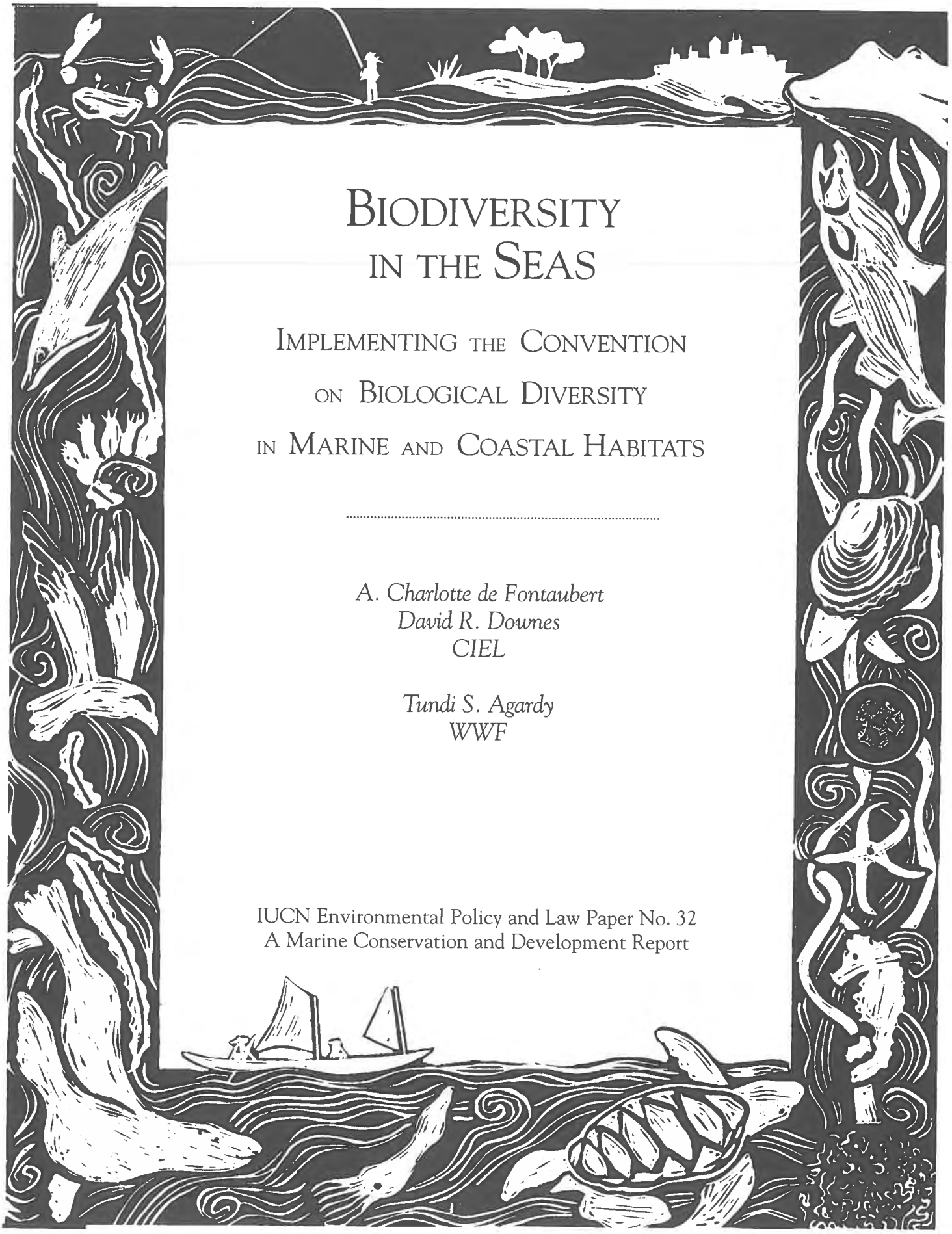
Biodiversity in the Seas

Implementing the Convention on Biological Diversity in Marine and Coastal Habitats



BIODIVERSITY IN THE SEAS

IMPLEMENTING THE CONVENTION ON BIOLOGICAL DIVERSITY IN MARINE AND COASTAL HABITATS

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TABLE OF CONTENTS

FOREWORD

Marine and coastal biodiversity forms the foundation of natural ecosystems that produce and maintain fisheries and other biological resources on which humanity depends. Unfortunately, marine and coastal biodiversity and associated resources everywhere are increasingly subject to a range of human-caused threats, such as land-based sources of pollution, overexploitation of living resources and destructive harvesting techniques, and the introduction of alien species.

Improved and strengthened laws and policies — effectively implemented and enforced — are needed to address these threats and make the transition to conservation and sustainable use of these resources. As the world's central legal instrument on the topic of biodiversity, the Convention on Biological Diversity (Biodiversity Convention) should be a major force to stimulate and support these much-needed law and policy reforms.

Biodiversity in the Seas is intended to promote effective application of the Biodiversity Convention in coastal and marine environments. It is based in large part on the recommendations of the "Jakarta Mandate" agreed to by the Convention's Parties at their Second Conference in Jakarta in November 1995. The Jakarta Mandate identifies the major threats to marine and coastal biodiversity, and the principal legal and policy measures needed to address them.

To support Parties' implementation of the Jakarta Mandate, *Biodiversity in the Seas* explains the special challenges that marine and coastal biodiversity pose for achievement of the Biodiversity Convention's objectives of conservation, sustainable use, and equitable sharing of the benefits from genetic resources. Equally important, it identifies the policy tools that will be most effective for implementing the Convention in marine and coastal areas. The recommended actions are defined in general terms, recognizing that the Convention is designed to allow Parties flexibility in implementing its requirements according to their cultural, political, biological and other circumstances. These general recommendations are illustrated by specific examples, drawn from efforts in countries all over the world. The discussion also highlights existing legal instruments through which the Convention's Parties can and should implement the Jakarta Mandate.

This publication is intended to serve a variety of users, ranging from those who are developing national policies and international agreements relating to biodiversity, to managers of marine living resources working at the local and regional levels. The text is written in non-technical language as much as possible, and the level of detail is limited, to ensure accessibility and facilitate the widest possible distribution. Selected references are included for those seeking additional detail. We hope that this publication will help improve communication and coordination among its audiences, ultimately leading to more effective implementation of the Convention's objectives.

Biodiversity in the Seas has special importance for us, as the product of the first major collaboration between our organizations. Within IUCN, the Biodiversity Policy Programme, the Environmental Law Centre, the Marine and Coastal Programme, and IUCN US provided essential support. While CIEL and IUCN took the lead, we gratefully acknowledge the important contributions of the many organizations and individuals identified in the acknowledgments page. In particular, the Center for Marine Conservation (CMC) and the Biodiversity Action Network (BIONET) played indispensable roles. Roger McManus, President of CMC, first formulated and outlined the idea of a "handbook" on applying the Biodiversity Convention to the marine realm; CMC also organized regional discussions in the Caribbean on an early outline. The product was greatly enriched by insights obtained through distribution of successive outlines and drafts at a series of meetings organized by BIONET, under the direction of Sheldon Cohen, as part of BIONET's 1995 marine campaign.

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This document has benefitted from input and comments from many sources. The structure and contents reflect input received in a series of meetings among members of the Biodiversity Action Network's (BIONET) marine working group, as well as discussion at an international workshop organized by BIONET and IUCN on marine and coastal biodiversity involving over 100 participants from non-governmental organizations, inter-governmental organizations, and governments, which was held in Paris in September 1995, preceding the meeting of the Biodiversity Convention's Subsidiary Body on Scientific, Technical and Technological Advice. Comments were also received on a draft outline circulated on the Internet and distributed at a workshop on Caribbean marine and coastal biodiversity held by the Center for Marine Conservation (CMC) in Santo Domingo in July 1995. Successive drafts were circulated widely for comments at the the Second Conference of the Parties to the Biodiversity Convention, held in Jakarta in November 1995; at the Global Biodiversity Forum organized by IUCN, WRI and others, preceding the COP in November 1995; and at the April 1996 meeting of the U.N. Commission on Sustainable Development.

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Photo by Charlotte de Fontaubert

I. INTRODUCTION

Marine and coastal biological diversity (biodiversity) encompasses the enormous variety of marine and coastal species and their genetic variety, the global ocean's cornucopia of living resources, myriad coastal and open sea habitats and ecosystems, and the wealth of ecological processes that support all of these. The oceans cover over 70 percent of the planet's surface area and account for 99 percent of the volume that is known to sustain life. Coastal ecosystems such as estuaries, wetlands and mangrove forests, also contain significant diversity and are highly valuable for coastal communities.

Unfortunately, human activities everywhere are depleting marine and coastal living resources and degrading marine and coastal ecosystems in ways that are harmful and sometimes irreversible. In the oceans, as on land, the scope of this depletion and degradation has no precedent in human history. It is generally agreed that such biological diversity loss — the attendant decimation of stocks of living resources, widespread appearance of ecosystems imbalances, and the impairment of ecological processes — may well undermine the adaptive potential of those systems and their ability to meet future human needs.

The sea's vastness and its enduring mysteries conceal its inherent vulnerability and the limits of its resources. Oceans are relatively inaccessible to human investigation, and the marine environment is far less well understood than is its terrestrial counterpart. Many societies still operate on the implicit assumption that the oceans offer a wealth of limitless resources and possess an infinite capacity for resilience in the face of environmental pressure and change. The mounting evidence that human activities are inflicting serious damage on the oceans demonstrates the fallacy of this assumption. All regions — including polar, temperate, and tropical latitudes, and those in both developing and developed countries — face increasing threats to the rich natural heritage of marine and coastal biodiversity that has such great value for humanity.

In view of their common concern regarding marine and coastal biodiversity, and recognizing the significant differences between marine and terrestrial biodiversity, the Parties to the Convention on Biological Diversity (the Biodiversity Convention) agreed on a program of action for implementing the Convention with respect to marine and coastal biodiversity at their second Conference of the Parties (COP), held in Jakarta in 1995. This program, termed the "Jakarta Mandate on Marine and Coastal Biological Diversity" (Summary included in Annex 3), demonstrates that the Biodiversity Convention is an important legal tool for promoting the conservation of marine and coastal biodiversity and the sustainable use of living marine and coastal resources. The Jakarta Mandate draws heavily on the recommendations of the first meeting of the Convention's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) held in Paris in September 1995, although it includes some qualifications and additions.

This analysis is intended to help Parties implement the Jakarta Mandate. Part II identifies eight areas where action is needed. For each area, Part II describes specific ways in which Parties can implement the requirements of the Biodiversity Convention in the context of marine and coastal biodiversity. Five of these action areas correspond to those called for by the SBSTTA and included in the Jakarta Mandate. An additional three areas identify actions that support the Jakarta Mandate's five recommendations, through implementation of other obligations under the Convention. Part III establishes five general principles to enhance the effectiveness of implementation in each of the eight action areas.

How can marine and coastal ecosystems be maintained so that humans and the rest of the biosphere can continue to derive values from them? Generally,

The Convention on Biological Diversity

The Convention on Biological Diversity is a legally binding agreement opened for signature at the Earth Summit in Rio de Janeiro in 1992. Over 145 countries are Parties. The Convention's objectives are: the conservation of biological diversity (biodiversity); the sustainable use of biodiversity's components; and the equitable sharing of benefits derived from genetic resources. The Convention defines biodiversity as "the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems."

The Convention recognizes "the importance of biological diversity for . . . maintaining life sustaining systems of the biosphere." It acknowledges that "conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population." Biodiversity has intrinsic value, and biodiversity and its components have "ecological, genetic, social, economic, scientific, education, cultural, recreational and aesthetic values."

The Convention establishes a framework of general obligations that Parties are to elaborate in more detail at the national level. For example, Parties must: create national plans, strategies or programs for conservation and sustainable use; inventory and monitor the biodiversity within their own territories; identify and regulate destructive activities; and, integrate consideration of biodiversity into national decision making. Parties must also take special measures to protect customary resource uses and local and indigenous communities' traditional knowledge, innovations, and practices, where they carry on sustainable traditions. Most of the Convention's obligations allow Parties some flexibility in implementation, recognizing that conditions of biodiversity conservation and loss may vary widely.

The Convention also provides for an international structure to support national implementation and to promote continued international cooperation. This includes a permanent Secretariat, a Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), and a Clearing-House Mechanism (CHM) to support scientific and technical cooperation. The parties meet periodically at Conferences of the Parties (COP) to elaborate and build on the Convention, for instance by negotiating protocols (follow-up treaties on specific issues), or creating and modifying annexes on technical or scientific matters. Each party must submit reports on its implementation to the COP. There is also a multilateral fund, currently operated by the Global Environment Facility (GEF), that is funded by developed countries and helps finance implementation in developing country Parties.

