as a site for scientific study and education (IUCN 1990; World Bank 1993a).

- **Ozouri (1°02′–1°22′S, 8°53′–9°08′E):** Recommended as a national park (IUCN 1990); 44,000 hectares; includes lagoons, mangroves and other coastal habitats; diverse waterfowl; breeding leatherback turtles (World Bank 1993a).

**The Gambia**

Previous analysis have identified the need to address shortcomings in the development of protected areas policy and legislation, including for MPAs (Schwartz 1992). More effective surveillance and management of coastal and estuarine fisheries is also a priority.

Existing MPAs that require management support:

- **Niumi-Sine Saloum National Park:** Improved management is required. Consideration should be given to establishing a cross-border Biosphere Reserve and Ramsar site with Senegal's Sine Saloum Delta National Park (Schwartz 1992).

Proposed new MPAs:

- There are no existing MPAs.

**Ghana**

Existing MPAs that require management support:

- **Songor Lagoon (5°45′N, 0°30′E):** coastal lagoon (Jones 1993).

Proposed new MPAs:

- **Anlo-Keta Lagoon Complex (5°55′N, 0°50′E):** Designated 1992; good stands of mangrove; of all coastal wetlands of Ghana this lagoon supports the largest populations of shorebirds (40,000 waders, 3,000 terns, 8500 herons and waterfowl during peak periods) (World Bank 1993b; Robinson and de Graaff 1992; Jones 1993).

- **Densu Delta (5°33′N, 0°18′E):** (Jones 1993).

- **Muni Lagoon (5°22′N, 0°40′E):** coastal saline lagoon and marsh (Jones 1993).

**Guinea**

Existing MPAs that require management support:

- There are no existing MPAs.

Proposed new MPAs:

- **Ile Alcatraz (10°38′N, 15°23′W):** Rocky islet of 0.75 hectares with sandy intertidal areas; Ramsar site includes Ile de
Naufrage (1 hectare); one of few breeding sites in West Africa for Atlantic race of the brown booby *Sula leucogaster*—about 3,000 pairs, also six species of tern; also important nesting colony on Ile de Naufrage; dolphins, manatees, marine turtles (Altenburg 1987; IUCN 1987; WIWO 1989; World Bank 1993a; Schwartz 1992).

Blanche Island (9°26'N, 13°46'W): Possible breeding ground for two species of marine turtle.

Iles Tristao (10°53'N, 15°03'W): 85,000 hectares; estuarine complex at mouth of River Kogon, with two main islands; mangroves, dunes, 2,300 hectares of mudflats at low tide; large breeding populations of spoonbills, ibis and Caspian tern; many other birds; manatee, hippopotamus (Altenburg 1987; IUCN 1987; WIWO 1989; World Bank 1993a; Jones 1993), has also been recommended as a Biosphere Reserve.

Konkoure Estuary (9°45'N, 13°41'W): 90,000 hectares; part of delta of Konkoure River; extensive intertidal mud/sandflats and mangroves important for resident and wintering shorebirds; dolphins, manatees; Sangareya Bay mangroves cover 28,000 hectares on southern bank of estuary and around bay; diverse fauna, especially feeding avocets (Altenburg 1987; Hughes and Hughes 1992; World Bank 1993a; Robinson and de Graaff 1992; Jones 1993).

Rio Kapatchez (10°25'N, 14°33'W): Complex of mangroves, intertidal mud/sandflats, marshy coastal plain, sand dunes, nesting birds, flamingoes (Jones 1993).

Rio Pongo (Boffa Mangroves) (10°10'N, 14°02'W): 46,000 hectares of almost pristine mangroves on Pongo River estuary (among the best on the Guinean coast); important for waterfowl, manatee and other fauna (Altenburg 1987; World Bank 1993a; Robinson and de Graaff 1992; Jones 1993).

Other important areas that have been identified include:

- Rio Komponi (Kogon) and Rio Nunez Mangroves (10°51'N, 14°42'W): 124,000 hectares of tidal forest, with mangroves and diverse fauna; potential Ramsar Site (Altenburg 1987; Hughes and Hughes 1992; World Bank 1993a; Robinson and de Graaff 1992 (as Kapatchez Delta).
- Forecariah Mangroves (9°15'N, 13°17'W): Large areas of swamps, mudflats, mangroves; probably important fauna (Altenburg 1987; World Bank 1993a).

**Guinea-Bissau**

Existing MPAs that require management support:

Bijagos Archipelago Hunting Reserve (see below)

Proposed new MPAs:

- Bijagos Archipelago Hunting Reserve and Proposed Biosphere Reserve (11°3'N, 16°0'W): Including the existing Bijagos Hunting Reserve: a group of islands extremely rich in organic materials and plankton and supports a highly diverse fauna, in addition to being an important breeding and nursery zone for fish and crustaceans (critical importance for the fishing industry); mangroves, including a rare species *Laguncularia racemosa*, cover almost one-third (35,000 hectares) of the total surface of the islands; mudflats cover 76,000 hectares; area largely untouched except by local inhabitants, the Bijagos culture, who are also at...
risk. The archipelago is an important feeding and resting place for wintering shorebirds, over one million using this area, making it the most important West African wintering ground for Palearctic shorebirds after the Banc d'Arguin in Mauritania; also 10,000–15,000 pairs of breeding waterbirds. The presence of sea-going hippopotamus (*Hippopotamus amphibius*) has been recorded. The phytoplankton-rich coastal waters support a large marine fauna, including species such as mullet, shrimp, shad, sea catfish, barracuda, grouper, snapper, corvina, mollusks; regionally important stocks of five turtle species (green, loggerhead, olive ridley, hawksbill, leatherback); Ilhau do Poilao is possibly largest breeding ground for green turtles in West and Central Africa; crocodiles and marine mammals such as bottlenose dolphin (*Tursiops truncatus*), humpback dolphin (*Sousa teuszii*), and manatee (the largest population in West Africa is found here) (World Bank 1993b; Stuart, Adams, and Jenkins 1990; WCMC 1991b; Robinson and de Graaff 1992).

Possible future overfishing would seem to be the greatest threat to this area. Expansion of artisanal and commercial fisheries, could interfere in recruitment and migration of fish and upset the ecological balance that now exists in this area. At the present time fishing is by local inhabitants and is subsistence-based. The Biosphere proposal includes a draft zoning system and recommendations for further inventory and study within the area. Within the archipelago the Orango islands, comprising an area of around 68,000 hectares (including a 1-kilometer marine zone around the islands), probably harbors the greatest biological diversity and requires special protection.

**Rio Cacheu (12°02'–12°20'N, 15°13'–16°42'W):** Area extending to Ilha de Jeta with 9,500 hectares of mudflats, 52,000 hectares estuarine mangroves, 24,000 hectares swamp and marsh; important for Palearctic waters and other waterfowl, shrimp production; has been proposed as a national park (World Bank 1993b; Altenburg 1987; WCMC 1991b; Schwartz 1992; Robinson and de Graaff 1992).

Other important sites include:

- **Rio Geba Estuary (11°43'N, 15°14'W):** 17,500 hectares mudflats, 3,000 hectares mangrove 13,000 hectares marshes; important for waterbirds (Altenburg 1987; WCMC 1991b; World Bank 1993b).
- **Rio Grande de Buba Basin (11°25'N, 15°23'W):** 13,000 hectares rocks and mudflats 17,000 hectares mangroves, important for resident and migrant waders (Altenburg 1987; WCMC 1991b; World Bank 1993b).
- **Rio Mansoa Basin (11°54'N, 16°00'W):** River and islands lined by 11,000 hectares mudflats, 50,000 hectares mangroves (up to 50 kilometers inland); international importance for W. European populations of black-tailed godwit *Limosa limosa* and other birds; incorporates Rio Mansoa Hunting Reserve (Altenburg 1987; WCMC 1991b; World Bank 1993b).
- **Rio Tombali (11°11'N, 15°05'W):** Includes estuaries of Rio Cumbija and Rio Cacine, with 32,500 hectares coastal mudflats, 78,500 hectares mangroves; biologically the richest area in the country, important for numerous birds, resident and Palearctic waders (WCMC 1991b; World Bank 1993b).

**Liberia**

Existing MPAs that require management support:

There are no existing MPAs.
Proposed new MPAs:
- Cape Mount proposed National Park (6°4'N, 11°21'W): 55,400 hectares: lagoons and mangroves, important turtle nesting beach; Lofa mouth and mangroves to east are important roosting place for waders and waterfowl; Lofa is the only large estuary in Liberia with no villages (Stuart, Adams, and Jenkins 1990; World Bank 1992b, Gatter 1988; Robinson and de Graaff 1992).
- Cestos-Senkwen proposed National Park (various spellings—Sankwen, Saukwen, Sehnkwehn) (5°20'N, 9°25'W): 145,000 hectares to include estuaries with 1,200 mangroves; diverse mammal and bird fauna (Gatter 1988; Hughes and Hughes 1992; IUCN/UNEP 1987; World Bank 1993b; Robinson and de Graaff 1992).

Mauritania

Existing MPAs that require management support:
- Banc d'Arguin National Park: 1,173,000 hectares of which 50 percent is marine, consisting mainly of large stretches of coastal seas 14 islands, mudflats; 3,100 hectares of mangrove (the most northerly in West Africa); designated as a Ramsar site in 1982 and part as a World Heritage site in 1989; shallow coastal waters between Cap Blanc and Cap Timiris benefit from an upwelling that greatly increases their biological productivity; shallow tidal flats important as breeding and nursery areas for fish and crustaceans; seagrass beds (Zostera spp.) cover about 70,000 hectares, mostly around Tidra Island and Argui Bay; the most important site for over-wintering migrants (30 percent of seven million wading birds that use Atlantic flyway) in West Africa, and breeding ground for thousands of aquatic birds (white pelicans (Pelecanus onocrotalus), grey heron (Ardea cinerea monicae), spoonbill (Platalea leucorodia), reed cormorant (Phalacrocorax) and others; marine turtles (green, loggerhead, hawksbill, leatherback); marine mammals including the killer whale (Orcinus orca), Atlantic humpback dolphin (Souza teuszi), bottlenose dolphin (Tursiops truncatus), Risso's toothed dolphin (Grampus griseus), fin whale (Balaenoptera physalus), common porpoise (Phocoena phocoena). Largest known colony (150 individuals; 25 percent of world population) of Mediterranean Monk seal (Monachus monachus) (Robinson and de Graaff 1992; Jones 1993; World Bank 1993c; IUCN/UNEP 1987 [site account]). Lack of effective protection, although little human disturbance in terrestrial areas. However, poaching of marine turtles results from lack of constant patrolling within and around the Park. Overfishing by international fishing fleets in the waters off the Banc d'Arguin may present an important threat to the fish populations and thus bird populations; status of monk seal critical following collapse of breeding caves in 1982. Financing is required to improve management in these areas and to develop a research plan for the park; Netherlands is supporting a major research program and may supply a seagoing vessel for fishery patrol and research (World Bank 1993c; Schwartz 1992; Price and de Grissac).