The Convention establishes a new international regime for the transfer of "genetic resources," which are defined as "genetic material of actual or potential value." The Convention affirms each Party's sovereign right to control access to its genetic resources, while requiring that the Party make efforts to facilitate access for other Parties. It also requires the users of genetic resources to take measures to promote equitable sharing of the benefits, including technologies, with the providers of those resources.

Adapted from: D. Downes, 1996. "Global Trade, Local Economies and the Biodiversity Convention." in W. J. Snape, ed. *Biodiversity and the Law*. Washington, D.C.: Island Press.

the response will require three complementary types of action. The first is to conserve ecological processes and threatened populations of organisms, species and habitats, managing harmful human activities so as to maintain the integrity of ecosystem processes and functions. The second is to determine levels of resource use that are sustainable, and to manage use to keep within those limits. The third is to ensure a fair and equitable sharing of the benefits of effective management and conservation, so that people who use and depend on the resources are rewarded for use that sustains the resource base without impairing the ecological processes that maintain it.

Scope of Application of the Convention to Marine and Coastal Biodiversity. Under the Convention, each Party is required to take action to protect components of coastal and marine biodiversity within its national jurisdiction. As defined by the law of the sea, embodied in the United Nations Convention on the Law of the Sea (UNCLOS), coastal States can exercise jurisdictional rights over vast areas of the marine realm, including inland waters, the territorial sea, the contiguous zone, the exclusive economic zone (EEZ), and parts of the continental shelf. The Biodiversity Convention's obligations apply within these jurisdictional zones, insofar as they are consis-

Related International Agreements: UNCLOS and the Law of the Sea

Article 22.2 of the Convention on Biological Diversity (the Biodiversity Convention) provides that it shall be implemented consistent with rights and obligations under "the law of the sea." While Article 22.2 does not refer explicitly to the 1982 United Nations Convention on the Law of the Sea (UNCLOS), UNCLOS is generally understood to embody the law of the sea, i.e. customary international law that is binding upon all States. UNCLOS is a comprehensive international agreement establishing legal principles for navigation, conservation and use of marine resources, marine environmental protection and other human conduct relating to the oceans. UNCLOS was opened for signature in 1982, but did not come into force until November 16, 1994, because of controversy involving Part XI, which deals with deep seabed mining. This problem was addressed through the negotiation of the 1994 Part XI Agreement, which adopted modifications to the 1982 Convention's regime for mineral resources found on the seabed in areas beyond national jurisdiction. Over one hundred States have now ratified or acceded to the 1982 UNCLOS.

Under UNCLOS, coastal States' jurisdictional rights extend to a set of maritime zones, including inland waters, the territorial sea, the contiguous zone, and the exclusive economic zone (EEZ). For each of these zones, UNCLOS establishes a set of rights and obligations for the coastal State. Coastal States have sovereign jurisdiction in inland waters, and (subject to rights of other States) over their territorial seas, which extend twelve nautical miles from a baseline that is approximately equivalent to the coastline. (A nautical mile is equal to 1.852 kilometers or approximately 1.15 miles.) Within their EEZs, which can extend up to 200 nautical miles (approximately 370 kilometers) from their coastline, coastal States have exclusive jurisdictional rights as defined in the UNCLOS over all living resources. In contrast to the territorial sea and internal waters, these rights are counterbalanced by obligations to conserve those resources. Coastal States also have exclusive rights over sedentary species and nonliving resources found on the bottom and in the subsoil of the continental shelf, which is defined to extend up to 200 nautical miles or to the outer edge of the geological continental margin, whichever is farther from the coast (in some specific cases, the continental shelf may extend beyond 200 miles from the baseline, see UNCLOS, Art. 76(5)).

The Biodiversity Convention's obligations apply within these jurisdictional zones, insofar as they are consistent with rights and obligations under the law of the sea. As explained in Annex 2, the two conventions' obligations are in general consistent and complementary.

tent with rights and obligations under the law of the sea (see box on this page).

In addition, each Party to the Biodiversity Convention must apply it to all activities and processes under its jurisdiction or control that occur within its area of jurisdiction or on the high seas, no matter where their effects occur, consistent with the law of the sea. For example, Parties are responsible for the activities of vessels flying their flags while they are in their zone of maritime jurisdiction or on the high seas. In fact, under the law of the sea, flag States have primary jurisdiction over their vessels, and therefore some responsibility, even when those vessels are within other Parties' zones of marine jurisdiction (for example, when they call in the port of another Party).

The Convention's expansive coverage of activities and processes is important in the marine context. The circulation of ocean waters does not honor legal boundaries. Oceans, seas, and coastal zones are ecologically linked across wide distances and are profoundly affected by freshwater flows and the transport of pollutants by air. The activities of one natior may have an impact upon the coastal waters of othe nations nearby and may eventually affect waters thousands of kilometers away.

The Convention also requires Parties to cooperate a far as possible and as appropriate to achieve conservation and sustainable use of biodiversity outside national jurisdiction, in the high seas and on the deep sea bed, as well as on other matters of mutual interest. (Parties to UNCLOS have a similar duty with respect to marine living resources on the high seas and certain stocks in the EEZ). Parties to the Biodiversity Convention shall carry out their obliga tion to cooperate through competent international organizations where appropriate. A number of international instruments are in place through which Parties can work to achieve the Convention's goals in the marine context (see Appendix 1). These include UNCLOS (described above), the 1995

Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, the 1995 UN Agreement on Straddling and Highly Migratory Fish Stocks, Chapter 17 on oceans of Agenda 21, and notably a number of regional agreements on fisheries and the marine environment.

Eight Action Items. Action in the following eight general categories will be critically important in the application of the Biodiversity Convention to the marine and coastal realm. The first five areas are those identified in the Jakarta Mandate. The last three actions aim to support implementation of the Mandate. Part II of this publication explains the basic policy tools for addressing the problems in each of these eight areas. While these eight areas of action are priorities in most marine and coastal ecosystems, each Party will select or develop its own means of implementation and priorities within these eight areas. The action items are the following:

(1) Institute integrated coastal area management (ICAM), including community-based coastal resource management, and prevention and reduction of pollution from land-based sources;
(2) Establish and maintain marine protected areas for conservation and sustainable use;
(3) Use fisheries and other marine living resources sustainably;
(4) Ensure that mariculture operations are sustainable;
(5) Prevent introduction of, and control or eradicate, harmful alien species;
(6) Identify priority components of biodiversity and monitor their status and threats to them;
(7) Build capacity to use and share the benefits from marine genetic resources;
(8) Take responsibility for transboundary harm and global threats to marine biodiversity.

This ambitious set of actions reflects the Biodiversity Convention's comprehensive approach that seeks to link conservation and development in every sector that affects biodiversity. Implementing these actions will require major changes in policies and programs in all Parties to the Convention, both developed and developing. Many countries, however, have very limited resources to devote to reshaping policies and institutions for sustainable use and conservation; this is especially true for developing countries. Realistically, many countries will need to move forward incrementally. For example, a Party may decide to begin with one or a few demonstration projects on integrated coastal area management (ICAM) to tackle activities that have a major impact on marine and coastal biodiversity. Over the long term, the Party can learn from this experience how to apply the ICAM concept to its entire coastline. Equally important, developed country Parties must carry out their obligation under Article 20 of the Convention to help developing countries by providing them with the new and additional financial resources and relevant technologies they need in order to implement the Convention. The high levels of industrialization and consumption characteristic of developed countries result in disproportionate impacts on marine and coastal biodiversity, and those countries have a responsibility to ensure that activities within their jurisdiction are sustainable.

Five Principles for Successfully Implementing Each Action Item. Ecological, social and economic circumstances vary widely among Parties to the Convention. Nevertheless, scientific and technical assessments and experiences suggest that adherence to the following five general principles can help Parties implement the Convention in each of the above eight action areas.

These principles are discussed further in Part III:

(1) Wide consultation and public participation;
(2) Regional and global cooperation combined with national action;
(3) Transfer of technology and financing from developed to developing countries.
(4) Integrated implementation of all action items as much as possible, recognizing the existing limits on capacity; and
(5) Adopting a precautionary approach.

1. The Diversity of Life in the Ocean Environment

he Convention defines biological diversity or bio-versity as "the variability among living organisms om all sources including, *inter alia*, terrestrial, arine and other aquatic ecosystems and the ecolog-al complexes of which they are part; this includes iversity within species, between species and of cosystems." Much of the world's wealth of biodiver-ity is found in highly diverse marine and coastal abitats. These habitats range from shallow coral eefs to the dark ocean floor's soft sediments thou-ands of meters below the surface. While the total number of described marine species is smaller than that found on land, scientists are continually discov-ering new concentrations of diversity. Coral reefs are already known to be among the richest habitats in species diversity on the planet. The deep sea bottom, dark and subjected to tremendous pressure, is now thought to be a dwelling place for thousands, per-haps millions, of species of small invertebrate ani-mals, including crustaceans, molluscs and worms. In recent years scientists exploring the dim middle depths have discovered numerous new species that compose almost unknown, yet apparently produc-tive, ecosystems.

Regardless of species counts, marine animals are more diverse than land animals at the higher, phylet-ic levels of evolutionary and taxonomic differentia-tion. All but one of the phyla (or major branches on the tree of life) of animals are found in the sea. In comparison, only about half of all phyla occur on land. Marine animals exhibit a correspondingly greater range of body forms and structures than are found among terrestrial species.

Ocean creatures (along with freshwater aquatic organisms) also exhibit a diversity of survival strate-gies not found on land. The numerous planktonic life forms of the ocean drift passively in the water, relying on ocean currents to transport them to new nutritional sources and new habitats. Filter feeders sieve plankton and other floating material for food; they range from microscopic zooplankton to barna-cles to sea anemones to baleen whales.

Because access to the marine realm is difficult and expensive, marine biodiversity is even less well-known than terrestrial biodiversity. We know aston-ishingly little about marine life, even in the most familiar seascapes. For instance, scientists have iden-tified twenty-two phyla of meiofauna, two of which were identified only in the past two decades. These animals, barely visible to the naked eye, live on grains of coastal and ocean-bottom sands. Up to 10,000 such animals can be found in a single handful of wet sand. Thousands of species may live in soft bottom sands off the Atlantic coast of Canada. Yet only recently have scientists begun to suspect the important role they play in marine ecosystems. They are a major source of food for shrimp and bottom-feeding fish, and they consume detritus and pollu-tants in sea water that filters through coastal and nearshore sands.

Oceans and coasts encompass an impressive diversity of ecosystems and habitats. Coral reefs, among the planet's largest and oldest structures created by living organisms, are home to dense concentrations of species and complex webs of interspecies interactions (see example in Part II, Action Item 6). In contrast to these sunlit shallow-water habitats are the deep ocean bottoms, characterized by high pressures and absolute darkness, which themselves harbor a diver-sity of species adapted to this extreme environment. Around deep sea hot springs communities of organ-isms can be found that are especially adapted not only to darkness and high pressure but also to tem-peratures near the boiling point.

Some coastal systems — such as estuaries, marshes, mangrove forests, and seagrass beds — are character-ized by high biological production rather than high diversity of species. They are important both to other marine ecosystems such as coral reefs and larg-er ocean ecosystems, and to human development because of the fisheries and other resources and ser-vices they provide. Declines in species diversity in these areas often signal a decline in productivity of valuable resources, with detrimental consequences for coastal communities.

2. Why Marine and Coastal Biodiversity Is Important

Marine and coastal ecosystems, and the diversity of species that compose their structure, provide a wide range of important resources and services. Food from the sea, in particular fish, crustaceans and molluscs, is a major source of human consumption. Marine fish provided about 84 million tons of human food and livestock supplements in 1993 (FAO, 1995d). The fisheries producing this catch are a major source of employment for many of the world's coastal States. A large proportion of the world's catch is harvested by small-scale fishers. Fish accounts for about 16 percent of the average individual's intake of animal protein worldwide (FAO, 1993), and the proportion is higher in many developing countries (WRI, 1996).

Marine and coastal ecosystems also provide critically important services for humanity. These ecological functions include storing and cycling nutrients, regulating water balances, buffering land and protecting it against erosion from storms and waves, and filtering pollutants. On a larger scale, the oceans play an essential role in regulating planetary balances in hydrology and climate. Biological processes contribute to the Earth's climate regulating function through the ocean's photosynthetic pump, removing the primary greenhouse gas, carbon dioxide, from the atmosphere, and producing one-third to one-half of the global oxygen supply.

The diversity of ecosystems fringing the land — coral reefs, estuaries, lagoons, and shallow coastal waters — are particularly valuable for human populations because of the goods and services they provide. They are among the most biologically productive systems on the earth. Some, like reefs and mangroves, provide sea defenses and buffer the impacts of tropical storms, mitigating the erosive effects of waves and storm surges. Marshes filter sediments from water. All of these systems provide nurseries and feeding grounds for many coastal and pelagic species of fish, including many of the most important sources of fish for human consumption.

Marine species provide many other products as w including edible seaweed, ingredients for food anc cosmetics, industrial chemicals and dyes, and a hc of other products. Medical researchers, who are ju beginning to explore the biological wealth of the have already identified a number of marine organ isms that produce previously unknown bioactive compounds, including antiviral and antitumor agents, which may soon have medicinal applicatic One compound derived from a sea sponge to treat herpes, for example, is worth US $50 to 100 millic annually (Norse, 1993). Marine biodiversity is alsc thought likely to produce new enzymes for industr or biotechnological applications, environmental technologies, and adhesives and other industrial compounds.

This diversity of species and ecosystems in the marine and coastal environment is the foundation for the production of goods and services valuable tc human communities. While we tend to measure th ocean's value in terms of harvests of particular species used for food or other purposes, marine and coastal ecosystems provide important ecological ser vices that are rarely perceived until they are lost. Ir addition, it is important to realize that harvested species do not live in isolation, but are part of, and dependent upon, vast ecological communities and systems. The exploitation of target species impacts upon ecological communities, which may provide other benefits to human communities. Conversely, impacts on ecosystems will affect target species. Thus, exploitation of living marine resources, even of single stocks, is a biodiversity issue. The conserva tion of biodiversity is therefore an important part of managing economically valuable living resources.

3. Human Impacts on Marine and Coastal Biodiversity

Though human impacts on marine and coastal biodiversity are less understood and publicized than those on its terrestrial counterpart, their potential effects are no less threatening. The major direct threats to marine and coastal biodiversity can be divided into five interrelated categories: pollution (from land-based and other sources), over-exploita-

tion of marine living resources, introduction of alien species, development and its attendant side-effects, and global climate change.

Pollution. Land-based sources are the primary source of marine pollution. While the impacts of airborne and vessel sources are also significant, toxic chemicals, sewage and agricultural runoff cause even more damage as they lead to eutrophication and other destructive processes. Coral reefs illustrate this problem well. Algae overgrowth on reefs, which is due to high levels of nutrients leaked from land-based sources, can smother and devastate entire reefs (see example in Part II, Action Item 6).

The types of sources and general pathways of pollutants are now fairly well known. Rivers flowing into the sea carry wastes and toxins from cities and industrial sites. These pollutants largely result from agricultural runoff, mining, construction and dredging, and other industrial processes. Oil spills, which occur both on land and from vessels, during extraction, processing, or transportation, are also a common source of marine pollution. The effects of these point and non-point sources of pollution are aggravated by coastal development, which adds further stresses by altering shorelines and critical ecosystems such as wetlands, coral reefs and mangroves.

Among this variety of pollutants, persistent organic pollutants (POPs) are in a class of their own. Their impact is aggravated by their bioaccumulative properties and the toxicity, which occurs at even low dosages. Because they are lipid soluble (they can be dissolved and stored in fats), they tend to accumulate in animals higher on the food chain, such as marine mammals and other large predators, and eventually affect human consumption. Certain properties of POPs allow them to be transported long distances in the atmosphere to sites far away from their emitting source. Their observed effects have been greatest on endocrine, immune, and reproductive systems (see further discussion of POPs in Part II, Action Item 8).

Over-exploitation of marine living resources. Of the world's marine fish stocks for which data is available, 44 percent are fully or heavily exploited, 16 percent are overexploited, 6 percent are depleted, and 3 percent are very slowly recovering (FAO, 1995c). The problems now facing fisheries worldwide have been widely documented. Their manifestations not only have sobering implications for food production, but also have second order effects on biodiversity because of the destructive harvesting methods used and depletion of certain stocks and species.

These impacts on marine and coastal biodiversity are profound. The cumulative effects of bycatch on the health of ecosystems and biodiversity are only slowly being recognized and understood. The use of destructive fishing gear and techniques, ranging from driftnets to bottom trawling and dynamite fishing, are having dramatic effects on species populations and the health of the marine environment. Illustrative examples abound of stocks that have been overfished: commercial fisheries have been shut down, and entire coastal ecosystems devastated. In Canada, for example, thousands of jobs have been lost because the government was forced to close fishing grounds where stocks collapsed because of overfishing (World Resources Institute, 1994).

Introduction of alien species. Another major threat to marine biodiversity lies in the introduction of alien species to an environment in which they are not native. Introduction of alien marine species is largely due to the accidental transport of species from one harbor to another in the ballast waters of ocean going ships. This can upset predator-prey relationships (where in the absence of predators, the introduced species may supplant native species) and introduce previously unknown diseases and pathogens. For communities dependent on the harvesting of native fish species, this can have devastating social and economic consequences. While there may be some eradication and control technology options available once alien species have been introduced in the marine and coastal environment, prevention of new introductions is the most effective strategy.

Habitat degradation caused by coastal development. Mariculture and industrial and urban development embody the most visible human encroachments upon marine biodiversity. Intimately tied to the other sources of impact on marine biodiversity, coastal development in the form of agriculture, mariculture, and residential, tourist, and commercial development and road construction, can alter coastline ecosystems, increase pollution, lead to overexploitation of resources, and allow the introduction of alien species. This problem is pressing, as coastal regions are already home to three-quarters of the world's population and migration to the coast is increasing worldwide (Needham, 1991).

Global climate change. In the long term, anthropogenic pollution is slowly altering the global atmosphere, posing serious risk to vast ocean ecosystems. The growing evidence shows that projected global climate change due to the emission of greenhouse gases may cause major changes in the circulation patterns of the oceans over short time spans. While impacts in particular areas are unpredictable, serious impacts in many regions are nearly certain, including impacts on fisheries and terrestrial climate. Sea level rise threatens to overwhelm some small islands and low-lying areas. In addition, climate change is particularly threatening to coral reefs and the colonies that are the foundation of these highly diverse ecosystems.

Ozone depletion. A further cause of concern stems from ozone depletion. The primary producers of stored energy from sunlight in the sea are microscopic photosynthetic plankton and their protection is an important factor in the preservation of ocean biodiversity. These species, however, are under direct threat from exposure to harmful ultraviolet light, which is enhanced by depletion of the ozone layer.

Through these combined sources of impacts, the marine ecosystems which are the most relied upon for food and ecological services are among those affected most heavily. Fishing pressures have caused the collapse of populations both of target species and, through incidental take and destructive fishing practices, non-target species and habitats. This has implications for entire ecosystems, not to mention food supplies for millions worldwide. But overfishing is just one example of the widespread impact of human activities on marine biodiversity. Increased resource demands, human demographic pressure, and rapidly expanding coastal development are all aggravating factors.

Taken separately, overfishing, pollution, demographic pressure and other harmful activities are damaging enough, but their cumulative impact prohibits the recovery of the ecosystems, even if one of the many impacts is finally brought under control. Coastal communities who stand to lose most, and should be able to identify these impacts first, are often unable to read these symptoms until it is too late. When they have identified the problems, they are often powerless to change the behavior of the culprits whose activities may take place further upstream. Coupled with pollution, development and other human activities, cumulative impacts have yet to be comprehensively assessed. Inappropriate development, it seems, is degrading the most productive, ecologically critical, and highly valued habitats, first and foremost.

Some of the harmful human impacts on marine biodiversity stem from ignorance and lack of understanding of the importance of marine biodiversity and how it can be affected. Marine resources and biodiversity have traditionally been undervalued, which puts marine resources on a lower priority level vis-à-vis land biodiversity. With the absence of value comes absence of regulation and monitoring, leading to overexploitation of these systems. Unregulated use of resources, increased demand for resources, and rapidly expanding coastal development put marine resources at considerable risk.

The belated realization of the need for action only after the damage has become apparent (and often when it is too late) perpetuates this destructive cycle. Communities that depend on marine resources face the long-term challenge of sustainability, yet are often confronted with immediate economic hardship. For developing and developed communities alike, action is hardly ever preventive, but is usually undertaken only after irreversible damage has occurred.

In the face of this increasing uncertainty, the adoption of a precautionary approach is a *sine qua non* to the conservation of marine and coastal biodiversity. The precautionary principle, which is now widely recognized as an emerging part of customary international environmental law, requires that no harmful action be undertaken until all the effects on marine and coastal biodiversity have been clearly identified and weighed against the expected benefits. In the absence of certainty on, for example, the impacts of the development of a new fishery, the proponents of its development should bear the burden of proving that it will not unduly harm marine and coastal biodiversity. Past experiences in fisheries have shown that it is no longer sufficient to fish until the effects of overfishing — in the form of stock depletion — have become apparent. Moreover, this precautionary approach should cover all the activities, past, present and future, bearing in mind the cumulative impact that these activities combined will have on marine and coastal biodiversity.

II. EIGHT ACTION ITEMS FOR PROTECTING MARINE AND COASTAL BIODIVERSITY UNDER THE BIODIVERSITY CONVENTION

This part reviews eight general areas in which action is required in order to implement the Biodiversity Convention effectively with respect to marine and coastal biodiversity ("Action Items"). Action Items 1 through 5 correspond to priorities identified in the Jakarta Mandate adopted by the second Conference of Parties (COP) in 1995. Action Items 6 through 8 are recommended as actions needed to support the first five items. In the discussion of each Item, Part A offers factual and definitional background, Part B discusses relevant provisions of the Biodiversity Convention and Part C describes more specific "recommended actions" that Parties may take within the general area of action.

Action Items 1 Through 5: Marine and Coastal Program of Action Under the "Jakarta Mandate"

ACTION ITEM 1: Institute Integrated Coastal Area Management (ICAM)

Develop and implement integrated coastal area management (ICAM), including: identification of sectoral impacts and the relative importance of their effects on marine and coastal biodiversity; consultations among stakeholders; development and application of best practice guidelines; and assumption of sectoral responsibility for environmental impacts, particularly those resulting from land-based activities affecting the marine environment. ICAM should incorporate community-based coastal resource management systems. Parties should also cooperate to implement the 1995 Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (Articles 5, 6, 8, 10).

A. Background

The Jakarta Mandate to implement the Biodiversity Convention in the marine and coastal context identifies "integrated marine and coastal area management as the most suitable framework for addressing human impacts on marine and coastal biological diversity and for promoting conservation and sustainable use of this biological diversity." In the Jakarta Mandate, integrated marine and coastal area management was generally understood to be equivalent to the more commonly used term integrated coastal area management, which is the term used in this discussion. The Subsidiary Body for Scientific, Technical and Technological Advice (SBSTTA) defined integrated marine and coastal area management as follows:

> Integrated marine and coastal area management is a participatory process for decision making to prevent, control, or mitigate adverse impacts from human activities in the marine and coastal environment, and to contribute to the restoration of degraded coastal areas. It involves all stakeholders, including: decision makers in the public and private sectors; resource owners, managers and users; nongovernmental organizations; and the general public.

Integrated coastal area management (ICAM), also known as integrated marine and coastal management, or coastal zone management, involves planning for multiple uses based on the precautionary approach and ecosystem management principles. It seeks to respond to the reality that terrestrial, freshwater and marine ecosystems, and human impacts upon them, are intricately inter-related. ICAM ideally extends from the coastal watersheds to adjacent offshore systems, and is thus related to the concepts of integrated watershed management and large marine ecosystem management.

Integrated watershed management (IWM) seeks to integrate planning for human activities in the context of ecological and hydrological processes in an entire watershed or stream basin. Integrated watershed management brings together all the groups within a watershed whose waste or consumption of resources interact. Integrated watershed management can be applied from regional to continental scales.

The Pros and Cons of Ecotourism

Nature-based tourism or ecotourism can offer a sustainable alternative to the overexploitation of living resources and destructive consumptive uses that have devastated coral reefs and other marine habitats and living resources. Outside attention on the resource can spark both local and national interest in protecting it, opening the door for marine protected areas, coastal management plans, and effective resource management. Revenues generated from tourism can support local development and create incentives for conservation. Revenues can be used to finance conservation and management, in the form of monitoring and enforcing regulations, establishing permit systems, and installing or constructing devices such as mooring buoys. In turn these measures and amenities will provide a "draw" for ecotourism.

Coral reefs are typical marine sites for ecotourism. Often, ecotourism is associated with scuba diving on coral reefs. Although diving activities will inherently affect the reefs and irresponsible or ignorant divers can cause serious damage, a number of cases have shown that dive operators and reef managers can work together to support conservation. Other tourism activities that utilize coral reef resources directly include snorkeling, swimming and boating, "seascape" viewing, and collecting. Less direct are the activities that depend on the existence of a healthy intact reef system, even when tourists do not come into contact with the reef itself, such as some forms of beach tourism, and landscape viewing more generally. Development is typically more sustainable if it capitalizes on a diversity of visitor interests, reducing pressure on the primary target resources.