Proposed new MPAs:
- Aftout es Saheli: 120,000 hectares coastal lagoon extending 165 kilometers from Nouakchott to St. Louis in Senegal; northern part of Senegal R.
Delta; important for fish and waterfowl; recommended as a Ramsar site (World Bank 1993c; Schwartz 1992; Hughes and Hughes 1992).

**Morocco**

Existing MPAs that require management support:
- Khnifiss/Puerto Cansado Biological Reserve
- Merja Zerga Biological Station

Proposed new MPAs:
Moroccan authorities envisage the establishment of Dakhla National Park to include marine areas covering the complete shore of Dakhla province for the protection of the monk seals.

**Namibia**

Existing MPAs that require management support:
There are no existing MPAs although long stretches of coastal land are included in the Skeleton Coast and Namib Naukluft Game Parks.

Proposed new MPAs:
Robinson and de Graaff (1992) identify Wetlands along the Namibian coast (6°5′N, 2°7′E) as a high priority. There are some 14 areas of sheltered, shallow saline waters between and inclusive of the Orange (in the south) and Cunene (in the north) rivers. They support sub-continentally and globally important migratory bird populations and five are considered candidate Ramsar sites (Nole-Peard and Williams 1991).
- Sandwich Harbor: Recommended as Ramsar Site (Robinson and de Graaff 1992)
- Walvis Bay wetland: Recommended as Ramsar Site (Robinson and de Graaff 1992)

Swakopmund Saltworks: Recommended as Ramsar Site (Robinson and de Graaff 1992)

Orange River Mouth: The South African side of this is already a Ramsar site (see below)

Cape Cross lagoons.

**Nigeria**

Existing MPAs that require management support:
There are no existing MPAs.

Proposed new MPAs:
The three main wetland areas along the coast of Nigeria are characterized by the presence of mangroves and are important breeding and nursery grounds for fish and crustacean species typical of those in West Africa. They are some of the most extensive and valuable coastal wetlands in West Africa. Some rare fish species are present (*Polyterus palmas conicus*, *Tetraodon pustulatus*) and the fish fauna in general may be particularly diverse. These three areas should be priorities within Nigeria for the establishment of protected areas. The Lagos and Lekki lagoon system and the delta of the Niger River are both under strong pressure from the surrounding human population. Land conversion, overfishing, pollution and deforestation are all major threats.
- Lagos and Lekki lagoons and system (6°22′–6°38′N, 2°48′–4°6′E): Proposed protected area of 155,355 hectares with 99,875 hectares open water and 55,460 hectares mangrove; entire system under tidal influence; 79 species of pelagic and riverine fish recorded (Altenburg 1987; Robinson and de Graaff 1992; World Bank 1993b).
- Niger Delta (4°16′–4°40′N, 5°30′–7°35′E): Large mangrove areas especially at Taylor’s Creek and Stubb’s Creek (both proposed game reserves,
wildlife sanctuaries); diverse mammal and bird fauna; proposed protected area of 3,226,000 hectares (Stuart, Adams, and Jenkins 1990; World Bank 1993b; Schwartz 1991). (N.B.: according to map in World Bank 1993b, Stubb's Creek is not in the Delta).

Cross River wetlands and delta (6°27'N, 7°27'E): Recommended as Ramsar site, 45,000 hectares; mangroves; fauna richer than in other parts of West Africa, and more like that of Cameroon (Schwarz 1991; Robinson and de Graaff 1992); not listed in World Bank 1993b.

Other sites listed in World Bank (1993b): Benin River mangroves, Calabar Estuary (80,000 hectares mangrove and 4,000 hectares mudflats, important for waterfowl (Altenburg 1987)).

**Senegal**

Senegal possesses five MPAs along its coast. Schwartz (1992) noted that despite this there is no appropriate surveillance of offshore and estuarine fisheries and fish species and stock sizes are not well known. Existing MPAs lack effective management and should be given highest priority treatment.

Existing MPAs that require management support:

- Delta of the Sine and Saloum Rivers: On the border between Senegal and The Gambia; includes the Delta du Saloum National Park and Biosphere Reserve in Senegal and the Niumi/Sine Saloum National Park in Gambia (both described above). The former is threatened by excessive fishing, destruction of bird colonies, rice culture and cutting for fuelwood. The development of a management plan is urgent (Schwartz 1992). It may be appropriate for a joint Ramsar site and Biosphere Reserve to be established between the two parks. Joint management of mangrove, fish and shrimp stocks and joint surveillance of the parks (particularly the marine areas) should be encouraged.

- Langue de Barbarie National Park: A revised management plan should be developed for this park and training should be supplied to Park staff. The development of ecological tourism in the area in collaboration with local populations could alleviate some of the financial strains on the Park (Schwartz 1992).

- Gueumbeul Special Reserve: Efforts should be intensified to integrate the reserve with the improved natural resources management being invested in the surrounding area. Its educational value should also be developed (Schwartz 1992).

- Iles de la Madelaine: As part of a general plan to establish surveillance of fishing activities along the Senegalese coast, the park should be a priority area for strict control of both commercial and sports fishing (particularly by tourists). A new boat is needed for park management in addition to a campaign to educate local fishermen. The area offers potential for ecological tourism (Schwartz 1992).

- Basse-Casamance National Park: It has been suggested that protection should be extended to a much wider area than is currently covered by the Basse Casamance National Park (World Bank 1993c). Local populations need to participate more effectively in Park management and in the development of ecological tourism (Schwartz 1992).

Proposed new MPAs:

No new MPAs are proposed.
Sierra Leone

Existing MPAs that require management support:

There are no existing MPAs.

Proposed new MPAs:

- **Bunce River (Sierra Leone River System)** (8°50'-8°75'N, 12°36'-13°05'W): Extensive mangrove forests; over 20,000 migrant wading birds; the Bunce River has a rich flora and fauna and is a spawning ground for marine organisms; manatees may still occur; the area is threatened by local fishery exploitation and cutting of mangroves to supply fuelwood; proposed as a Biosphere Reserve (perhaps on the model being developed for the Bijagos Archipelago) (Schwartz 1992).

- **Yawri Bay-Shenge/Kagboro Creek** Area: A protected area is proposed to include around 20,000 hectares of coastal land and 9,000 hectares of intertidal terrain. This could be expanded to include the coastal waters.

- **Turtle Islands** (7°38'N, 13°02'W): Small islands including Mut and Yele, off the tip of the Sherbro Peninsula; important marine turtle nesting area (Stuart, Adams, and Jenkins 1990; World Bank 1993b).

Other areas include:

- **Bonthe Mangrove Swamp proposed Strict Nature Reserve** (7°33'N, 12°40'W): 10,101 hectares covering the greater area of the Sherbro River Delta; 120,000 hectares of mangroves 10,500 hectares of mudflats and 65 kilometers of sandy beach; important for wintering Palearctic waders (Altenburg 1987; IUCN 1987, Stuart, Adams, and Jenkins 1990; World Bank 1993b).

- **Bumpe Mangrove Swamp proposed Game Sanctuary** (8°07'N, 12°54'W): 4,921 hectares of mangrove; and Kagboro Creek (Yawri Bay) proposed Game Reserve (7°48'-8°37'N, 12°36'-13°05'W): 60,000 hectares mangroves and 7,550 hectares mudflats, important for wintering Palearctic waders (over 20,000); area of 5,000 hectares proposed for protection within the sanctuary (Altenburg 1987; World Bank 1993b; Robinson and de Graaff 1992).

- **Lake Mape and Lake Mabesi proposed National Park** (7°10'N, 11°43'W): 7,511 hectares mainly freshwater, but adjacent to proposed Kpaka-Pujehun Game Reserve covering 2,500 hectares mangroves; important for waterfowl, manatees and other fauna (Gatter 1988; IUCN 1987, Stuart, Adams, and Jenkins 1990; World Bank 1993b; Robinson and de Graaff 1992 (give different area)).

- **Scarcies River Estuary** (8°32'-9°05'N, 12°51'-13°18'W): 19,000 hectares mangroves, 4,000 hectares mudflats or sandbanks; important for wintering waders, especially avocets (Altenburg 1987; Stuart, Adams, and Jenkins 1990; World Bank 1993b).

- **Sewa-Waanje Game Reserve** (7°22'N, 12°05'W): 10,000 hectares mangroves and lakes, manatees (Stuart, Adams, and Jenkins 1990; World Bank 1993b).

- **Sierra Leone River and Freetown Peninsula** (8°10'-8°47'N, 12°48'-13°18'W): 42,000 hectares mangroves, 50 kilometers sandy beaches on western side of peninsula, 2000 hectares mudflats; important for wintering waders (Altenburg 1987; Stuart, Adams, and Jenkins 1990; World Bank 1993b).

- **Sulima Mangrove Swamp proposed Strict Nature Reserve**: 2,590 hectares (World Bank 1993b).

South Africa

Existing MPAs that require management support:
No areas identified.

Proposed new MPAs:
Robinson (1991) listed marine and adjacent onshore conservation areas that have been recommended as prime candidates for special protection and management, with marine boundaries at least 12 nautical miles offshore. The Committee on Coastal and Marine Systems noted the desirability of establishing areas large enough to withstand external pressures, and that consequently a few large areas are better than a large number of small ones. The areas identified by the Committee are listed below:

- The Richtersveld: Mainly the Richtersveld area, including the estuary of the Orange River and the alluvial mining operations along the coast.
- The Namaqualand Coast: Mainly the coast between the Spoeg and Groen rivers, including the adjoining terrestrial environments.
- The Longebaan Coast: Langebaan Lagoon, Saldahana Bay and adjacent islands, including Dassen Island, south to Bok Bay and inland fossil beds.
- The Cape Peninsula Coast: Table Mountain, the Cape Peninsula, Robben Island, False Bay, and east to the Bot River estuary.
- The De Hoop Coast: The fynbos area and the coastline as far as west as Quoin Point, including the coast to the east of the present De Hoop Reserve. A reference area on the Agulhas Bank would be incorporated in the marine component of this site.
- The Garden Route Coast: The area between George and the eastern boundary of the Tsitsikamma Coastal National Park, including the Outeniqua and Tsitsikamma mountain ranges.
- The Woody Cape Coast: The area from the mouth of the Sundays River east to Kenton-on-Sea and including the Alexandria Forest, Bird and St. Croix islands.
- The Southeast Coast: The area between the Kwenxura and Quko rivers, just north of East London; important estuaries in a natural state.
- The Mtamvuna Coast: The Estuary on the border of Transkei and Natal, and the coastline to the east. Representative of Natal's marine flora and fauna.
- The Maputuland Coast: The area north of the Umfolozi Estuary in Zululand to the Mozambique/Kwazulu border at Ponta do Ouro, including Lake St. Lucia and the Sibaya and Kosi Bay systems. Unique and the most tropical marine area in South Africa, with highest species diversity; Kosi Bay system rich in fish fauna.

The committee also identified the Prince Edward Islands (the Subantarctic island group southeast of Southern Africa) as a marine conservation area. It was proposed that the 200 nautical miles exclusive fishing zone would form the seaward boundary of the area. These islands fall within the CNPPA Antarctic Marine Region but are mentioned here for information.

Togo

Existing MPAs that require management support:
There are no existing MPAs.

Proposed new MPAs:
- Lakes Togo and Vogan and coastal lagoons: 6,400 hectares open water, 38,000 hectares seasonally inundated
land; small areas of mudflat and mangrove; important for waterfowl and waders (Schwartz 1992; World Bank 1993a; Altenburg 1987).

Westem Sabara

WCMC lists three proposed MPAs: Cap Bojador, Côte des Phoques, and Laadeim Coast. Further information on these sites is needed.

Zaire

Existing MPAs that require management support:

Proposed new MPAs:
- No areas have been identified.

Tristan da Cunba

No areas have been identified.

Ascension

Existing MPAs that require management support:
- There are no existing MPAs.

Proposed new MPAs:
- Several beaches provide important nesting sites for the green and olive Ridley turtles (*Chelonia midas* and *Lepidochelys olivacea*) as well as for three other turtle species. Ascension Island is a globally important nesting beach for green turtles, with 1,800–2,000 females nesting each year; hawksbills also nest there (Mortimer and Carr 1984).
- Boatswain Bird Islet: Total protection required (Williams 1984); as the single most important seabird nesting site in the South Atlantic, Ascension needs appropriate management. Measures are underway and a management plan is to be developed as part of the ODA funded project to manage St. Helena (see below).

Canary Islands

Le Grand, Emmerson, and Martin (1984) recommended that the four islets north of Lanzarote (Graciosa, Roque del Este, Montana Clara, Allegranza) should be protected for the islands' seabird colonies.

Cape Verde Islands

Existing MPAs that require management support:
- There are no existing MPAs.

Proposed new MPAs:
- Several islands have been recommended as reserves for seabird colonies. A number of other areas have been recommended but are not listed here although they are nesting sites for seabirds (steep cliffs) and are situated inland; WCMC's database also lists a number of sites but it is not clear whether these are existing or proposed MPAs. A number of these sites are also important for endemic West African coral species:
  - Ilheus Branco and Raso (16°38'N, 24°37'W): Small islands with endemic terrestrial species; also possible turtle nesting on Branco and important seabird nesting sites with endemic subspecies of shearwater and storm-petrel (Stuart, Adams, and Jenkins 1990; Miller 1989; World Bank 1993c).
  - Ilheu Rombos (14°58'N, 24°40'W): Small islands recommended as total nature reserves; nesting marine turtles; breeding seabirds include Bulwer's petrel *Bulweria bulwerii*, Madeiran storm petrel *Oceanodroma castro*, white-
faced storm petrel *Pelagodroma marina eadesi* and brown booby; endemic terrestrial species (World Bank 1993c; Miller 1989). (WCMC database suggests that Ilheus Secos ou do Rombo was declared a Nature Reserve in 1990).


Sal Rei, Boavista Island (16°05'N, 22°55'W): Baia de Sal Rei is locally important for migrants; important vegetated dunes; nesting turtle beaches and coral communities on north coast of island; small islands of Baluarte and Cural Velho have the only nesting colonies of the brown booby *Sula leucogaster* and magnificent frigate bird *Fregata magnificens* in the western Atlantic (Miller 1989; World Bank 1993c). (WCMC database suggests Ilheu Baluarte was created a nature reserve in 1990).


**Sao Tome and Principe**

The Tinhosas Islets near Principe and Sette Pedras Islets of São Tomé have been recommended for protection of their seabird colonies (Williams 1984).

**St. Helena**

To date, most conservation efforts have been on behalf of the island's unique terrestrial fauna and flora. However, it is proposed that the entire island should be designated as one of international importance, perhaps as a Biosphere. The Sustainable Environment and Development Strategy being produced (Report 1993) takes the marine environment into consideration and is identifying important marine and coastal sites and issues.

**Regional Priorities for the Establishment and Management of MPAs**

The identification of regional priority areas has proved difficult in the West Africa Marine region. The information available suggests that little is known about coastal marine areas. There are more data on priority wetlands and other sites of importance for birds, and on mangroves, but this level of information does not often extend to the subtidal marine environment and offshore.

Consequently, for some countries there is little information available concerning coastal marine areas of priority for biodiversity conservation. Further, it has not been possible to conduct a thorough review of priorities with regional and national experts and consequently more intense consultations will be required before a comprehensive list of priorities can be determined.

However, based on available information available, there are a number of areas deserving regional priority for the conservation of marine biodiversity. The priority sites were selected on the basis of the criteria outlined in the introduction and the suggestions should be considered as preliminary. A number of information gaps can also be highlighted. No areas have been identified along the South African coast because this is relatively well protected by existing measures.

Existing MPAs that require management support:

- Banc d'Arguin National Park (Mauritania)
- Delta of the Sine and Saloum Rivers (2 adjacent MPAs) (Senegal/Gambia)
- Niumi/Sine Saloum National Park (Gambia)
- Delta du Saloum National Park (Senegal).
Proposed new MPAs:

- Bijagos Archipelago (Guinea-Bissau)
- Wetlands of the coastal plains (Benin)
- Cape Verde Islands
- Aby Lagoon (Cote d'Ivoire)
- Bunce River (Sierra Leone).

Information Gaps

The areas above do not adequately represent all the biogeographic zones in the region. There are major gaps in the far northern (Morocco/Western Sahara) and southern (Angola/Namibia) parts of the region. There is also a need to identify priority sites in the eastern Gulf of Guinea in the area of Cameroon and Gabon, where there are likely to be a number of important sites for rare and endemic West African coral species and associated marine life. Although sites of national importance have been identified in these areas, it has not been possible to determine if these should be considered to be of regional priority. Further review of existing literature or consultation with national representatives will be required. This work should be carried out as a high priority to establish sufficient information to plan the development of a system of MPAs to adequately represent marine biodiversity in the region.

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MARINE REGION 9
South Atlantic

Antonio Diegues, Guillermo Harris, and André de Castro Moreira

BIODEOGRAPHTY AND MARINE BIODIVERSITY

The South Atlantic Marine Region include marine areas under the jurisdiction of four countries: Argentina, Brazil, United Kingdom (Falkland/Malvinas Islands, the sovereignty over which is disputed with Argentina), and Uruguay. The region spans a wide range of environments, including diverse subtropical and tropical areas in the north and productive temperate areas in the south.

Oceanography

In the south the region is characterized by an extensive continental shelf off the coast of Argentina. In the north Brazil's continental shelf shows a variety of widths, being wider in the north of the country and becoming narrower in the northeast and again in the southeast and south (Diegues 1987).

The cold Falkland (Malvinas) Current flows slowly north along the coast of Argentina from the extreme south. It is strongest along the outer edge of the continental shelf where it travels at speeds of about 2 kilometers per hour. Prevailing westerly winds produce upwelling of cold Antarctic water along the edge of the shelf that lowers the surface temperatures. Most of the shores of Patagonia are washed by an inshore component of the Falkland Current. The northward extent of this current is variable; it generally reaches the latitude of the province of Buenos Aires in Argentina, but its influence can be felt as far north as Rio de Janeiro. At Rio de La Plata the Falkland Current meets the warmer Brazil Current that flows in a southwesterly direction along the coast of Brazil from about 10°S. Highly productive areas occur where there is mixing of inshore and deeper northbound drifts of water with those of the southward-moving warm Brazilian current. The Brazil Current is strongest off Brazil from Abrolhos Archipelago to the latitude of Rio de Janeiro. From the tropic of Capricorn south it becomes progressively weaker. The Rio de La Plata forms an important biogeographic barrier between the cold Falkland Current and the warm Brazilian Current systems.

The warm and shallow Guiana Current flows along the north coast of Brazil and
links with the Caribbean circulation system. Both the Brazil and Guiana Currents are fed from the east by the westerly flowing South Equatorial Current that enters the region and branches to the north and south, with the southerly branch becoming the Brazil Current and the northerly branch becoming the Guiana Current.

Tides along the Brazilian coast are generally weak, growing in amplitude from south to north, being approximately 2 meters around Cabo Frio (Rio de Janeiro State) and reaching a maximum of 12 meters in the Amazon estuary. Tides in Argentina become pronounced, particularly along the coast of Patagonia where tidal range can be as much as 7 meters.

Coastal Geography and Geology

The following information is summarized from Chapman (1977) and Schwartz (1982).

The region includes a diverse range of coastal formations ranging from the inter-tropical and tropical regions in the north of Brazil, including the Amazon estuary and coral reefs, to the temperate and productive marine areas of Argentina.

The great size of Brazil allows for considerable diversity of coastal exposure and geomorphic development. There are three principal portions of the shore. The first is the area in the north that is influenced by the Amazon River and its sediments; the second is the narrow coastal margin fringing the huge Brazilian Shield, creating an escarpment nearly adjacent to the ocean; the third is the southern area where considerable quantities of sediments have accumulated to provide a barrier island formation.

The mouth of the Amazon River is a great estuary stretching for about 1,500 kilometers inland. Large quantities of sand and especially silt and clay are discharged by the river and accumulate along the shore margins. From the border with Surinam eastward to the Bahía de São Marcos, the fine-grained sediments blanket the shoreline and are cloaked with mangrove. East of the Bahía de São Marcos the shoreline begins to be characterized by sandy beaches lying before low hills. The sand beaches are interspersed with mangrove stands.

Beginning in Rio Grande do Norte and continuing southward to the coastal margin of Alagoas state, the beach zone is severely attenuated. The dry climate and the short drainage systems limit the transport of sediment to the ocean margin. This portion of Brazil is bordered by fairly extensive coral reef formations.

South of Recife the coast is cliffed. The combination of cliffed coast and the presence of coral reef extends for about 500 kilometers. Sandy beach backed by an escarpment begins near the Alagoas-Sergipe border and continues south to Rio Grande do Sul State. The beach often broadens in large curvilinear embayments, and there may be local mangrove stands, beach ridges, and deltaic buildout. In the state of Parana there is an extensive area of beach ridge development associated with the Maciel River. The beach ridges attain elevations of 10 meters in their interior location and gradually decrease to elevations of 2–3 meters near the shore.

The coastal margin of the state of Rio Grande do Sul is distinct from the rest of Brazil, consisting of a classic barrier island-lagoon sequence. Broad sandy beaches extend along the coast for 640 kilometers and incorporate wide beach ridge systems and large coastal dunes reaching 25 meters in elevation. The northern margin of this coastal plain comes against a terrace surface with elevations of 15 meters.