But ecotourism is not a panacea, and can lead to unsustainable development and user conflicts. Some of the potential problems include:

(1) By attracting attention to the resource, ecotourism development can create ever-greater demand for access and use; even the tourism focused on nature that is the essence of ecotourism may become unsustainable if visitors become more numerous and impacts of their visits are not monitored and managed;
(2) Ecotourism can create an elitist situation, providing access only to those who can afford it;
(3) Inappropriate ecotourism development can disrupt self-regulating traditional systems of use;
(4) Continuing ecotourism development can spur local population expansion, increasing pressure on resources;
(5) Ecotourism, when coupled to the formation of a recreational use-oriented marine park, can lead to an increase in resource exploitation outside boundaries of core areas;
(6) Successful ecotourism can create a false sense of security that coastal management throughout the country or region is being dealt with effectively;
(7) Tourist attraction to one area can deflect attention from other deserving areas;
(8) Economic growth may take precedence over ecological sustainability;
(9) The presence of foreign tourists can lead to the incursion of foreign value systems at the expense of local value systems;
(10) Tourist visits can open the door for alien species introduction that subsequently undermine native biodiversity; and
(11) Sharing of benefits with local communities may be inadequate, particularly with international ecotourism.

There must be a balance between the benefits that ecotourism can provide and the dangers of tourism development. Ecotourism development must take place within the framework of integrated coastal area management (ICAM). There should be assessments, before ecotourism activities start, of the likely impact on the ecosystems and local societies. Assessments should consider the carrying capacity of the environment for tourism use, including infrastructure, services to the tourism industry, direct exploitation of living resources, and indirect degradation brought about by cumulative impacts on the resource base. Involving local stakeholders, as early as possible in the planning process, is perhaps the most important step that can be taken to ensure that ecotourism development is suitable in the long run.

The concept of large marine ecosystem (LME) management provides a new framework for delineating, describing and managing offshore ecosystems. Large marine ecosystems are regions usually over 200,000 square kilometers, defined by bathymetric and hydrographic boundaries. They define distinct biological communities with characteristic reproductive, growth and feeding activities and interrelationships. These ecosystems may incorporate physical and biological characteristics of importance to human endeavors, such as upwelling areas of importance for commercial fisheries. In managing LMEs, planners consider entire ecological units, including not only target fish stocks but also prey, predators, and other biological and physical factors. More often than not, LMEs extend across legal and political boundaries, and their management therefore requires regional and international cooperation.

B. Relevant Obligations Under the Convention

The SBSTTA has recommended ICAM as the most effective tool for implementing the Convention with respect to marine and coastal biodiversity. While the Convention does not expressly refer to ICAM, Parties are required to take a number of steps under the Convention that are consistent with undertaking and implementing ICAM. Under Article 6(a), Parties shall create national strategies, plans or programs for conservation and sustainable use. Under article 6(b), they shall integrate conservation and sustainable use into relevant sectoral and cross-sectoral plans and policies. In addition, Parties are obligated, as far as possible and as appropriate: to identify and regulate activities and processes that harm biodiversity (Article 7(c), 8(l)); to integrate consideration of the conservation and sustainable use of biological resources into national decision-making (Article 10(a)); to regulate use of biological resources to avoid or minimize harm to biodiversity and with the goal of ensuring conservation and sustainable use (Article 8(c),10(b)); to encourage cooperation between public and private sectors in developing sustainable use methods (Article 10(e)); to adopt economically and socially sound incentives for conservation and sustainable use (Article 11); and to establish procedures for environmental impact assessments of activities that may harm biodiversity (Article 14(1)).

C. Recommended Actions

1. National Level. Important steps for instituting ICAM at the national level include: (1) identifying major sectors, industries and activities that have impacts on coastal and marine biodiversity, and assessing the relative importance of their contributions; (2) bringing together stakeholders and relevant local, provincial and national agencies, in an integrated planning process; (3) developing supportive institutions and enacting authorizing legislation, with regulations and management policies that ensure sustainable development; and (4) developing mechanisms and strategies for monitoring and enforcement.

An initial step in the ICAM process is usually to inventory coastal and marine resources, uses and effects of those uses. Coastal and marine areas include a vast array of resources subject to diverse and often conflicting activities that impact marine and coastal ecosystems, such as fishing, logging, mining, farming, tourism, and industrial and urban development. Assessments must be made of the impacts that these activities — such as discharge of industrial toxics or agricultural pesticides into watersheds, runoff of eroded soil, or harvest of target species — have on marine and coastal biodiversity, including repercussions throughout the relevant ecosystems. (The inventory process is described in Part II, Action Item 6.)

Next, interested and responsible stakeholders should be brought together to explore how to integrate development and conservation within the region, and adopt methods for achieving sustainable development. The process should be a continuing one that allows for: (1) consideration of proposed projects and whether they are consistent with the overall plan, and (2) adjustment of the plan in light of changing circumstances or values. ICAM also requires the agencies responsible for different sectors and activities to come together and jointly address the interacting impacts on the systems they share. In addition, there must be consultation among adjacent jurisdictions, be they municipalities, states, provinces or nations. This integration is necessary to ensure that the views and interests of all the actors in the process will be taken into account.

An important factor for success is participation by communities and groups that depend on various ecosystems for their livelihoods. Many indigenous and traditional communities have developed resource management systems that incorporate principles of sustainability; ICAM should recognize and incorporate these existing systems. Such recognition and integration of customary use systems is required by Article 10(c) of the Convention, which calls for Parties to "[p]rotect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements," and by Article

Practical Examples: Community-Based Coastal Resource Management and Marine Biodiversity Conservation, Lessons From The Philippines

Article 8(j) of the Convention on Biological Diversity requires governments, *inter alia*, to "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles...relevant for the conservation and sustainable use of biological diversity and promote their wider application." This provision reflects the wide recognition that success in biodiversity conservation generally requires local support and involvement, including the empowerment of local communities as stewards, managers and beneficiaries of biological resources. There is also a growing recognition that many communities already have their own effective and sustainable management systems.

Tropical coastal ecosystems support an abundance of the planet's biodiversity and a wealth of living resources. At the same time, many tropical coastal areas are poor, densely populated, and rapidly developing. The premise of community-based coastal resource management is that local communities have the greatest interest in the conservation and sustainable use of coastal resources and thus should have the incentives, resources and capacity for coastal biodiversity conservation. Community-based management may involve a revival of traditional resource management. It generally calls for: empowerment and organization of communities to act in their own behalf; recognition and enforcement of community property rights over local fishing grounds and other resources; provision of environmentally-sound technologies and financing by NGOs, donors, and governments; and the reform of national policy and legal frameworks.

The Philippines epitomizes the crisis of tropical marine biodiversity and coastal poverty, and is also home to pioneering work in establishing community-based management. Located at what has been termed the global epicenter of marine biodiversity (Kelleher, et al. 1995), the country has experienced catastrophic destruction of its coastal resources over the past several decades. Immediate causes include the water run-off impacts of widespread deforestation, mining, and industrial agriculture, over-exploitation of fish stocks by an over-capitalized commercial fleet, the spread of destructive fishing gear and techniques (such as small-mesh nets, dynamite, and cyanide), coastal tourism development, and the migration to the coast of great numbers of farmers uprooted by resource degradation and the loss of access to land to commercial interests (ADB, 1993). While governmental authorities have the legal mandate to regulate development and access to resources, they lack the capacity for enforcement. As a result, biodiversity is being lost and key biological resources are degraded. For instance, municipal fish catches are at one-fifth of their post-World War Two levels (Hancock, 1994), which poses a critical problem for a country where fisheries provide a major source of animal protein and employment.

The many community-level projects, mostly initiated or assisted by NGOs, conduct participatory rural appraisals, facilitate community organization, develop livelihood opportunities, introduce new technologies (such as mangrove reforestation techniques), raise environmental awareness, and serve as community advocates to government agencies. While the Asian Development Bank and World Bank have funded large-scale programs, these efforts have been hampered by a number of problems, such as the difficulty of maintaining community-based decision making.

An essential ingredient of long-run success is a supportive framework of national and international policy and law. The Local Government Code of 1991 provided an important basis in national law for community-based management by giving municipalities the exclusive authority to grant fishery privileges within a zone reaching to fifteen kilometers offshore from the coast (Pimentel, 1993). Unfortunately, the new law does not require that fishing be carried out in a sustainable fashion. Some municipalities have allowed commercial incursions on artisanal fisheries. On the other hand, other communities have used their new powers to pass local legislation declaring ecologically sensitive areas as fish sanctuaries (Agbayani, 1995). At the international level, instruments such as the Biodiversity Convention can support local efforts at sustainable use; international trade policies, in contrast, could intensify commercial pressures for overexploitation.

From contributions by Chip Barber

8(j), which calls for the protection and wider use of traditional knowledge.

The Jakarta Mandate encourages Parties to establish and/or strengthen institutional, administrative and legislative arrangements for the development of integrated management of marine and coastal ecosystems and plans (see COP Decision II/10.3). Institutional structures for achieving ICAM will vary depending on cultural, economic and political factors specific to each situation. For example, a government could create an inter-ministerial commission that would include non-governmental members from relevant sectors, user groups and communities. This overall

management authority could oversee a process of regional planning and coordination, while existing agencies (local, regional and national) could be responsible for implementing specific programs or policies as part of the overall plan.

Parties should also take measures for the monitoring and enforcement of relevant obligations in the ICAM context. For example, Parties should apply the "polluter pays" principle, which requires that the party responsible for environmental degradation remedy and/or compensate for the damage it causes; in economic terms, actors should "internalize" the costs of the damage they inflict on the environment that they share with others. This principle was endorsed by over 160 governments in Principle 16 of the Rio Declaration on Environment and Development. Parties could implement this principle through a wide range of instruments, which could include fees or taxes on damaging activities, legal liability for damages, and environmental assurance bond. These methods can also supplement existing financial resources available to administer ICAM systems.

A number of international publications and other documents provide advice and guidelines for developing and implementing ICAM, such as the World Bank Noordwjik Guidelines on Integrated Coastal Management (World Bank, 1993), the IUCN Integrated Coastal Area Planning Guidelines and Principles (Pernetta and Elder, 1993), the USAID guidelines on Institutional Arrangements for Managing Coastal Resources and Environments (Sorensen and McCreary, 1990), and the FAO Fisheries Technical Paper on Integrated Management of Coastal Zones (FAO, 1992). Integrated coastal area management also figures prominently in Chapter 17 of Agenda 21 (dealing with the protection of oceans and coastal areas).

2. Regional and International Level. Parties should explore how to develop ICAM processes at the regional and international level by identifying regions around the globe in need of special protection, and by cooperating to manage activities within ecological rather than political boundaries (for example on the basis of LMEs).

The Regional Seas Programme of the United Nations Environment Programme (UNEP) is a widely utilized framework for developing regional management strategies. The Programme identifies regions large enough to encompass related ecosystems in need of protection, such as the Mediterranean and the Caribbean, and calls for nations in those regions to address shared environmental threats in a coordinated fashion, focusing on regional priorities and distinctive regional problems. The UNEP action plan for managing natural resources and the environment in the South Pacific is often cited as a successful example. In another example, the Philippines, Thailand, Malaysia, Indonesia and Singapore have agreed on an Action Plan that focuses on the protection of coral reefs and fisheries and the control of marine pollution, which are common threats that all five States share. While questions exist about effectiveness of implementation in some regions, Parties can undoubtedly learn from and build on the experience of the Regional Seas Programme in implementing the Convention at the regional level.

ICAM is closely related to another area where international cooperation is of the utmost importance — marine pollution from land-based activities. Article 4 of the Biodiversity Convention requires Parties to manage all impacts on biodiversity of activities within their jurisdictions; this obligation covers the impacts of land-based sources (LBS) of marine pollution within national jurisdiction. Even land-locked States, therefore, have an obligation under the Convention to address LBS that degrade the marine environment in the jurisdiction of other nations. This is consistent with UNCLOS, which establishes obligations to prevent, reduce and control marine pollution, and refers to the effects of such pollution on habitats.

Land-based sources, including municipal, industrial and agricultural wastes and run-off, represent approximately 70 percent of ocean pollution and have particularly devastating impacts on estuaries and coastal area waters (GESAMP, 1990). To address this problem, the Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities

(Washington, October 23 - November 3, 1995) developed a Programme of Action to provide guidance for management of land-based activities impacting the marine environment. Its clearing-house mechanism offers a means for identifying resources to assess problems and identify solutions, many of which will be directly relevant to the implementation of the Biodiversity Convention.

The Barbados Conference on the Sustainable Development of Small Island Developing States adopted in 1994 a Programme of Action calling for States to establish and strengthen arrangements for developing and implementing integrated coastal zone management plans. The Programme of Action calls for nations to use traditional knowledge and ecologically sound management practices as the basis for formulating integrated management programs, and to include local peoples in the creation of management programs (de Fontaubert, 1994).

ACTION ITEM 2: Establish and Maintain Marine Protected Areas for Conservation and Sustainable Use

Establish marine protected areas for the conservation and sustainable use of threatened species, habitats, living marine resources and ecological processes (Article 8(a), (b) and (e)).