The coast of Uruguay is diverse for such a relatively short coastline. The northern area consists of an extension of the barrier island system of southern Brazil. The sand beach continues in Uruguay but narrows and becomes discontinuous, forming a series of
sandy embayments. In several places the embayments contain small lagoons behind a sand barrier. From Maldonado westward the shoreline is the margin of the Rio de La Plata estuary. For nearly this entire length there is a cliffed shoreline with a sand beach lying at its base. Occasionally, mud flats occur along the cliffed shoreline.

Argentina is characterized primarily by a cliffed shoreline with a narrow beach zone before it. The cliffs vary from only a few meters to the spectacular elevations of greater than 500 meters south of Comodoro Rivadavia. The Rio de La Plata estuary dominates the northern portion of the Argentinean shoreline. From the mouth of the river at Cabo San Antonio, the shoreline is tidal mudflat. From Mar del Plata to Bahía Blanca the coast consists of a low cliffed shoreline fronted by a narrow beach. Occasionally, there are large dune fields leading from the beach.

South of Bahía Blanca, the Negro and Colorado rivers transport considerable quantities of sand to the shoreline, and the beaches are extremely broad. Broad mudflats, low islands and sandbars occur between these two river mouths. The Colorado River delta is extensive.

With the exception of well-developed beaches and associated landforms at the Gulf of San Matias and the Gulf of San Jorge, the southern half of continental Argentina is mainly comprised of a cliffed shoreline. Terraces ranging to 140 meters have been noted in Patagonia. From Santa Cruz to the eastern tip of Tierra del Fuego the cliffs are cut into glacial morainic material. Occasional outcrops of bedrock are noted, as are pocket beaches. At Punta Dungeness there is a series of beach ridges created where currents converge at the point. Bahía San Sebastián on the northeastern shore of Tierra del Fuego is a shallow bay partially separated from the ocean by a low, narrow peninsula.

Ecosystem Diversity

Coral Reefs

The distribution of coral reefs in the South Atlantic is limited to tropical areas along the coastline and offshore islands of Brazil. According to UNEP/IUCN (1988) the Brazilian coral fauna has long been considered of interest on account of its high proportion of endemic species. Some 3,000 kilometers of coast has reefs, although not all of these are true coral reefs. Ten of the 18 hermatypic coral species known from Brazil are endemics.

Two main coral reef formations may be identified on the Brazilian coast. The first is Grupo Recifal do Cabo São Roque that unfolds from Cabo de São Roque until Natal in Rio Grande do Norte State, along which are the Fernando de Noronha archipelago and the Rocas atoll; the second is the assemblage of coral reefs situated in the Bahia State's south coast (the Abrolhos archipelago), which is the richest and most developed coral reef formation in the region. In addition to these main formations, coral reefs also occur between Natal and the São Francisco river mouth and on the latitude of Salvador Bahia (both usually associated with calcareous reefs).

The northeast coast formations are rocky calcareous outcroppings forming reefs and hence differ from the coral reef formations such as those of the Abrolhos archipelago.

Mangroves

The following species of mangrove are found along the coast of the South Atlantic: *R. mangle, A. germinans, L. racemosa, Conocarpus erectus, R. harrisonii, R. racemosa,* and *A. schaueriana.* The northern limit of mangroves on the American continent is found in Florida (U.S.), at around 29°53'N. Mangrove formations extend to Santa Catarina state in southern Brazil. Low stands of
both *Avicennia schaueriana* and *Rhizo-
phora mangle* terminate at Florianopolis (27°30'S), but *Laguncularia racemosa* ex-
tends southward to the poleward limit of
mangrove at the mouth of the Arananguá

The most extensive areas of mangrove are
associated with the mouth of the Amazon
River in the north of Brazil; well-developed
communities extend from the northern
boundary of the region until the border be-
tween Maranhão and Pauí states at around
2°30'S. Less extensive areas of mangrove are
present along the coast until saltmarshes be-
come dominant in Santa Catarina and Rio
Grande do Sul States in the south.

**Other Wetlands and Saltmarshes**

The dominance of cliffed coast, extensive
sand beaches and dune fields along the
Atlantic coast from southern Brazil to
Tierra del Fuego has limited the develop-
ment of tidal marshes to small deltaic plains
and river mouths. South American species
of *Spartina*, *Distichlis*, *Juncus* and *Salici-
cornia* dominate the tidal marshes of Ur-
guay and Argentina north of approximately
44°S (Chapman 1977). South of this, low
salt-tolerant shrubs become dominant in
small disjunct marshes along the coast of
Patagonia.

In Brazil tidal marshes occur as a pioneer
community and as a secondary formation on
disturbed areas within mangrove woodland
along the coast. Tidal marshes become more
prevalent on the southern coast of Santa Ca-
tarina and Rio Grande do Sul where exten-
sive saltmarsh formations are found, the
most important being associated with the Pa-
tos, Mirim and Mangueira lagoons in Rio
Grande do Sul.

In Uruguay tidal marshes are limited
mainly to the areas east of Punta el Tigre
near Montevideo, with the largest occurring
along the banks of the Santa Lucia river
(Chapman 1977).

In Argentina the largest tidal marshes oc-
cur along the muddy shores of Samborom-
bón Bay (about 200 kilometers south of
Buenos Aires) and in the vicinity of Bahía
Blanca, the Colorado River delta (Bahía
Anegada), and San Blas Bay at the southern
margin of the Pampas region. There are
mudflats that are important to shorebirds at
San Antonio Oeste, Golfo San Jose, Bahía
Bustamante. Smaller river estuaries and an-
cient river beds, such as Ria Deseado, San
Julian and Rio Gallegos have small associ-
ated wetlands. Bahía San Sebastián on Tierra
del Fuego has large mudflats that are im-
portant wintering grounds for shorebirds from
the northern hemisphere.

**Beaches, Dunes, Cliffs**

The best-developed beaches and dunes are
found on the coast of Brazil. In the north
much of the shoreline is formed by sandy
beaches interspersed with mangroves lying
before low hills. Sandy beaches continue
from Alagoas State to the south where large
dunes and barrier island formations occur.
Beaches in Argentina are sandy or stony and
interspersed by cliffs.

The Brazilian coast is rocky and cliffed in
its central regions (for about 500 kilometers
south of Recife) while much of the Argentin-
ean coast falls in this category.

**Islands and Submerged Banks**

Atol das Rocas lies about 200 kilometers
northeast of the coast of Rio Grande do
Norte State. The atoll is an almost circular
reef possibly lying on the same submarine
shelf (the platform of the Rio Grande do
Norte) as Fernando de Noronha. Fernando
de Noronha is a volcanic archipelago consist-
ing of a principal island of 17 square kilo-
metros and eighteen islets of varying sizes. The
archipelago lies 350 kilometers northeast of
Cabo de São Roque and has a similar flora
and fauna to the Atol das Rocas. The islands
of São Pedro and São Paulo (St. Paul's Rocks) are situated in the Atlantic about 500 kilometers northeast of Fernando de Noronha (UNEP/IUCN 1988).

There are few islands off the east coast of Argentina. These are restricted to the southeast coast of Tierra del Fuego and small groups of islands near the shore associated with coastal wetlands, or small volcanic outcrops in parts of Chubut and Santa Cruz. These areas are important for marine birds and mammals.

Open Ocean, Deep Sea, Upwellings

On the Brazilian coast, areas of upwelling are rare due to stratification of the water masses that prevents the surface layers from receiving nutrients from bottom layers. The main exception is areas of upwelling in the Cabo Frio region (near Rio de Janeiro). The main areas of higher productivity are the estuarine and mangrove areas, which receive larger amounts of nutrients from continental runoff (Diegues 1987).

Important areas of coastal upwelling occur along the edge of the continental shelf of Argentina. This ecosystem provides much of the nourishment that sustains the Argentine marine environment.

Kelp Forests

Kelp beds are found off the shelf of Patagonia and Tierra del Fuego in Argentina. These form some of the largest seaweed ecosystems in the world. The giant Macrocystis is the dominant algae. These beds form habitat and feeding grounds for numerous species (Elder and Pernetta 1991).

Species Diversity

Only limited information has been available on species diversity for this report. Due to the limitations of time and funding it has not been possible to fully review the literature on this subject. Brief information is presented below.

The West Indian (Antillean) and Amazonian manatees Trichecus manatus manatus and T. inunguis are found along the northern coast of Brazil. The Antillean manatee can be found from Central America to northeastern Brazil, as far south as Bahia state. There are areas where these two species can potentially overlap such as the Parque Nacional do Cabo Orange and Reserva Biológica do Lago Piratuba (Borobia, personal communication). The loggerhead (Caretta caretta), Olive Ridley (Lepidochelys olivacea) nest in small numbers in scattered localities from Maranhão state to Espírito Santo state in Brazil, while a large population of green turtles (Chelonia mydas) feeds in coastal waters and up to a few thousand nest annually (UNEP/IUCN 1988). The leatherback (Dermochelys coriacea) and hawksbill (Eretmochelys imbricata) turtles also nest in some areas of Brazil.

At least 37 species of marine mammals are known to occur in Brazilian waters, including dolphins, whales, sea lions, fur seals and occasional Antarctic visitors such as crabeater, elephant and leopard seals (Borobia, personal communication).

The Argentine marine system is characterized by large biomass. Although the number of species is comparatively low, the importance of the system lies in volume rather than variety. Large numbers of individuals of each species live in an interdependent system. Several species are prominent indicators of the overall health of the ecosystem. Penguins, for example, reflect changes in food availability at sea by variations in their breeding success rates.

Sea lions, fur seals, elephant seals, right whales, dolphins, Magellanic penguins, cormorants, terns and gulls are the principal marine birds and mammals. Some species are resident in the region year-round, others migrate at sea for several months each year.
The marine birds and mammals that make up the Patagonian coastal fauna are in general colonial species. There are major seabird congregations along the coast, for example, over 250,000 pairs of Magellanic penguins congregate at Punta Tombo alone. It is estimated that at least 1 million individuals of this species are distributed along the Patagonian coast. There are also more than 50,000 South American sea lions and up to 40,000 southern elephant seals; the only continental breeding colony of this latter species in the world is on Peninsula Valdes. At Punta Leon, only a few kilometers from some of the largest towns on the coast, 4 species of cormorants, 2 species of terns 1 species of gull and 2 species of pinnipeds breed side by side in an area of a few hectares. Golfo San Jose and Golfo Nuevo in the province of Chubut are among the few remaining breeding sites for the southern right whale.

Biogeographic Classification

The biogeographic classification used for this report is that developed by Hayden, Ray, and Dolan (1984). According to this classification the region falls within four coastal realms: the Eastern Tropical, Eastern Intertropical, Eastern Subtropical and the Eastern Temperate. The location of these zones is shown by Map 9.

Hayden, Ray, and Dolan (1984) identify three Faunal Provinces in the region: the Magellan, which includes coastal areas from Tierra del Fuego to the southern end of the Rio de La Plata; the Eastern South American, which extends from the Rio de La Plata to Cabo Frio just north of the city of Rio de Janeiro; and the Brazilian, which extends beyond the boundary of the region to the border of Guyana and Venezuela.

According to this classification the Falkland (Malvinas) Islands fall within Oceanic Realm I: variable eastward currents.

### Table 9.1 Number of Existing Marine And Coastal Protected areas in the South Atlantic Marine Region

<table>
<thead>
<tr>
<th>Location</th>
<th>Marine Areas</th>
<th>Coastal Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>4</td>
<td>30+</td>
</tr>
<tr>
<td>Brazil</td>
<td>15</td>
<td>50+</td>
</tr>
<tr>
<td>United Kingdom (Falkland/Malvinas Islands)</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Uruguay</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>98+</td>
</tr>
</tbody>
</table>

### ASSESSMENT OF EXISTING MPAS

**Description of National MPA Systems**

There are over 120 protected areas located in marine and coastal environments in the South Atlantic Marine Region; available information suggests that relatively few of these extend into the subtidal marine environment. It has been difficult to determine how far the boundaries of some protected areas extend due to a lack of available information on this point. Nevertheless, an attempt has been made to identify which areas include a subtidal marine component. Available information suggests that 19 protected areas include a subtidal component while there are more than 98 coastal terrestrial and intertidal protected areas. The location of existing MPAs with a subtidal component is shown on Map 9; these areas are identified in the national sections below.

**Argentina**

There are a number of coastal terrestrial protected areas in Argentina but only four areas include parts of the subtidal marine environment. These include one area administered at the national level and three at the provincial level:
Parque Nacional Tierra del Fuego: The park includes a small subtidal marine component.

Parque Marino Golfo San José: This provincial park is located in Chubut province and provides a protected area for one of the two most important breeding areas for the southern right whale (*Eubalaena australis*); it also includes mudflats that are important feeding and stopover areas for migratory birds.

Isla Escondida: A protected area has been established under provincial laws to include coastal marine areas off Chubut. The site includes breeding areas for several species of fish, including Hake (*Merluccius hubbsi*). Restrictions are applied to commercial fishing within the area.

Bajo Bazarredo, Golfo San Jorge: This MPA is located in Santa Cruz province and protects shrimp breeding grounds. With the exception of selective squid catching, commercial fishing is not permitted.

The government agencies with responsibility for management have insufficient resources to effectively carry out this task. Many areas that are important for marine biodiversity are also used for commercial and recreational fishing, tourism and other uses that have varying degrees of impact. In most instances there is little or no commitment to integrated management for these areas to ensure that their resources are used in a sustainable manner and that biodiversity is protected. Population increases in coastal areas, pressures for commercial exploitation and a lack of alternative sources of resources have increased pressure for development of areas that are important for marine biodiversity.

Information held by the World Conservation Monitoring Centre Protected Areas Data base suggests there are at least another 30 coastal protected areas that include intertidal terrain. Some of the more significant areas are:

**Río Negro State**
- San Antonio Oeste
- Caleta de los Loros
- Complejo Isla de Lobos Provincial Fauna Reserve
- Punta Bermeja Provincial Fauna Reserve

**Chubut State**
- Cabo dos Bahías
- Caleta Valdés
- Isla de los Pájaros
- Península Valdés Integral Objective Touristic Nature Reserve
- Punta Delgada
- Punta León
- Punta Loma
- Punta Marques
- Punta Norte
- Punta Pirámide
- Punta Tombo
- Santa Cruz State:
  - Monte Loayza
  - Bahía Laura
  - Cabo Blanco
  - Cabo Vírgenes
  - Cañadón del Duraznillo
  - Península San Julián Provincial Reserve
  - Ría de Puerto Deseado Provincial Nature Reserve

**Tierra del Fuego State**
- Isla de los Estades
- San Sebastián
- Punta Buque

**Brazil**

IBAMA, the Brazilian Institute of Environment and Natural Renewable Resources, under the Ministry of Environment, is
responsible at the government level for the establishment and management of Conservation Units including MPAs. In addition the Brazilian Constitution of 1988 authorizes local state and council administrations to create Conservation Units within their jurisdictions. State Marine Parks and Council Marine Parks are created by the state government (Governor) or by the municipal government (Mayor) with the objective of preserving areas considered unique and important. Such Conservation Units will then be implemented and managed by the local administration. The management regulations should follow the federal specifications for each category (Park, Biological Reserve and so forth). However, the level of compromise available to the local state and council administrations in relation to the implementation and administration of the Conservation Units has not yet been determined by Federal legislation.

The distinction between the creation of a Conservation Unit and its actual implementation must be emphasized. A Conservation Unit can be created as a document, but its effective implementation requires funding, personnel and equipment. In some cases several years can pass between these two phases. The main problem in all cases remains a lack of resources for law enforcement and for baseline research and monitoring. Nevertheless, some MPAs have been implemented largely due to personal efforts and cooperative work with NGOs and a few have management plans underway.

Another difficulty is that due to Brazil’s economic instability, changes in government result in changes in priorities, making it difficult to maintain long term programs. Cooperative work between IBAMA, universities and NGOs is the most effective way to minimize such difficulties. Due to the complex bureaucracy of Brazilian public institutions, the administration of funds is more efficiently handled by NGOs. Funds from private institutions can also be sought in this way. IBAMA has a problem of a lack of personnel, particularly researchers. On the other hand, the universities have a serious problem of lack of funds to carry out marine research.

There are 15 MPAs that include subtidal components:
- Reserva Biológica Nacional Atol das Rocas
- Parque Nacional Cabo Orange
- Federal Estação Ecológica Ilha Maracajá
- Estação Ecológica Jureia-Itatins
- Reserva Biológica Nacional Lago Piratuba
- Parque Nacional Lençois Maranhenses
- Parque Nacional Abrolhos Marinho
- Marinho Parque Nacional Fernando do Noronha
- Parque Nacional Monte Pascoal
- Parque Nacional Serra da Bocaina
- Parque Nacional Superagui
- Estação Ecológica Taim
- Reserva Biológica do Arvoredo
- Parcel of Parque Estadual Marinho of Manuel Luis
- Municipal Marinho Parque Paripueira

Data held by the World Conservation Monitoring Centre Protected Areas Data Unit indicate the existence of over 50 coastal terrestrial and intertidal protected areas. Some of the main coastal protected areas are listed below:
- Reserva Biológica Nacional Comboios
- Parque Nacional Lagoa do Peixe
- Estadual Parque Caraguatatuba
- Estadual Parque Ilha Anchieta
- Estadual Parque Ilha Bela
- Estadual Parque Ilha do Cordoso
- Estadual Parque Serra do Mar
- Estadual Parque Ilha Grande
- Estadual Parque Pedra Branca
- Reserva Biológica Estadual Guaratiba
- Reserva Biológica Estadual Praia do Sul
- Reserva Biológica de Santa Isabel
United Kingdom (Falkland/Malvinas Islands)

The Falklands has legislation for setting up nature reserves and for protecting wildlife. A number of nature reserves have been established on land, including a number of small islands that have been designated as reserves in their entirety. However, none of these areas includes a marine component and it is possible that existing legislation may require some revision to allow this.

Existing coastal terrestrial and intertidal protected areas are listed below. These data have been supplied by the World Conservation Monitoring Centre Protected Areas Data Unit.

- Arch Island East Nature Reserve
- Beauchene Island Sanctuary
- Bird Island Nature Reserve
- Bleaker Island Nature Reserve
- Cochon Island Nature Reserve
- Dunbar Island Sanctuary
- Gid's Island Nature Reserve
- Kidney Island Nature Reserve
- Low Island Sanctuary
- Middle Island Sanctuary
- Sea Dog and Arch Islands Nature Reserve
- Stanley Common and Cape Pembroke Peninsula Sanctuary
- Tussac Island Nature Reserve
- Volunteer and Cow Bay Sanctuary

Uruguay

Only limited information has been available about MPAs in Uruguay. Data held by the World Conservation Monitoring Centre Protected Areas Database indicate the presence of four coastal protected areas, none of which seems to include subtidal elements.

- Costa Atlantica Monumento Natural
- Dunas de Cabo Polonio Monumento Natural
- Franklin Delano Roosevelt Parque Nacional
- Santa Teresa Parque Nacional

International and Regional Initiatives Relevant to MPAs

World Heritage Convention

Argentina, Brazil, the United Kingdom and Uruguay are all parties to the World Heritage Convention (IUCN 1992). There are no World Heritage sites that include a subtidal marine component in the South Atlantic Marine Region.

Ramsar Convention

Argentina, the United Kingdom and Uruguay are parties to the Ramsar Convention (IUCN 1992). There are no Ramsar sites that include a subtidal marine component. The following areas include coastal terrestrial and intertidal terrain: Logoa do Peixe (Brazil), Reentiancias Maranhenses (Brazil) and Banados del Este y Franja Costera (Uruguay).

UNESCO Biosphere Reserves

All countries in the region participate in the UNESCO Man and the Biosphere Programme (IUCN 1992). However there are no marine Biosphere Reserves in the region. The following areas include coastal terrestrial and possibly intertidal elements: Parque Costero del Sul (Argentina), Reserva da Biosphere da Mata Atlantica (Brazil) and Banados del Este (Uruguay).

UNEP Regional Seas Programme

In view of the recognized need to address coastal zone resources and management needs and priorities in each country, discussions held with the governments of Argentina, Brazil and Uruguay during the course of 1993 have led to ongoing preparations for a workshop on Integrated Coastal Zone Management.

The workshop will be held jointly by UNEP and IOC/UNESCO, with participation...
of relevant international organizations and would serve as a basis to assess the status and identify priorities of each country concerning the marine environment (Borobia, personal communication).

**Assessment of Representation of Biogeographic Zones within MPAs**

The degree to which MPAs in the South Atlantic Marine Region represent the biogeographic zones (coastal realms and the main oceanic islands) in the region is summarized in Table 9.2 and discussed below. This assessment considers only those 19 MPAs recorded as including a subtidal component. There are more than 98 protected areas that include coastal terrestrial and in some instances intertidal features that are not included in this analysis.

All of the coastal realms in the region have three or more MPAs. The Eastern Intertropical zone (which includes the northern coastline of Brazil) has the most MPAs with 8, followed by the Eastern Subtropical (the southern coastline of Brazil) with 5, the Eastern Tropical (the central coast of Brazil) with 3 and the Eastern Temperate (the coast of Argentina) also with 3. There are no MPAs in the Falkland (Malvinas) Islands.

Of the 3 faunal provinces there are 11 MPAs in the Brazilian province, 4 in the Eastern South American, and 4 in the Magellan province.