A. Background

Marine protected areas (MPAs) are coastal or oceanic management areas designed to conserve ecosystems together with their functions and their resources. MPAs range from small, highly protected reserves that sustain species and maintain natural processes to larger multiple-use areas in which conservation is coupled with various socioeconomic activities and concerns. The past twenty years have witnessed a dramatic increase in the number of MPAs. There are now over 1,000 MPAs scattered across the globe, ranging in size from three square kilometers to 340,000 square kilometers (the Great Barrier Reef Marine Park of Australia) (Ticco, 1995). However, less than one percent of the planet's marine surface area has been designated as protected, compared to over 6 percent of the land surface (WCMC, 1992).

Article 2 of the Biodiversity Convention defines a protected area as "a geographically defined area which is designed or regulated and managed to achieve specific conservation objectives." Typical objectives of protected areas include: (1) protection of endangered species; (2) maintenance or restoration of viable populations of native species; (3) maintenance or restoration of communities, habitats, nesting and breeding areas, and genetic diversity, especially that which is relevant to living marine resources; (4) exclusion of human-caused species introductions; and (5) provision of space to allow distributions of species to shift in response to climatic or other environmental change. In addition MPAs illustrate the social, economic and ecological benefits of marine and coastal resource protection (Eichbaum et al., 1996). MPAs provide frameworks within which various, but compatible uses cohabit, and where conflicts between users can be addressed. As such, they should not be exclusionary ecological zones, but should recognize the importance of traditional sustainable uses of local communities therein.

Marine protected areas are important economically as they contribute to the creation of jobs and services important for tourism and recreation. They play an increasingly critical role in sustaining commercially or locally important marine resources such as fisheries. In addition, marine protected areas can be used for the preservation of cultural and archaeological sites. They can also serve as institutional frameworks for resolving user conflicts, and can provide small scale models of integrated coastal management (Kelleher, 1991).

Marine protected areas can generate revenue and employment, and developing countries may use marine protected areas as a means to combat poverty and raise standards of living. Revenue generated through sustainable development or ecotourism (park revenue in the form of user fees and/or access fees) can finance the management of an MPA. Other creative means to generate revenue from MPAs include private sector grants and debt-for-nature swaps in which a debt-holder forgives an indebted nation's debt in exchange for that government's commitment to invest in local conservation

projects. Tax incentives that provide favorable tax treatment for actions that lead to better resource conservation can also create incentives for conservation and sustainable use.

B. Relevant Obligations Under the Biodiversity Convention

The Convention contains a number of important provisions relating to MPAs. First, each Party shall, as far as possible and as appropriate, establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity (Article 8(a)). If necessary, Parties must also develop guidelines for MPA selection, establishment and management. Under Article 8 of the Convention, protected areas form one element of a comprehensive set of broader conservation measures. Thus Parties should incorporate marine and coastal protected areas within the broader framework for multiple-use planning required under Article 6, whereby each Party must develop national strategies, plans or programs for the conservation and sustainable use of biological diversity. This planning should incorporate a number of sustainable use management tools including, for example, the creation of buffer zones around protected areas (Article 8(e)); the identification and regulation of major activities that threaten or harm key ecosystems (Articles 7(c), and 8(1)); and the conservation and sustainable use of biological resources (Article 10(c)).

Marine protected areas can also be one way to implement Article 10(c), which requires Parties to protect and encourage the customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements. Finally, Article 22(2) provides that implementation of the Biodiversity Convention shall be consistent with rights and obligations under the law of the sea. Thus, the creation and management of MPAs pursuant to the Biodiversity Convention must be consistent with these rights and obligations, such as the right of innocent passage and the rights of coastal States to establish and enforce measures for conservation of marine living resources within their zones of jurisdictions.

C. Recommended Actions

1. National Level. While each MPA should be designed and administered independently to achieve its own distinct objectives, having a collective national integrated strategy in which terrestrial, freshwater and marine areas are managed together is usually preferable. This integrated coastal area management usually leads to the protection of a wider range of ecosystems and processes than is protected within a single MPA (See Part II, Action Item 1).

There are a number of important steps required for planning and implementing a national MPA program. An initial step is to perform a national survey and field analysis of natural resources and processes to identify suitable areas for the establishment of the MPA. The identification of MPA candidates can be carried out as part of the national inventory of biodiversity discussed in Part II, Action Item 6, below. The precise criteria used for identifying and creating MPAs will vary from nation to nation, but will reflect some weighing of social, economic and ecological criteria, and depend primarily on a society's overall conservation objectives. Social criteria will cover cultural and educational aspects, as well as the possible need to solve conflicts among users. Identification of areas to be protected should also generally take into account the economic value of the species to be protected, the nature of threats and the potential benefits that are to be derived. From an ecological standpoint, diversity, naturalness, uniqueness, productivity and vulnerability are all key factors (Ticco, 1995).

In identifying the area(s) to be protected, policy makers can use a number of general guidelines available (Kelleher and Kenchington, 1991). But such criteria are merely indicative, and many countries are unlikely to have the resources and political will to set up all the MPAs that would ideally be called for. Decision makers therefore need to choose, and to weigh the differences among the criteria, and between different areas that may meet the same criteria.

The success of any MPA hinges on adequate public support, sufficient financial and human resources,

Practical Examples: Local Control of Sustainable Tourism in the Saba Island Marine Park

Saba Island is a small extinct volcano that rises steeply from the deep ocean floor of the Lesser Antilles of the West Indies, and is a Netherlands territory. Despite its small size and population, it has succeeded in attracting and maintaining a thriving tourist trade. Concerned with the impacts of tourism, the residents of Saba wanted to control anchor damage, regulate access by divers, raise funds for enforcement and management purposes, and minimize the taking of marine organisms through the establishment of a multiple use protected area.

The Saba Island Marine Park is locally-designed, self-managed, and internally financed;it provides a good example of local control of biological resources aimed at sustainable development. The Park was established in 1987, to control diving and dive and charter boat operations in Saba's waters. It encompasses the entire coastal zone of the island, from mean high water to a depth of approximately 60 meters, as well as two offshore sea mounts.

The Park is divided into four zones: (1) multiple use zones in which fishing and diving are permitted; (2) recreational diving zones where fishing and anchoring are not permitted; (3) anchor zones in which free anchoring and mooring are permitted; and (4) recreational zones which accommodate swimming, boating, snorkeling, diving and fishing. Public education about the Park is made available through leaflets, brochures and signs (Ticco, 1995).

User fees were instituted ("dollar a dive"), which generate enough revenues to support patrols, buoy maintenance, and visitor services. The fact that the park is self-financing has greatly contributed to the participation of the islanders, who have enjoyed an increase in income from tourism, without having to pay for this new management scheme. Sabans are proud of their Park, and do much to promote the marketing potential of this tourist destination.

Some aspects of the development of the Park proved troublesome. The user fee scheme, in particular, faced major obstacles. At the outset, both the local authorities and the dive operators had recognized the importance of the marine park and the need to involve divers in its financing. Yet, twice, proposals to institute the user-fee scheme were rejected by the dive operators, who feared that such a measure would discourage divers from coming to dive in Saban waters. In the end, however, the dive operators agreed to the user fees because they perceived the overwhelming need to keep the area as pristine as possible by restricting access. If anything, the diving fees have encouraged the most selective of divers to come to Saba. They seem to recognize that the fee is a fair price to pay to help sustain the Park.

and the active involvement of stakeholders. In many cases, local communities have knowledge and experience that are a key factor in MPA management, monitoring and enforcement. Defining and managing MPAs to protect sustainable use of natural resources used by local people supports local economies and the survival, nutrition, and health of coastal inhabitants.

The Jakarta Mandate recognizes that the scientific, technical and technological knowledge of local and indigenous communities should be incorporated in the conservation and sustainable use of marine and coastal biodiversity (see COP Decision II.10, Annex II.3.d). Marine protected areas can also help preserve traditional resource uses and cultural practices. The extent to which national and local governments can raise necessary funding and employ adequate numbers of workers to maintain MPAs is essential for the effective enforcement of plans, regulations and laws. Lastly, the involvement of individual citizens, especially those coastal stakeholders who have a vested interest in the establishment of an MPA, can positively influence their attitudes towards the value of an area's conservation. Through participation of stakeholders and the public, conflicting uses can be avoided and conservation may be coupled with various socioeconomic activities and concerns.

The establishment of a framework of laws and policies that provide adequate authority to regulate uses and that define and support institutions and processes for developing and enforcing MPA management plans is also important. The management plans should identify important issues, state local and national objectives, establish priorities for action, aid in determining the financial and personnel resources required to achieve the stated goals, and help bridge

the gap between public and private interests. Marine areas at risk from maritime activities such as shipping and offshore exploitation should be identified and appropriate measures introduced for their protection. Establishment and management of MPAs should also take into account all applicable regional or international laws and standards. These may include, for example, the designation under MARPOL of special areas restricting vessel discharges or requiring changes in shipping routes, or the IMO's 1991 guidelines on Special Areas and Particularly Sensitive Sea Areas, which provide for similar restrictions.

2. Regional and International Level. By coordinating the establishment and management of MPAs, countries within a region can address common problems. Due to the fluid nature of the marine environment, impacts that originate far from the marine environment, and the migratory characteristics of many marine species (such as sea turtles, sea birds and whales), MPAs work best when they are developed within an integrated coastal area or large marine ecosystem management plan. Ideally, this will include a network of MPAs that is identified and managed within the context of common ecological and oceanographic characteristics of shared marine and coastal ecosystems. The ecosystems will likely extend across legal boundaries between the territorial seas and EEZs of different States, and into the high seas. Thus, management of a network of MPAs requires cooperation between nations that have both an interest in safeguarding the marine environment and a mutual need for sustainable development of marine resources. Examples of this type of cooperation include the Circumpolar Protected Area Network Plan (CPAN), which encompasses national MPA efforts for the eight Arctic countries, the 1990 Protocol for Specially Protected Areas and Wildlife in the Wider Caribbean Region (SPAW), and the European Union's Natura 2000 programme.

Finally, recognition of an MPA under one or more international agreements can bolster the legal status, public recognition, and in some cases financial support for protected areas. Such agreements include the World Heritage Convention and the Ramsar Convention on Wetlands (see Appendix 1).

In 1991, the General Assembly of the International Maritime Organization (IMO) approved Guidelines for the Designation of Special Areas and Identification of Particularly Sensitive Sea Areas (PSSAs) (Res A. 720(17)), and identified the Great Barrier Reef in Australia as the first PSSA. Since then, however, no additional PSSAs have been identified. Agenda 21 clearly calls on "States in cooperation with IMO, to take pro-active steps to identify rare and fragile marine ecosystems as well as the habitats of vulnerable marine species, and ensure that measures are taken to minimize, to the fullest extent possible, the threat of pollution from vessels in these areas." Agenda 21 also calls on States and the IMO to "take action to ensure respect of areas designated by coastal States, within their exclusive economic zones, consistent with international law, in order to protect and preserve rare or fragile ecosystems, such as coral reefs and mangroves."

Parties to the Biodiversity Convention should cooperate through IMO in a concerted effort to identify appropriate measures for PSSAs, including areas within exclusive economic zones, territorial seas and internal waters, in line with the provisions of the Biodiversity Convention and the Jakarta Mandate.

ACTION ITEM 3: Use Fisheries and Other Marine Living Resources Sustainably

Manage fisheries by setting ecologically sustainable levels of use, managing ecosystems rather than single stocks, reducing bycatch and incidental impacts on non-target species and habitats, and eliminating subsidies that encourage overfishing. Where artisanal fisheries are sustainably managed, protect sustainable management systems through measures such as legal recognition and enforcement of community-based resource management systems, and recognition and maintenance of traditional sea tenure (Articles 6(b), 8(c), 8(j), 10(b), 10(c), 11).

A. Background

Human use of the oceans' bounty of fish, which provides a major part of the food supply for the world's population, is placing increasing pressure on marine ecosystems and biodiversity. This pressure can be divided into three components: the impact on the

Practical Example: Spiny Lobsters in Mexico (Casitas)

The coral reefs that buffer the coasts of the Yucatan Peninsula in Mexico are part of the massive Belize Barrier Reef system, the world's second largest. The reefs and associated communities form an ecosystem which is biologically diverse, productive, and relatively intact. The massive reefs buffer the coast from storm events and erosion. The marine environment is a critical component of the local culture; Mayan traders and fishermen in this area have a long history of depending on and caring for marine resources.

In the Sian Ka'an Biosphere Reserve on the Caribbean coast of Yucatan in the state of Quintana Roo, a fishermen's cooperative carefully regulates the harvest of spiny lobsters with an intricate and judicious limited entry system (Miller, 1994). Each fisherman is granted a "tract" of the productive coastal waters, to harvest lobsters in any way feasible. Actual fishing regulations are minimal (size limits, closed seasons), but fishermen cannot obtain new tracts if they overfish or otherwise damage their own tract. The fishermen, however, can trade these areas among themselves, but since all the areas have been allotted, overfishing an area to then move to another one is simply not an option. They use "casitas" — artificial reef-like structures that lobsters use for shelter — to attract lobsters and to keep population levels high. The state allows areas to be used for the placement of casitas in given areas, in a *de facto* regime rather than a strict legal one. This arrangement is comparable to, although looser than, those employed by government agencies in many countries, which lease tracts of the continental shelf for oil and gas exploration.