A more detailed assessment of the representation of the zones in Brazil is provided by Diegues and Moreira (1992). The following discussion is based on these authors' work.

**Intertropical Coastal Realm**

The ecosystems located around the intertropical realm's northern limit are well represented in existing MPAs. Four well-defined MPAs exist in the region: Cabo Orange and Lencois Maranhenses National Parks, Maraca-

<table>
<thead>
<tr>
<th>Biogeographic Zone/Coastal Realm</th>
<th>Number of MPAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Tropical</td>
<td>3</td>
</tr>
<tr>
<td>Eastern Intertropical</td>
<td>8</td>
</tr>
<tr>
<td>Eastern Subtropical</td>
<td>5</td>
</tr>
<tr>
<td>Eastern Temperate</td>
<td>3</td>
</tr>
<tr>
<td>Other Oceanic Areas:</td>
<td></td>
</tr>
<tr>
<td>Falkland/Malvinas Islands</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

Jipioca Ecological Station, and Lago Piratuba Biological Reserve.

These areas include considerable mangrove formations in addition to the important dunes that are found within Lencois Maranhenses National Park.

In contrast, along the Piaui, Ceara and part of Rio Grande do Norte State's coasts (within the realm's subequatorial component), extensive sandy beach "restinga" formations can be found that are not properly protected. In addition, some marine systems such as river mouths, bays and estuaries are also not represented in MPAs.

**Tropical Coastal Realm**

The best represented ecosystems in the tropical realm are the coral reef formations. The Fernando de Noronha and Abrolhos Marine National Parks include Brazil's most significant coral reefs.

Some important ecosystems present in this area are unprotected, such as the calcareous reefs found along the northeastern coast, the dune formations that exist mainly on the Rio Grande do Norte and Bahia State's coast, the Alagoas State's estuarine and lagoon systems that includes the Mundau and Manguaba lagoons and various estuarine areas found along this coastline.
Subtropical Coastal Realm

Of the ecosystems in the subtropical realm, those that are best represented by MPAs are located on the country’s southern coastal plain: in the region between Rio de Janeiro State’s southern littoral and on São Paulo State’s northern coast; and on the Cananeia, Iguape and Paranagua estuarine and lagoon system located on the coastal border between São Paulo and Parana States. Within the Iguape, Cananeia and Paranagua estuarine and lagoon system, mangrove, sandy beach, restinga and lagoon formations are under protection within Superagui National Park (Parana State), Jureia-Itatins Ecological Station and Ilha do Cordoso State Park (São Paulo State).

Important ecosystems in this realm are not protected, including the Santos-São Vicente estuary region (São Paulo State), Santa Catarina State’s saltmarshes and sandy beaches and the Lagoa dos Patos, in Rio Grande do Sul State.

Temperate Coastal Realm

There are four MPAs in this realm, which includes the Argentinean coast south of the Rio de la Plata. Two of these areas are located in Chubut province: the Golfo San José includes a marine bay that is important for marine mammals and Isla Escondida includes breeding areas for fish. The Bajo Bazurdo includes marine areas in the Golfo San Jorge in Santa Cruz province along the southern coast while the Tierra del Fuego National Park is located on the southern tip of the South American continent. These MPAs include only a very small proportion of the marine ecosystems found in this realm.

Management Level

It is not possible to provide a detailed analysis of the management status of MPAs in the region. However, available information suggests that the existing MPAs have in general a low level of management. The main causes of this are:

- Lack of efficient and effective management program.
- Inadequate legislation.
- The impacts of illegal activities within the MPAs and of activities on land and at sea outside the borders of the MPAs.
- Lack of management-oriented research.

Priority Areas and Recommendations

National Priorities for the Establishment and Management of MPAs

Argentina

The following areas were identified by Guillermo Harris in consultation with other contributors from Argentina. The areas were selected according to existing and available information using the criteria outlined in the introduction to this report.

Proposed New MPAs

- Punta Tombo Provincial Wildlife Reserve: The area includes the largest colony of Magellanic penguins on the coast of Argentina. Current protected status is restricted to the shore and does not include the infra-littoral zone. Furthermore, the reserve area as it now stands, does not include the entire colony. Commercial fishing fleets operate freely in waters around the colony in January–October each year. Penguins occupy the colony in September–April every year, so there is considerable overlap. Fishing competes directly with some of the target species such as Hake (Merluccius hubbsi). Furthermore, there is evidence that penguins are caught accidentally in fishing nets. Accidental spills from oil tankers have caused serious oiling of penguins.
Agreements should be developed in coordination with the Province of Chubut to provide protection for the entire colony area and to extend protected status to infra-littoral areas that are important for foraging Magellanic penguins. This marine reserve should extend sufficiently out to sea around Punta Tombo/Punta Clara, to secure food supply and provide safe transit for penguins. Fishing should be banned within this area between September 1 and April 30. Restrictions to shipping around the colony should include oil tankers.

Isla Quintano to Cabo Dos Bahias Island System: This group of eight islands near the shores of the province of Chubut supports breeding colonies of seabirds, South American Sea Lions (Otaria flavescens) and one of the only colonies of fur seals (Arctocephalus australis) on the Patagonian coast. Large forests of seaweed (Gracillaria sp.) form the basis of a small agar industry. Guano from cormorant colonies is harvested in a small way on several of the colonies with little control. It is recommended to provide MPA status to the whole area and to effectively manage human impacts in this island system.

Puerto Deseado/Bahia Laura Island System: This area includes important breeding colonies of marine mammals and birds. It is recommended to review current legislation and establish protection in adjacent waters.

Isla de los Estados: This is an important breeding area for colonies of marine mammals and birds. It is recommended to review current legislation and establish protection for colony sites.

A number of other sites have been identified primarily for their importance for migratory and resident seabirds. These are listed below for information:

- Bahia Samborombon (Buenos Aires): This valuable stopover feeding site for migratory shorebirds is only partially represented in MPA. Protected areas should be increased to cover the full extent of the coast of this bay.
- Ria Bahia Blanca (Buenos Aires): This is an important breeding area for the Band-tailed gull (Larus atlanticus). Colony sites need protected status. Assessment should be made of importance to migratory shorebirds.
- Bahia Anegada/Bahia San Blas (Buenos Aires): An important breeding area for the Band-tailed gull (Larus atlanticus), it is also a valuable feeding area for shorebirds and flamingos. It is recommended to provide protective status to colony sites and increase protective measures for feeding areas.
- Ria de San Antonio Oeste (Rio Negro): This is an important stopover area for migrating shorebirds. Protective legislation for this site is under review. It is recommended to support MPA legislation for this area.
- Bahia San Sebastian (Tierra del Fuego): This bay is of international importance as a wintering area for migrating shorebirds.

Existing MPAs that require management support:

- Parque Marino Golfo San Jose, Chubut: Parque Marino Provincial Golfo San Jose is currently under severe pressure for development. Mariculture, urbanization of the coast and tourism could threaten this important protected area. Right whales are under pressure from the growing whale-watching industry (30,000 people went whale watching in 1993 in Golfo Nuevo), and it is clear that significant income is generated for the province by this endangered species. Maintaining the protection in Golfo San Jose would provide an area for whales
where human disturbance and pollution are reduced. It is recommended to maintain restrictions on mariculture, boating in the bay and urbanization of its shores.

- Isla Escondida: (see description above)
- Bajo Bazarredo, Golfo San Jorge: (see description above)

**Brazil**

In Brazil although there are a number of gaps in the representation of important marine ecosystems along the coast (see above), the highest priority has been given to improving the management of existing MPAs, which is generally at a low level, rather than proposing the establishment of new areas. The main problem in all cases is the lack of resources for law enforcement, baseline research and monitoring. The following areas were identified as being of highest priority on the basis of the criteria outlined in the introduction by Professor Antonio Diegues, Dr. Beatrice Ferreira and other Brazilian nationals who contributed to this report.

Proposed new MPAs:

- **No new areas are proposed as priorities.**
  - One new MPA is of secondary priority:
    - Alcatrazes Island State Marine Park: A project for the creation of a State Marine Park is under way with the support of NGOs and University of São Paulo. Some of the islands are already under protection in the existing terrestrial Ecological Station of Tupinambas. The park will be located about 40 kilometers off the coast of Santos in São Paulo state and will include a high island that is important for marine mammals, turtles and birds.

- **Puerto Deseado/Bahía Laura Island system:** This area should also be considered for the establishment of a new MPA due to its importance for marine mammals and because of the presence of a number of marine bird colonies in the area.

Existing MPAs that require management support:

- **Cabo Orange National Park, Amapá State:** The park contains a marine area of 120,000 hectares, including mud flats and mangroves. The following noteworthy species are present: green turtle (*Chelonia mydas*), leatherback turtle (*Dermochelys coriacea*), greater flamingo (*Phoenicopterus ruber*), scarlet ibis (*Eudocimus ruber*), Amazonian manatee (*Trichechus inunguis*), Caribbean manatee (*Trichechus manatus*). Additional financial resources are required to support management.

- **Lencois Maranhenses National Park, Maranhão State:** The park preserves a unique ecosystem that includes dunes, mangrove and restingas formations (scrubby vegetation typical of sand marine barrier islands) and includes a total marine area of 12,000 hectares, including extensive mangrove formations. The area is an important site for breeding of marine turtles and also for some shore and marine birds. Noteworthy species include green turtle (*Chelonia mydas*), Olive Ridley turtle (*Lepidochelys olivacea*), loggerhead turtle (*Caretta caretta*), hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*). Additional financial resources are required to support management.

- **Fernando de Noronha National Park:** The Fernando de Noronha archipelago lies about 345 kilometers off the coast of Rio Grande do Norte state. There are coral colonies but no coral reef formations. The park includes mangroves and breeding sites for green turtles (*Chelonia mydas*), while the hawksbill turtle (*Eretmochelys imbricata*) feeds in the area. The spinner dolphin (*Stenella longirostris*) uses a bay on one of the
islands as a feeding ground. Some species are endemic to the islands and Atol das Rocos (for example, the damselfish *Stegastes rocasensis*). Inadequately managed tourism is probably the major threat to the area.

**Abrolhos Marine National Park, Bahia State:** The Abrolhos archipelago includes five volcanic islands surrounded by the largest hermatypic coral formation in the South Atlantic. Several endemic species of coral are present (*Millepora brasiliensis, Mussimitia brasiliensis, M. hartii, M. hispida*). Several species of marine birds are present and marine mammals such as humpback whale (*Megaptera novaeangliae*) breed in the area. The green turtle (*Chelonia mydas*) and loggerhead turtle (*Caretta caretta*) are both present. The park area is threatened by deforestation activities that take place on the coast near the archipelago. There is a management plan but difficulties in implementation exist due to a lack of financial resources.