Spiny lobster fishermen have the highest level of income among local inhabitants. The system provides an enormous incentive for fishermen to protect their renewable resources and the environment that supports these resources. In fact, Sian Ka'an fishermen have been the most outspoken of the state's citizens in putting pressure on government to better manage the impacts of tourism and industry on the marine and coastal environment.

The state and the federal government try, but are not always effective, in enforcing the laws governing lobster fishing. Consequently, in one area where the fishery is extremely productive, the fishermen banded together to do their own policing of the coastal waters. Not only do they patrol areas where casitas are used in order to catch lobster thieves, they also patrol ports and markets to enforce limits on sizes and conditions of the lobsters.

The development of this sustainable fishery practice has not been without its problems, however. The cooperative recently encountered difficulties when an ice plant was built north of the reserve, just at the time the stocks appeared to be declining. The project was reportedly ill-planned and poorly managed and generated considerable debt. Nevertheless, the spiny lobster cooperative is a good illustration of how local resource users can sustainably use marine living resources when supported by traditions of sustainable management, well-designed property rights systems, and official recognition of local decisions and policies.

stocks (e.g., through overfishing), the impact on non-target species (i.e., the issue of bycatch), and the broader impact on the marine environment (for example, through the use of destructive gear and deleterious fishing methods).

From the 1950s to the 1990s, the world harvest of wild fish quintupled, peaking at 86 million metric tons in 1989. The FAO has estimated that over two-thirds of marine fisheries are being harvested at or over capacity (World Resources Institute, 1996). Overfishing may create imbalances in target stock populations, erode genetic diversity within the targeted species, and lead to a long-term decline in target stocks. In extreme cases the result is the decline or death of a once-productive fishery. Depletion of the target species can also start a chain of impacts throughout the ecosystem, affecting ecological processes as well as populations of other species.

Continued depletion of stocks is likely to have dramatic consequences for the many people who depend on fish and shellfish as sources of protein. Globally, fisheries account for about 16 percent of protein consumption, but that figure is higher in many developing countries. It is estimated that fishing employs approximately 200 million people worldwide directly or indirectly (World Resources Institute, 1996). Fishing is also an important economic and cultural feature of many traditional cultures and communities.

Certain widely used fishing techniques lead to excessive bycatch (the harvesting of species other than

those targeted) and habitat destruction or otherwise impact marine and coastal environments. Use of drift nets, gill nets and trawls can result in an extremely large proportion of bycatch of fish, invertebrates, jellyfish, crabs, sea turtles and many other marine species. By conservative estimates, the world's commercial fisheries discard 27 million metric tons of incidental take per year, more than one-third of the 77 million tons harvested on average (World Resources Institute, 1996). This figure does not include subsistence fishing discards, where discard rates tend to be lower, nor does it include data from countries that do not monitor bycatch, or losses of marine mammals.

Some fisheries are enormously wasteful and inefficient in terms of their take of non-target species. In trawl fishing, bycatch can sometimes amount to 75 percent of the total catch by weight. In other words, three kilograms of marine species are killed and thrown overboard for every kilogram taken for consumption. Shrimp trawling has one of the highest rates of bycatch, and is currently the biggest anthropogenic source of mortality of sea turtles, all species of which are listed on Appendix I of the Convention on International Trade in Endangered Species (CITES) as threatened with extinction and affected or possibly affected by trade. New technology such as the use of turtle excluder devices (TEDs) can reduce sea turtle mortality. TEDs are designed for installation in shrimp trawling gear; they release sea turtles and other large marine species without excessively reducing shrimp harvests.

Driftnet fishing is another technique that involves an extremely high level of bycatch. While international condemnation has greatly reduced the use of driftnets in the high seas, the problem is still not entirely resolved (see discussion of UN High Seas Driftnet Resolutions in Appendix 1). Large-scale pelagic (open sea) driftnets are usually made of nylon netting, and individual boats can deploy as much as 50 to 60 kilometers of nets in a single night. In just one year in the Northern Pacific alone, over 3.5 million kilometers of driftnet were deployed (Norse, 1993). The toll on marine life from driftnets can be very damaging.

Expanded capacity and overexploitation also have social and economic costs. Large-scale commercial fisheries sometimes crowd out smaller, artisanal fisheries. (Artisanal fisheries can be defined as fisheries where the fishing units are wholly owned by either the fishermen who work them, or by others in their immediate community.) Artisanal fisheries tend to be far more energy- and capital-efficient than large-scale operations, employ more people, and are often part of important cultural traditions for coastal communities (IUCN, UNEP, WWF, 1991). They also frequently employ selective fishing methods that result in less bycatch.

Not all artisanal fisheries are sustainable, however, and artisanal use of techniques such as dynamite and poison fishing causes severe and lasting damage. The use of cyanide in the reef fish trade, for instance, is one of the most deleterious fishing methods and virtually decimates the living coral habitats upon which the reef communities depend (Johannes and Ripien, 1995). When using dynamite, some fishers will bait a reef area, wire it with dynamite and, when the big fish come in sufficient numbers, detonate it. A more common dynamite technique involves the use of a single stick of dynamite thrown overboard. In both cases, the amount of fish killed is so great that only the larger fish are collected, and all the others discarded. Muro-ami is another widely used fishing method where swimmers drive the fish into nets by hitting the coral reefs either with weights on long ropes or with bamboo poles. The impacts on the reefs are considerable.

While overfishing and bycatch issues receive the most attention, the impacts of fishing on the marine environment may be broader and the consequences can be quite severe. For instance, bottom trawling has a long history of reported damage on benthic ecosystems and yet is used extensively to harvest shrimp, scallop and demersal fishes (i.e., swimming fish that live on or near the sea bottom). With techniques such as dredging the impacts are threefold, as the non-target species impacted are numerous and varied, the sea bottom is impacted by scraping and plowing, and considerably more of the target species is killed than harvested. One of the worst cases doc-

umented is that of a scallop fishery in Australia, where studies showed that only 11.6 percent of the scallops dredged were harvested, while the rest were wasted through direct and indirect mortality (McLoughlin et al., 1991).

The threat to marine biodiversity from fishing operations is fueled by several underlying forces. These include overcapitalization, failure to control access to fisheries, incentive failures, external debt burdens and trade pressures.

Overcapitalization, which in simplistic terms can be defined as too many boats chasing dwindling stocks of fish, is one of the major forces underlying the unsustainability of intensive commercial fisheries. The FAO estimates that countries provide $54 billion in subsidies to the fishing industry every year to encourage the purchase and operation of bigger boats and more intensive gear (Weber, 1995). Government policies that create economic incentives for overcapitalization are hard to justify either environmentally or economically in the face of declining stocks and degraded ecosystems.

In addition, from a social perspective, the ongoing development of industrialized fleets contributes to the displacement of subsistence artisanal fishers whose traditional sources of subsistence are depleted by the government-subsidized operations of their commercial counterparts.

Overcapitalization is also fueled by another underlying problem — open or poorly regulated access where vessels continue to enter a fishery even as stocks decline. To combat falling yields and profits, fishers tend to invest in larger boats, trawls and gillnets in an attempt to boost their catches as stocks are depleted — precisely the opposite of what is needed to restore the resource. Bigger boats and new technology increase the capacity to harvest at an unsustainable level, resulting in declining target stocks, higher bycatches and greater physical damage to marine ecosystems.

In many cases, open access is fostered or permitted by authorities at the expense of local, often traditional sea tenure systems by which artisanal fishers have limited exploitation and maintained sustainable yields. Governments may be unaware of such sea tenure systems, or may respond to commercial fishers' demands for open access that override traditional rights. While it would be a mistake to assume that all traditional regimes are thereby sustainable, at least some traditional resource management regimes are likely to have a better chance to achieve sustainable yields than their commercial competitors (Ruddle, Hviding and Johannes, 1992).

Even where there is an official regulatory regime in place, over-harvesting may result if the total allowable catch (TAC) is too high, or if regulations are poorly or selectively enforced. Commercial interests often pressure regulatory authorities to exceed scientifically established TACs. There has typically been a presumption favoring continued harvesting if there is no scientific certainty that such harvesting is unsustainable — just the opposite of what a precautionary approach would prescribe. In practice, even scientific management approaches often rely on faulty assumptions or reasoning. For example, the most common modern scientific management models based on maximum sustainable yield (MSY) or optimal yield (OY) are usually applied to a single stock, ignoring the interactions between the target species and other ecosystem components, such as associated species. Often, MSY and OY unrealistically assume that stocks' environments and population dynamics will remain stable.

Distant water fishing fleets have little incentive under the present circumstances to apply sustainable methods, as they can overfish a given region, take their profits and leave without having to bear the long term costs of overexploitation or their destructive techniques. Instead, local communities that may have depended on marine resources, and in many cases managed them sustainably, bear the consequences.

Another underlying cause of non-sustainable fisheries involves global financial and trade conditions. The heavy external debt burden on many developing countries puts pressure on them to raise foreign cur-

rency by exploiting their fisheries and marketing the products for export. This in turn leads to higher domestic prices for fish, shortages in supply and disruptions in traditional cultures (Weber, 1995). Similarly, trade pressures fueled by consumption in distant markets also increase the pressure to mine fisheries at an unsustainable rate.

B. Relevant Obligations Under the Biodiversity Convention

Several provisions of the Biodiversity Convention are significant for the sustainable management of fisheries, requiring Parties to take a number of steps, as far as possible and as appropriate. Article 10(b) requires Parties to "[a]dopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity." Article 2 of the Convention defines sustainable use as "the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations."

Parties must regulate or manage processes or categories of activities found to harm biodiversity significantly (Article 8(l)). They also must "regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use" (Article 8(c)). On the high seas, Parties must cooperate in conserving and sustainably using biodiversity, working through competent international organizations when appropriate (Article 5).

With respect to artisanal fisheries, the Biodiversity Convention recognizes the "traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources" (Preamble), and requires Parties to respect and maintain knowledge, innovations and practices of local and indigenous communities, where they embody traditional lifestyles relevant for the conservation and sustainable use of biological diversity, as far as possible and as appropriate and subject to national legislation (Article 8(j)). This Article also requires Parties to promote the wider application of such knowledge, innovations and practices, with the approval and involvement of its holders, and to encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices. Article 10(c) also requires that the Parties protect and encourage the customary use of biological resources in accordance with traditional cultural practices where those practices are sustainable. Taken together, these provisions would seem to favor the protection of sustainable artisanal fishing methods over larger-scale commercial exploitation.

Article 11 requires that Parties develop economically and socially sound incentives for sustainable use of biodiversity. The reduction or elimination of incentives for overexploitation, such as government subsidies to the fishing industry, is clearly necessary for effective implementation of this provision.

Article 16 calls for Parties to "provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biological diversity." Developing countries are to receive such technologies on fair and most favorable terms, where necessary using financial assistance from the Convention's financing mechanism.

C. Recommended Actions

Parties should consider the following actions to protect fisheries that are within their zone of jurisdiction or affected by activities under their jurisdiction or control.

1. National Level. Approximately 90 percent of the global fish catch is taken within the 200 nautical-mile exclusive economic zones (EEZs) of coastal States. One rationale for coastal State jurisdiction reflected in the adoption of EEZs has been that if coastal States can control and reap benefits from coastal fisheries, they have greater incentives to conserve them. Unfortunately, coastal States, especially developing countries, often encounter heavy pressure from distant water fishing fleets as well as domestic fishing indus-

Community-Based Artisanal Fishing in Sri Lanka

In traditional fishing communities near Galle, on the southwest coast of Sri Lanka, residents cooperate closely on artisanal fishing. The men of the village crew a single boat, powered by oars. They set out and collect a large net by hand. The crew keeps part of the catch for their families' consumption, and the rest is sold by the women in the local market.

One of the villagers is the main owner and operator of the boat, but all of the fishermen and their families share in the profits. The nature of this fishing technique, and the investment cost of the boat, which is quite large for cash-poor communities, leads the villagers to unite their efforts, and the fish stocks are effectively treated as common property. At the same time the villagers cooperatively limit access, avoiding individual competing efforts that could deplete the stocks. Young boys participate in fishing early on, and the children show great respect for the ocean, their primary source of food.

Photo by Charlotte de Fontaubert.

tries when they seek to lower total fishing quotas. Many developing countries also apparently sell their EEZ resources too cheaply to foreign harvesters (Weber, 1995). Underpricing access to biological resources both hampers national development and reduces the incentive to ensure sustainable use.

More effective implementation of the provisions of the UN Convention on the Law of the Sea (UNCLOS) provisions for national control and conservation of living resources within EEZs, including stricter control over access by foreign fleets, would be a major step toward fulfilling obligations under the Biodiversity Convention. Parties should reexamine their access policies and ensure they fully exercise their jurisdictional rights under UNCLOS to receive a fair share of the benefits. Conversely, Parties with distant water fishing fleets should ensure that their nationals abide by the restrictions placed by other Parties on access to their EEZs.

Parties should also ensure that the traditional tenure of indigenous communities is taken into account. Parties should consider following the example of some coastal States that have protected artisanal fisheries as sustainable sources of employment and established "exclusive use zones" for artisanal fishers to protect the resources from depletion by large-scale commercial fishing operations (Weber, 1995). Parties can also give legal recognition and priority to traditional sea tenure rights that are the basis of sustainable community-based coastal resource management regimes. In general, protection of sustainable local management of marine resources against interference from large-scale commercial exploitation is an essential part of fulfilling the mandate of the Convention. Governments should recognize and uphold traditional community-based systems that can maintain sustainable use through direct enforcement or recognition of local enforcement.

In addition, Parties should ensure that the overall limits on access to fisheries are based on total allowable catches (TACs) that are grounded in sound science and incorporate a precautionary approach. These TACs need to be reevaluated periodically for adjustment as demand, access and environmental conditions change. One potentially useful technique for discouraging catches higher than the allowable catch is the adoption of individual transferable quotas (ITQs), which have the potential to reduce economic incentives for over-capitalization, and could be used cautiously on an experimental basis. The typical ITQ system allocates fixed quota shares to a set number of stakeholders, entitling each of them to catch a certain percentage of the total allowable catch of the fishery. ITQs have the potential to reduce overcapitalization in a fishery and thereby eliminate some of the incentive to over-harvest. However, an ITQ system may be more difficult to enforce. In addition, it may lead to inequitable results if shares are allocated based on past catch levels. In such situations, large fishing companies can overcapitalize a fishery before the first allocation of shares, and thus control large portions of the total harvest under the new system. It is critically important that systems such as ITQs be crafted so as to respect the traditional sea tenure rights that coastal peoples and smaller fishers have held for generations.

Finally, Parties should institute sustainable fisheries practices and reform policies such as subsidies that create incentives for overfishing and the use of destructive practices. Parties should reformulate the economic incentives they provide to the fishing industry so that they encourage sustainable use by avoiding overcapitalization and encouraging adoption of less destructive technologies and techniques. Specific steps are outlined in the discussion of the FAO Code of Conduct for Responsible Fisheries, below.

2. Regional and International Level. Regional cooperation can strengthen bargaining positions relating to access to EEZs. By joining their efforts, the small island States of the South Pacific were able to negotiate an advantageous treaty with the United States regarding the harvesting of tuna within their EEZs. This was the direct result of a regional approach, which enabled the island States to get much better terms than if they had dealt seperately with the United States in a series of bilateral agreements. To a lesser degree, South Pacific countries worked to protect their interests through the coalition approach in negotiations of the Straddling Fish Stocks Conference, where they were all represented by the South Pacific Forum Fisheries Agency (FFA). Coastal States in other regions might consider similar coalitions in dealing with distant water fishing fleets.

All Parties should make efforts to transfer technology needed to reduce harmful impacts of fishing. Developed country Parties in particular should promote technology transfer through measures such as financial assistance (while taking care not to create incentives for over exploitation). Technologies that aid in sustainable fisheries management include turtle excluder devices, which prevent the unintended capture of critically endangered sea turtles and other large species from bycatch in shrimp trawls, fish attracting devices, which enhance the efficiency of harvesting by attracting target species to an area, and fish grates, which help keep non-target species out of trawls.

All coastal State Parties should ratify or adopt, and implement, several existing instruments that establish frameworks and principles for moving toward sustainable use of fisheries. These include UNCLOS, the UN Agreement on Straddling and Highly Migratory Fish Stocks, the FAO Code of Conduct for Responsible Fisheries and the UN Driftnet Resolution. The UNCLOS outlines a framework of international law that can lead to sustainable ocean governance. It offers a number of avenues for pursuing the Biodiversity Convention's objectives, as detailed in Appendix 2.

UN Agreement on Straddling and Highly Migratory Fish Stocks. In an important step toward implementing some of the principles of UNCLOS, the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks recently adopted an international agreement on stocks of fish species that straddle or migrate between EEZs and the high seas or over long distances (the "Straddling Stocks

Related International Agreements: The 1995 UN Agreement on Straddling and Highly Migratory Fish Stocks

The Straddling Stocks Agreement, adopted by the UN General Assembly in 1995 and signed by more than 40 nations, calls on participating States to:

- Protect biodiversity in the marine environment;
- Take into account the interests of artisanal and subsistence fishers;
- Adopt measures to ensure the long term sustainability of the fish stocks and promote their optimum utilization;
- Ensure that the measures taken are based on the best scientific evidence available;
- Take account of environmental and economic factors, such as the special requirements of developing States;
- Apply the precautionary approach;
- Adopt an ecosystems approach, whereby dependent or associated species are taken into account;
- Take measures to prevent or eliminate over-fishing and excess fishing capacity;
- Give a high priority to the collection and sharing of data; and
- Implement and enforce conservation and management measures through effective monitoring, surveillance, and exchange of information.

The Agreement provides for implementation of these principles through regional management arrangements. For each particular region, and the specific stocks it holds, coastal States and other States with an interest in the stocks are to come together and negotiate among themselves to conduct scientific research, establish TACs, and agree on enforcement measures. The Straddling Stocks Agreement is revolutionary in that it gives participating States strong enforcement powers. The flag State still has primary jurisdiction over its vessels, but if it fails to act after being notified of a likely violation, any other State Party to the relevant regional management arrangement or organization has the right to board and inspect the suspected vessel. The Agreement was opened for signature at the 50th session of the UN General Assembly on December 4, 1995.

Agreement"), with the objective of ensuring the "long-term conservation and sustainable use" of these marine living resources (See box on this page).

Some participants to the Conference felt that the Straddling Stocks Agreement did not go far enough in addressing the issue of over-capitalization, though this issue is identified in the Preamble as one of the problems that needs to be addressed. The Straddling Stocks Agreement states generally that Parties have a duty to take measures to prevent or eliminate over-fishing and excess fishing capacity, but it fails to provide binding obligations in this respect.

Despite its deficiencies, States should ratify and implement the Straddling Stocks Agreement promptly in order to become full participants in the regional arrangements and organizations that will be set up and reinforced under it. The success or failure of the Straddling Stocks Agreement will ultimately depend on the implementing efforts of the Parties to it.

The FAO Code of Conduct for Responsible Fisheries. The FAO Code of Conduct is an important instrument of "soft international law" that Parties should endorse and implement in order to achieve the goals of the Biodiversity Convention in the fisheries context (See box on next page).

The Straddling Stocks Agreement and the FAO Code of Conduct were negotiated during approximately the same period of time and the two are intended to be complementary. The Straddling Stocks Agreement is intended as a framework for management regimes governing straddling stocks and highly migratory species that span EEZs and the high seas. The FAO Code of Conduct focuses on the practices of national fishing fleets, calling on countries to act at the national level. It covers fishing on the high seas, as well as activities within EEZs, including fishing of stocks exclusively within EEZs. The two instruments refer to one another extensively, and the full implementation of one will require implementation of the other. The Straddling Stocks Agreement draws heavily on the technical principles

Related International Agreements: The FAO Code of Conduct for Responsible Fisheries

The Code consists of six thematic articles on Fisheries Management, Fishing Operations, Aquaculture Development, Integration of Fisheries into Coastal Area Management, Post-Harvest Practices and Trade, and Fisheries Research. The Agreement to Promote Compliance with International Conservation and Management Measures by Vessels Fishing on the High Seas ("the Compliance Agreement") is an integral part of the Code of Conduct, and technical guidelines are being prepared by the FAO Secretariat in support of the implementation of the Code. The Code was adopted by the Conference of the FAO in November 1995.

The Code addresses most of the threats to biodiversity from current fisheries practices and explicitly states that it is designed to be interpreted and applied with due regard to the Biodiversity Convention (FAO Code, Article 3). The Code, like the Biodiversity Convention, notes that the precautionary approach must guide States in developing conservation and sustainable use programs when complete information is not available, so that conservation and management measures are not postponed or undermined by a lack of complete scientific certainty.

The FAO Code of Conduct helps address many of the damaging practices discussed above. It calls upon States to reduce the use of indiscriminate and destructive technologies such as trawls and driftnets, and to eliminate entirely the use of poisons and explosives. It calls upon States instead to use responsible technologies and methods, and urges developed countries to share technologies and knowledge with developing nations, with the aim of maintaining biodiversity and conserving population structures, aquatic ecosystems and fish quality. This cooperative, uniform approach can also help eliminate competitive impulses to fish unsustainably; if all nations' fleets are invested in using sustainable technologies and practices, the pressure to cut costs by using short-term, profit-maximizing destructive technology or practices will be reduced.

The FAO Code of Conduct also calls for the protection of artisanal fisheries. Under the Code, States are to provide educational and technical assistance to encourage those fishers to shift to more sustainable methods, where such a shift is necessary. In addition, those fisheries that already are sustainably managed, especially those that embody traditional practices of local and indigenous communities, are to be protected. Indigenous management methods may need to be strengthened or modified in order to address the difficulties of modern fisheries and competition from commercial fishers, but traditional knowledge must not be lost to large-scale commercial fishing. Customary sea tenure must be respected whenever authorities regulate, manage, or redistribute fishing rights.

The Code calls on States to reduce overcapitalization by ensuring that investments in fisheries are in proportion to the value of fishery yields. In addition, the Code of Conduct recognizes the need for fisheries management to be incorporated into a larger scheme of coastal area management, planning and development because of the effects of land-based activities on marine ecosystems (see also Part II, Action Item 1 on Integrated Coastal Area Management). Recognizing the need for a comprehensive management approach, the Code of Conduct requires States to establish a legislative, administrative and institutional framework within which sustainable fisheries management will be developed. The FAO Code of Conduct is to be applied by States to fishery operations by their nationals and by vessels flying their flag, whether within their national jurisdiction, in the zones of jurisdiction of other States or on the high seas. The FAO is now developing technical guidelines to help countries implement the Code.

of the Code, but goes further by calling for the establishment of strong regional organizations and arrangements, in which coastal States and distant water fishing States will collaborate to adopt conservation and management measures for straddling and highly migratory fish stocks. Both instruments seek to impose greater responsibilities on States whose vessels fish on the high seas.

UN Driftnet Resolution. Parties should also work to increase compliance with the 1992 UN Driftnet Resolution (see description in Appendix 1). The ban is still being violated by many nations, including some Parties. Parties should strengthen the enforcement of the ban, through cooperative measures if needed. Enforcement is difficult as much commercial fishing takes place in remote areas that are difficult to monitor, and fishers often avoid regulation under flags of convenience. Enforcement is also hampered by the absence of sanctions when violations occur.

Finally, Parties should cooperate to address underlying problems, such as the pressure that external debt puts on countries to mine fisheries unsustainably in order to earn foreign exchange.

ACTION ITEM 4: Ensure that Mariculture Operations are Sustainable

Conduct environmental impact assessments of siting, design and cumulative impacts of mariculture projects. Ensure protection of traditional property and use rights. Develop and enforce standards for mariculture to minimize its impacts on marine and coastal ecosystems (Articles 6(b), 8(c), 8(g), 8(h), 10(b), 10(c), 14(1)(a) and (b)).

A. Background

Mariculture is defined by the COP as "aquaculture in marine and brackish water," including "culture-based fisheries" (COP Decision II/10, Annex I.x). The Parties referred to FAO's definition of aquaculture as "the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc." So defined, the term would include cultivation of marine species within enclosed ponds or tanks in the coastal area as well as cultivation carried out in the sea itself, within cages and other contained structures. It also includes the cultivation of marine organisms or living systems to provide services such as sewage treatment or flood control. The main types of organisms currently produced through mariculture include mussels, oysters, shrimps or prawns, salmon, other species of fish, and seaweed (SBSTTA Decision I/8, Annex, para. 11).

Mariculture is expanding rapidly in many countries. By some estimates, as much as one-third of all fish production in the year 2000 will be the product of mariculture and aquaculture projects. Already, mariculture accounts for an estimated 30 percent of commercial shrimp production (Barraclough and Finger-Stich citing Maw Cheng Yang, 1995).

Mariculture, if carried out sustainably, has the potential to provide food, employment, and other benefits, while reducing the pressure on wild fish stocks. However, mariculture projects that are not carried out within a framework of conservation and sustainable use can cause serious harm to biodiversity and local marine and coastal living resources. Unfortunately, a large share of mariculture operations are increasingly intensive and cause serious environmental impacts.