**Atol das Rocas Biological Reserve:** The reserve is located on an atoll that lies 280 kilometers from the Rio Grande do Norte coast. This is the only atoll in the South Atlantic and is formed by a reef area of 7.2 square kilometers. Inside the reef there are a lagoon and two islands. The reef is formed by coral, algae and vermatid mollusks. It is the most important nesting site for tropical marine birds in the South Atlantic. Three species of turtle occur: *Chelonia mydas, Dermochelys coriacea* and *Eretmochelys imbricata*. The atoll is the second most important breeding ground for *Chelonia mydas* in the South Atlantic. Some endemic species are present. Lack of financial resources for effective enforcement, research and monitoring is the major problem facing the park.

**Paripeua District Park, Alagoas State:** The park is located in the State of Alagoas and extends from the high tide mark between the Suaçuí and Sapucaí river to a depth of 25 meters. It includes areas of mangrove and fringing reef and is the main site for *Trichechus manatus* along the Brazilian coast. The fringing reefs of Paripeua are typical of formations along the northeast coast. The reefs are heavily exploited by commercial and artisanal fisheries and are being damaged by uncontrolled tourism and development along the coast. A management plan is being developed through a joint effort by NGOs and the park administration.

**Manuel Luiz State Park:** This area includes a coral bank that lies about 80 kilometers off the coast of Maranhão state. The area is largely unknown but is likely to be of great importance for both biodiversity and fisheries resources.

**United Kingdom (Falkland/Malvinas Islands)**

No information is available about priorities in the Falkland (Malvinas) Islands.

**Uruguay**

No information is available about priorities in Uruguay.

**Regional Priorities for the Establishment and Management of MPAs**

Due to the constraints of time and funding it has not been possible to gather all reference sources for the purposes of this document. Further data are required from Argentina, Uruguay and the Falkland islands in order to systematically determine priorities for these areas. In Argentina there is activity aimed at the protection of marine mammals and seabirds, yet relatively little information available concerning other groups. However, on the basis of the information available, it is
possible to identify a number of areas that should be of high priority according to the criteria outlined in the introduction and that represent immediate opportunities for action aimed at the conservation of marine biodiversity. These areas should be considered preliminary selections and should be the subject of further investigation to determine their suitability.

Proposed new MPAs:
- Punta Tombo (Argentina)
- Isla Quintana to Cabo dos Bahias island system (Argentina)
- Puerto Deseado to Bahia Laura Island System (Argentina).

Existing MPAs that require management support:
- Parque Marino Golfo San José (Argentina)
- Cabo Orange National Park (Brazil)
- Lencois Maranhenses National Park (Brazil)
- Fernando de Noronha National Park (Brazil)
- Abrolhos Marine National Park (Brazil)
- Atol das Rocos Biological Reserve (Brazil).

BIBLIOGRAPHY


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Contributors

Many people and organizations contributed directly to these reports. The major authors or editors of each regional report in Volume II have prepared the following highlights of these contributions.

**Marine Region 7: Wider Caribbean**

The production of this report has been coordinated by Lynn P. Holowesko (Deputy Chair, CNPPA). The report is the product of collaborative work between IUCN-CNPPA, IUCN-US, the Great Barrier Reef Marine Park Authority (GBRMPA) and numerous other organizations. Substantial contributions in the form of editing or providing specific information were made by: Lynn Holowesko (IUCN-CNPPA), Allen Putney (IUCN-US), Yves Renard (Caribbean Natural Resources Institute), Pedro Rosabal (IUCN Protected Areas Programme), Jeremy Woodley (University of the West Indies). Editing was undertaken by Sonja Stanley, an intern at IUCN-US.

Except where noted, much of the information in this report has been derived from various reports and publications on the biogeography and diversity of marine ecosystems in the Caribbean, the main sources being IUCN (1979, 1991), UNEP/CCA/University of Michigan (1980), UNEP/IUCN (1988), Putney (1982), Wilson (1987), and van’t Hof (personal communication).

**Marine Region 8: West Africa**

This report has been compiled from a report written for CNPPA by Robbie Robinson and Gerrie de Graaff of the South African National Parks Board, a report for IUCN by Beatrice Schwartz of the Africa and Wetlands Programs, and other sources as noted. Editing was undertaken by Sue Wells with assistance from Chris Bleakley (GBRMPA).

The biogeographic classification used in this report is that of Hayden and others (1984). Lists of MPAs have been compiled from the WCMC Protected Areas Database, Schwartz (1992), information from Robinson and de Graaff (1992) and other sources as noted. Priority areas have been proposed by Susan Wells based on a survey of existing recommendations in the literature. The report was distributed to national protected area management agencies for comment in 1993 and has been revised based on the comments received.

**Marine Region 9: South Atlantic**

This document has been prepared primarily from two reports prepared for IUCN-CNPPA by Antonio Carlos S. Diegues and André de Castro C. Moreira (Center for Research on Human Population and Wetlands in Brazil) and by Guillermo Harris (Fundación Patagonia Natural, Argentina). Additional sources are noted in the text. The report was edited by Chris Bleakley (GBRMPA).

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Index

Page numbers printed in *italic* type refer to tables or figures. Passim indicates that the topic is discussed intermittently within the given range of pages. Proposed MPAs of regional conservation priority are indexed by name. Other existing and proposed MPAs are grouped under given nations and marine regions.

<table>
<thead>
<tr>
<th>Location</th>
<th>Page Numbers</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andros Barrier Reef (The Bahamas)</td>
<td>29</td>
<td>Marine protected areas, 49</td>
</tr>
<tr>
<td>Angola</td>
<td></td>
<td>Marine protected areas proposed, 56</td>
</tr>
<tr>
<td>Antigua and Barbuda</td>
<td></td>
<td>Barbuda, 28, 29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine protected areas, 19, 26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine protected areas proposed, 28, 29</td>
</tr>
<tr>
<td>Argentina</td>
<td>73</td>
<td>Marine protected areas, 76–77, 82–83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine protected areas proposed, 81–82</td>
</tr>
<tr>
<td>Ascension Island</td>
<td>45, 54</td>
<td>Marine protected areas proposed, 66</td>
</tr>
<tr>
<td>Audubon Society, Wider Caribbean</td>
<td></td>
<td>Marine protected areas proposed, 28, 29</td>
</tr>
<tr>
<td>Marine Region and, 26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Azores</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>The Bahamas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andros Barrier Reef, 29</td>
<td></td>
<td>Marine protected areas, 19, 26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine protected areas proposed, 28, 29</td>
</tr>
<tr>
<td>Barbados</td>
<td>22</td>
<td>Marine protected areas, 19, 26</td>
</tr>
<tr>
<td>Barbados Declaration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barbuda (Antigua and Barbuda)</td>
<td>28, 29</td>
<td>Marine protected areas proposed, 66</td>
</tr>
<tr>
<td>Beaches and dunes</td>
<td>74</td>
<td>in South Atlantic Marine Region,</td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>in West Africa Marine Region,</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>in Wider Caribbean Marine Region,</td>
</tr>
<tr>
<td>Belize</td>
<td>14</td>
<td>Marine protected areas proposed, 56</td>
</tr>
<tr>
<td></td>
<td>28, 29, 30</td>
<td></td>
</tr>
<tr>
<td>Belize Barrier Reef (Belize)</td>
<td>29, 30</td>
<td></td>
</tr>
<tr>
<td>Benin</td>
<td>49</td>
<td>Marine protected areas proposed, 56</td>
</tr>
<tr>
<td>Biodiversity Convention, Wider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caribbean Marine Region and, 22,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biosphere Reserves</td>
<td>8</td>
<td>South Atlantic Marine Region and, 79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>West Africa Marine Region and, 55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wider Caribbean Marine Region and, 21, 38</td>
</tr>
<tr>
<td>Birds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>See also Penguins</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>75–76</td>
<td>in South Atlantic Marine Region,</td>
</tr>
<tr>
<td></td>
<td>47–48, 49–52</td>
<td>in West Africa Marine Region,</td>
</tr>
<tr>
<td></td>
<td>57–66 passim</td>
<td>in Wider Caribbean Marine Region,</td>
</tr>
<tr>
<td></td>
<td>16–17, 26, 29, 31</td>
<td>in Caribbean Region,</td>
</tr>
<tr>
<td></td>
<td>77–78, 83–84</td>
<td>marine protected areas proposed, 83</td>
</tr>
<tr>
<td>Cameroon</td>
<td>45</td>
<td>Marine protected areas proposed, 49, 56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine protected areas proposed, 56–57</td>
</tr>
<tr>
<td>Canadian International Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency, Wider Caribbean Marine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region and, 23, 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANARI (Caribbean Natural Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institute, 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canary Islands</td>
<td>45, 54</td>
<td>Marine protected areas proposed, 66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine protected areas proposed, 66</td>
</tr>
<tr>
<td>Cape Verde Islands</td>
<td>45, 54</td>
<td>Marine protected areas proposed, 66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine protected areas proposed, 66</td>
</tr>
<tr>
<td>Caribbean Conservation Association</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine parks program, 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caribbean Environment Program, 21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caribbean Natural Resources Institute (CANARI), 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cartagena Convention</td>
<td>21, 38</td>
<td></td>
</tr>
<tr>
<td>Caves, in Wider Caribbean Marine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region, 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central American Commission for Environment and Development, 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalopods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>See also Rocky shores and cliffs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>19, 26</td>
<td>Marine protected areas proposed, 57</td>
</tr>
<tr>
<td>Congo</td>
<td></td>
<td>Coastal area, 49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine protected areas proposed, 57</td>
</tr>
<tr>
<td>Conservation International, Wider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caribbean Marine Region and, 24–25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central Africa Region, 55
Convention on Biodiversity, Wider Caribbean Marine Region and, 22, 38
Convention on Intervention on Nature Protection and Wildlife Preservation in the Western Hemisphere (Western Hemisphere Convention), 21
Convention on Wetlands of International Importance. See Ramsar Convention
Coral communities, in West Africa Marine Region, 45, 67
Coral reefs
in South Atlantic Marine Region, 73
in Wider Caribbean Marine Region, 15, 19, 29, 30
Costa Rica
marine protected areas, 27
marine protected areas proposed, 28, 29, 30
Tortuguero/Miskito Marine System, 29, 30
Côte d'Ivoire
coastal areas, 49–50
marine protected areas proposed, 57
Crocodiles
in West Africa Marine Region, 50
in Wider Caribbean Marine Region, 17, 31
Crustaceans. See Shellfish
Crustaceans
in West Africa Marine Region, 46, 47
in Wider Caribbean Marine Region, 16
Cuba
marine protected areas, 19, 27, 29, 30–31
marine protected areas proposed, 28
Dolphins
in South Atlantic Marine Region, 75
in West Africa Marine Region, 48, 50, 52, 59, 60, 61
Dominican Republic, marine protected areas, 27
Dominica, marine protected areas, 27, 29, 31
Dunes. See Beaches and dunes
Endangered species
seals, 48
in Wider Caribbean Marine Region, 19, 31, 37
Equatorial Guinea
coastal areas, 50
marine protected areas proposed, 57
European Union, Strategy for Protected Areas in the Caribbean, 23
Falkland Islands, 84
marine protected areas, 79
Fish
in West Africa Marine Region, 46, 47, 51, 52, 61, 62, 63
in Wider Caribbean Marine Region, 16, 30
Fisheries and fishing
in South Atlantic Marine Region, 77
in West Africa Marine Region, 46, 47, 60, 61, 63
in Wider Caribbean Marine Region, 16, 29–30, 31
Gabon, 45
marine protected areas, 50, 57–58
marine protected areas proposed, 58
The Gambia, 45
marine protected areas, 50–51, 58
Ghana, 44–45, 51
marine protected areas proposed, 58
Guadeloupe, marine protected areas, 27
Guatemala, marine protected areas, 27
Guinea, 45, 46, 51
marine protected areas proposed, 58–59
Guinea-Bissau, 44, 45
marine protected areas, 51, 59
marine protected areas proposed, 59–60
Honduras, marine protected areas, 27
Iguanas, in Wider Caribbean Marine Region, 17
Invertebrates
in West Africa Marine Region, 47
in Wider Caribbean Marine Region, 17
Islands
in South Atlantic Marine Region, 74–75
in West Africa Marine Region, 45
IUCN
Strategy for Protected Areas of the Neotropical Realm, 23
IUCN Commission on National Parks and Protected Areas, 1
biodiversity conservation, 1, 8
study methods, 2–3
Jamaica, marine protected areas, 27
Kelp, in South Atlantic Marine Region, 75

Lagoons
in West Africa Marine Region, 44, 50, 52, 57, 58, 65
in Wider Caribbean Marine Region, 16, 19, 29, 30, 31

Latin American Technical Network on Protected Areas and Wildlife, 26

Liberia, 51
marine protected areas proposed, 60-61

Madeira, 45
Malvinas Islands, 84
marine protected areas, 79

Manatees
in South Atlantic Marine Region, 75
in West Africa Marine Region, 48, 49, 50, 52, 53, 56, 59, 60, 64
in Wider Caribbean Marine Region, 30, 31

Mangroves
in South Atlantic Marine Region, 72, 73-74
in West Africa Marine Region, 2.30, 2.31-38
passim, 2.42-50 passim
in Wider Caribbean Marine Region, 15-16, 29, 30

Marine protected areas
See also under specific countries or marine regions
actions for establishment of, 2, 12
biogeographic zones in, 6, 7
community support for, 9-10
defined, 2
funding for, 10-11
management, 7, 8-9, 10
priority conservation site criteria, 3-5, 4
recommendations, 11-12, 12
sizes of, 6
subtidal, 5

Marshes. See Wetlands

Martinique, marine protected areas, 27

Mauritania
marine protected areas, 51, 61
marine protected areas proposed, 61

Mexico, marine protected areas, 19, 27

Mollusks
in West Africa Marine Region, 46, 47
in Wider Caribbean Marine Region, 16

Montserrat, marine protected areas, 27

Morocco
marine protected areas, 51-52, 61-62
marine protected areas proposed, 62

Mudflats. See Soft sediment habitats

Namibia
coastal areas, 52, 62
marine protected areas proposed, 62

Nature Conservancy, Wider Caribbean Marine Region and, 23-24

Neotropical Action Plan, Wider Caribbean Marine Region and, 23

Netherlands Antilles, marine protected areas, 19
Nigeria, 44, 45, 52
marine protected areas proposed, 62-63

Organization of Eastern Caribbean States, 25

Panama, marine protected areas, 27

Paseo Pantera, Wider Caribbean Marine Region and, 26

Penguins
See also Birds
in South Atlantic Marine Region, 75

Protocol on Combating Pollution in Cases of Emergency, 55

Protocol on Specially Protected Areas and Wildlife for the Wider Caribbean, 21

Puerto Rico, marine protected areas, 27

Ramsar Convention
South Atlantic Marine Region and, 79
West Africa Marine Region and, 54-55
Wider Caribbean Marine Region and, 21, 38

Reptiles. See Turtles

Rocky shores and cliffs
in South Atlantic Marine Region, 74
in West Africa Marine Region, 46
in Wider Caribbean Marine Region, 19

Salinas. See Wetlands

Sandy beaches. See Beaches and dunes
Sao Tome and Principe, 45, 54
marine protected areas proposed, 67

Seagrass beds
in West Africa Marine Region, 61
in Wider Caribbean Marine Region, 16, 19, 30

Seals
in South Atlantic Marine Region, 75, 76
in West Africa Marine Region, 48, 49, 52, 61
in Wider Caribbean Marine Region, 17
Seaweeds, in West Africa Marine Region, 47
Senegal, 46
    marine protected areas, 52–53, 63
Shellfish, in West Africa Marine Region, 57, 60, 61, 62, 63
Shells, in Wider Caribbean Marine Region, 29
Sierra-Leone, 45
    coastal areas, 53
    marine protected areas proposed, 63–64
Sitatunga, in West Africa Marine Region, 56
Soft sediment habitats, in West Africa Marine Region, 51, 56, 64
South Africa
    marine protected areas, 53–54
    marine protected areas proposed, 64–65
South Atlantic Marine Region
    beaches and dunes, 74
    biogeographic zones, 76, 80–81
    boundaries, 71
    coastlines, 74
    conventions pertaining to, 79–80
    coral reefs, 73
    ecosystems, 73–75
    environmental degradation, 77
    fisheries and fishing, 77
    geography and geology (coastal), 72–73
    Intertropical Coastal realm, 80
    islands, 74–75
    marine protected areas, 76–80, 80
        management levels, 81
    marine protected areas proposed, 81–85
    oceanography, 71–72, 75
    protected areas, 76, 76
    recommendations, 84–85
    rocky shores and cliffs, 74
    species diversity, 75–76
    submerged banks, 74–75
    Subtropical Coastal realm, 81
    Temperate Coastal realm, 81
    tourism, 77
    Tropical Coastal realm, 80–81
Sponges, in Wider Caribbean Marine Region, 30
St. Helena, 45, 54, 67
St. Lucia, marine protected areas, 19, 27, 29, 31–32
St. Vincent and the Grenadines, marine protected areas, 27
Surinam, marine protected areas, 19
Togo, 54
    marine protected areas proposed, 65
Tortuguero/Miskito Marine System (Costa Rica), 29, 30
Tourism
    in South Atlantic Marine Region, 77
    in Wider Caribbean Marine Region, 29, 30
Trinidad and Tobago, marine protected areas, 27
Tristan da Cunha Islands, 45, 54, 66
Turtles
    in South Atlantic Marine Region, 75
    in West Africa Marine Region, 47, 49, 50, 52, 53, 57, 58, 59, 60, 61, 64, 66, 67
    in Wider Caribbean Marine Region, 17, 29, 30, 31
UNEP Regional Seas Programme, 55
South Atlantic Marine Region and, 79–80
UNESCO Biosphere Reserves. See Biosphere Reserves
United Kingdom. See specific countries or territories by name
United Kingdom, Virgin Islands, 19
United States
    Florida, 19
    Virgin Islands, 19
Uruguay, 72–73, 84
    marine protected areas, 79
Venezuela, marine protected areas, 27
Virgin Islands (U.S.), marine protected areas, 19
Waterfowl: See Birds
West Africa Marine Region
    beaches, 46
    beaches and dunes, 46
    biogeographical zones, 48, 55, 55–56, 68
    boundaries, 43
    cliffs, 46
    conventions pertaining to, 54–56
    coral reefs, 45
    ecosystems, 45–46
    fisheries and fishing, 46, 60, 61, 63
    geography and geology (coastal), 44–45
    islands, 45
    mangroves, 45–46
    marine protected areas, 48–56, 49, 55, 55–56, 67
    marine protected areas proposed, 56–68
    oceanography, 43–44, 46
    recommendations for, 67–68
rocky shores and cliffs, 46
seagrass beds, 61
soft sediment habitats, 51, 56, 64
species diversity, 46–48

Western Hemisphere Convention (Convention on Intervention on Nature Protection and Wildlife Preservation in the Western Hemisphere), 21

Western Sahara, 54
maritime protected areas proposed, 65–66

Wetlands
See also Mangroves
in South Atlantic Marine Region, 74
in West Africa Marine Region, 45–46
in Wider Caribbean Marine Region, 16, 19

Whales
in South Atlantic Marine Region, 75
in West Africa Marine Region, 48, 61
in Wider Caribbean Marine Region, 31

Wider Caribbean Marine Region
Andros Barrier Reef, 29
archaeological shipwreck sites, 30
Barbuda, 28, 29
beaches and dunes, 19, 29
Belize Barrier Reef, 29, 30
biogeographic zones, 17
boundaries, 13
caves, 30
corals, 46–48
coral reefs, 15, 19, 29, 30
diversity, 14–16, 19
endangered species, 19, 31, 37
environmental degradation, 35–36
estuarine environments, 19
fisheries and fishing, 16, 29–30, 31
governance and geography (coastal), 14, 35–36
lagoons, 16, 19, 29, 30, 31
mangroves, 15–16, 29, 30
marine protected areas, 17–20, 18, 26–27, 29
management levels, 18–20, 19
marine protected areas proposed, 28, 29
oceanography, 13–14
organizations providing support services, 39
priority conservation sites, 26–32
recommendations for, 32–35
resource problems (by country), 35–36
rocky shores and cliffs, 19
seagrass beds, 16, 19, 30
species diversity, 16–17
Tortuguero/Miskito Marine System, 29, 30
tourism, 29, 30
wetlands, 16, 19

Wildlife Conservation Society, Wider Caribbean Marine Region and, 24

World Heritage Convention
South Atlantic Marine Region and, 79
West Africa Marine Region and, 54
Wider Caribbean Marine Region and, 20, 38

World Wildlife Fund, Wider Caribbean Marine Region and, 24

Zaire, marine protected areas, 54, 66
Map Supplement
<table>
<thead>
<tr>
<th>Country or Region</th>
<th>Name</th>
<th>Existing or proposed</th>
<th>Regional priority</th>
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MARINE REGION 7
WIDER CARIBBEAN

MARINE PROTECTED AREAS (MPAs):
REGIONAL PRIORITY
NATIONAL PRIORITY
EXISTING MPAs REQUIRING MANAGEMENT SUPPORT
PROPOSED MPAs
OTHER EXISTING MPAs

CNPPA MARINE REGION BOUNDARIES
BIOGEOGRAPHIC ZONES
BIOGEOGRAPHIC ZONE BOUNDARIES
INTERNATIONAL BOUNDARIES

The map appearing on this page has been created using the best available information. Comments, corrections, and other feedback would be most welcome.

06/14/1995