Mariculture operations can seriously damage important ecosystems and species, alter native species' gene pools through the introduction of selectively bred, genetically engineered or non-native populations, destroy biological resources needed by local economies, impact coastal regions' natural defenses against wave and erosion damage, and reduce or eliminate the capacity of ecosystems to produce goods and services for local needs. Mariculture operations, when not carried out in a sustainable fashion, release excess nitrogen compounds and other nutrients into the marine environment. The resulting eutrophication leads to low oxygen levels, which can change plant species composition, harm fishes and invertebrates and reduce productivity of locally important fisheries. The release of antibiotics used in mariculture operations may stimulate the development of resistant strains of pathogens in the wild. Many mariculture operations use large quantities of chemicals, which, when released, can reduce the productivity of fisheries and the ecosystems that support them.

Semi-intensive and, in particular, intensive mariculture operations demand large quantities of freshwater and tend to diminish water supplies for local communities, farmers, and ecosystems. In the Ranot region in Thailand, for example, so many shrimp ponds have been developed that the area's average groundwater level fell by four meters in two years (Gujja and Finger-Stich, 1995, citing NACA, 1994). One of the biggest impacts of expanding commercial mariculture projects is the destruction of coastal mangrove forests (see example on the importance of mangroves in Part II, Action Item 6). An estimated one-half of the world's mangrove forests have been destroyed or seriously degraded over the past decade. In many countries, an estimated 20-50 percent of this loss is attributed to clearing for mariculture projects designed for exports to developed countries

Practical Examples: Environmental Impacts of Shrimp Production and Trade, the Need for a Cooperative Response

The worldwide market for shrimp and prawns has grown rapidly. In 1993, the total harvest from wild fisheries and shrimp farms was 2,710,000 metric tons, 56 percent greater than the 1982 harvest of 1,736,000 tons. Much of the increase has been supplied by expanded aquaculture in coastal zones (included in the term mariculture as used in the Jakarta Mandate). While aquaculture has been promoted by some as the answer to the fisheries decline and a source of nutrition in developing countries, in fact 90 percent of the farming production is exported to the United States, Japan and Western Europe (Filose, 1995). Shrimp mariculture has been offered as a way to alleviate the environmental impacts of shrimp fishing, but is not necessarily more ecologically sound. In fact, both fishing and farming of shrimp inflict major environmental costs, few of which are paid by producers, investors or consumers.

Shrimp fishing is one of the most destructive types of fishing known. It is the largest threat to sea turtles, all species of which are in danger of extinction. While the danger can be greatly reduced by the use of turtle excluder devices (TEDs), the industry has yet to adopt TEDs widely outside of the United States. Yet the harm to sea turtles is only part of the problem. Much or most shrimp is harvested by bottom trawling, which has a devastating impact on the sea floor and its inhabitants. Bottom trawling scrapes and plows up to thirty centimeters into the sea bottom, suspending sediments and destroying bottom organisms. This seriously impairs the ability of the benthic (sea bottom) communities to adapt to environmental changes, harms fish species that prey on bottom dwellers, and may have far reaching implications for marine ecosystems. These effects are aggravated by the fact that a given area may be trawled several times a year (Dayton, et al., 1995).

In addition, shrimp fishing has one of the highest rates of bycatch of any fishery. On average, a shrimp fisher kills over five kilograms of other organisms for every one kilogram of shrimp harvested. Some shrimp fisheries have recorded bycatch ratios of 15:1. Although some artisanal fisheries in developing countries retain and use much of the bycatch, these operators are slowly being replaced by commercial shrimp trawlers that discard a large share of the bycatch. The environmental damage and bycatch associated with shrimp fishing call into question its long-term sustainability.

In developing countries, some traditional methods for shrimp culture have relied on low-impact techniques to produce shrimp for local consumption, with relatively low environmental costs. The expanding wave of intensive and semi-intensive production, however, is fed by outside investment, produces for export, and has major environmental impacts. As such, shrimp farms should not be regarded as an alternative to destructive shrimp fishing. Over fifty countries now have shrimp farms, and in 1991, the shrimp farming production worldwide reached 700,000 Metric Tons. The proportion of total shrimp production from aquaculture has grown from 5 percent in 1982 to nearly 30 percent in 1993. In specific cases, like that of Ecuador, shrimp farm production represents as much as 72 percent of the total shrimp output.

The extent of the impacts varies depending on the methods used. Aquaculture methods are defined as extensive, semi-intensive and intensive, depending on the extent of control exercised by the farmers, along with capital inputs, control of growout parameters and technical skills. The new wave of export-oriented industry tends to use intensive methods, which require large capital inputs and advanced technology, allow for higher survival rates and stocking densities, and generally have intensified environmental impacts. Shrimp farms are major contributors to the destruction of mangroves, depriving local communities of the fish and shellfish nurseries, storm buffering, and other services that these critical ecosystems provide. Shrimp farms also contribute to the depletion of groundwater, and pollution of water with shrimp waste, chemicals and antibiotics.

Shrimp aquaculture has socioeconomic as well as environmental repercussions for coastal residents. As noted, the expected nutritional benefits for coastal communities have failed to materialize. Outside investors in intensive shrimp farms have little interest in long-term development. Employment tends to provide low wages, and there is evidence that shrimp farming employs fewer workers than do alternative land uses. In one area, shrimp farming that replaced rice cultivation offered only one job for every ten jobs displaced. Shrimp farms are most often developed in coastal areas, frequently destroying or damaging resources traditionally used by local communities and displacing the traditional users and rights holders (Gujja and Finger-Stich, 1995).

Addressing these problems will require action at many levels. For instance, the ownership of coastal lands needs to be clarified, and shrimp farmers should be required to compensate the traditional users they displace. If governments allow the conversion of mangroves to shrimp ponds, they should ensure that the farmers pay a price or fee that reflects the full value of these ecosystems and that they take measures to restore any damage to the ecosystem if they decide to cease operations. In addition, these measures should be part of comprehensive shrimp mariculture plans designed to put the development of this industry on a sustainable path.

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While the problems with mariculture are complex, at least some technical solutions are available; but the political and economic barriers to their implementation are high. In contrast, the technical solutions for ameliorating the environmental impacts of wild shrimp harvesting are unclear. In that respect, the Parties should make it a priority to cooperate on assessing globally the environmental impacts of bottom trawling and exploring techniques for minimizing the impacts, as well as alternative methods of harvesting.

International agencies, including the multilateral development banks (MDBs), also need to reform their lending practices and policies. They should not continue to support expansion of mariculture without improved environmental impact assessments, and cost-benefit analyses that reflect accurately the environmental costs involved. Ironically, some MDBs provide funding to restore mangroves that were destroyed in the course of mariculture projects previously funded by the very same banks. Multilateral development banks should also ensure that the projects they fund do not dispossess or displace traditional users. In addition, they should evaluate environmental impacts and long-term sustainability when providing assistance in the fisheries sector, including shrimp fishing.

Importing countries and countries providing capital also need to take responsibility for the impact of their consumption and investment. Working with exporting countries, industry and citizens' groups, they need to identify policy instruments that will build incentives for sustainability into the markets, through, for instance, labeling and certification. Ideally, the consumer should pay the full cost of production — including environmental costs that the producers currently inflict on others. Mechanisms for channeling back the revenues to restore and repair the ecosystems and species affected should also be established. Environmentalists and scientists in consuming countries are increasingly concerned about the impacts of shrimp production. The potential for a shift in consumers' taste may motivate producers and importers to reexamine their practices.

(Gujja and Finger-Stich, 1995). In the Philippines, almost 70 percent of mangrove forests have been lost since the 1920s; half of that figure can be attributed to the development of mariculture ponds (Norse 1993, citing Primavera 1991).

Many intensive mariculture projects, such as shrimp farms, become unproductive after five to ten years. The abandoned area is then rendered unusable for most purposes (Gujja and Finger-Stich, 1995.) Local communities that may have used their resources sustainably prior to the mariculture projects then inherit a situation where mangroves and other related habitats no longer provide steady and environmentally sound sources of food and services. Instead, they have gained short term, polluting development that offers limited local benefits, and may even worsen conditions of employment, health, and nutrition.

Intensive mariculture such as shrimp farming generally demands significant capital investment. In most cases, this requires investment by national and transnational enterprises, often through joint ventures. Multilateral development banks (MDBs) and bilateral aid agencies also have provided significant funding for mariculture projects. In 1992, for example, the World Bank invested US$ 425 million in aquaculture in India, out of a total of US$1.7 billion for agriculture and fisheries. Some MDB-funded mariculture projects have proved controversial because of their environmental impacts, particularly the conversion of mangrove forests (Barraclough and Finger-Stich, 1995).

B. Relevant Obligations Under the Convention

Implementation of the Biodiversity Convention offers a significant opportunity to address the growing impacts of mariculture on marine and coastal biodiversity. Several of the Convention's obligations require Parties to address these impacts "as far as possible and as appropriate." Article 8(l) requires Parties to regulate activities harming biodiversity. Article 10(b) requires Parties to take measures to avoid or minimize impacts from use of biological resources. Where proposed mariculture operations might affect customary use of biological resources, Parties must ensure that sustainable customary uses are protected and promoted (Article 10(c)).

Under Article 14, Parties must introduce procedures requiring environmental impact assessments (EIAs) of projects that are likely to have significant adverse

effects on biodiversity; these procedures must also provide for appropriate public participation. Potentially relevant is Article 8(g), which requires Parties to regulate, manage or control the risks posed by modified organisms resulting from biotechnology that are likely to have adverse impacts on biodiversity. Article 8(h) requires Parties to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species. In light of the destruction and degradation of ecosystems caused by mariculture in many countries, Parties may need to apply Article 8(f), which requires them to rehabilitate and restore degraded ecosystems and promote the recovery of threatened species. Parties are also required to create economically and socially sound incentives for conservation (Article 11).

Because of the international trade and investment linked to mariculture, the Biodiversity Convention's provisions on international cooperation, including information sharing, technology transfer and financial assistance are relevant (Articles 5, 16-18, 20). This includes a duty to cooperate as far as possible and as appropriate through competent international organizations.

C. Recommended Actions

1. National Level. In the Jakarta Mandate, the COP endorsed the SBSTTA's recommendations that Parties should implement environmentally sustainable mariculture practices as far as possible and as appropriate. Applying the Biodiversity Convention's obligations at the national level to address the impacts of mariculture and to develop sustainable operations requires addressing a complex set of issues. The precise mix of problems — and of solutions — will vary from country to country. Many of the following suggestions, however, will apply to most Parties, and some will likely apply to all.

Define and Enforce Improved Standards for Mariculture Practices. Governments should develop, apply, publicize and enforce guidelines and best management practices for sustainable mariculture. Among the elements these guidelines should include are: prevention of the spread of diseases and excessive nutrients into the natural environment; controls on the release of alien species; minimization of the use of antibiotics and other chemicals; and siting of projects so as to minimize interference with surface water flow and contamination of aquifers, by requiring buffer zones between farms and shorelines or stream banks. These guidelines should include all of the elements identified by the SBSTTA in the Jakarta Mandate. Governments should amend national legislation if necessary. Parties should also promote self-cleansing systems, where all products, including waste, are utilized and disposed of within the system. Parties may find it useful to cooperate internationally as they develop these guidelines (see sub-section 2, below).

Internalize Environmental Costs and Protect Valuable Living Resources. While it is difficult to quantify in monetary terms the full costs that mariculture imposes on society (Barraclough and Finger-Stich, 1995), Parties should charge mariculture projects fees that reflect the environmental damage or loss of natural capital they may cause. At the very least, Parties should remove any perverse incentives that stimulate unsustainable mariculture. Parties should also create positive incentives for mariculture operations implementing sustainable approaches that protect biodiversity. Positive incentives could include, for example, tax credits for the operators of projects that demonstrate compliance with best practice guidelines.

Assess the Impacts of Proposed Projects. Parties should ensure that every mariculture project undergoes an environmental and social impact assessment that provides for public participation, including local and indigenous communities, and considers the needs of those communities. The assessment should consider the full range of impacts on biodiversity (including at all three levels of biodiversity: species, genetic and ecosystem) and components of biodiversity, including those that are important biological resources for local people. Decisions on permitting, siting, size, and other parameters for projects should take into account the results of the assessment. Wherever possible, projects should be redesigned to mitigate any identified negative impacts.

Practical Examples: Incentives for Sustainable Use and the Aquarium Trade

The giant clam, genus *Tridacna*, is valuable for its meat as well as the international aquarium trade. In this operation in the South Pacific, clam larvae are collected from giant clams in the wild, and seed clams are grown in aquariums. The clams grow to maturity only in the wild, which encourages local communities to maintain natural habitats. The aquarium trade, however, poses a threat to sustainable harvesting, because aquarium owners prefer small clams, which are taken before they reproduce.

More generally, demand for marine organisms for the aquarium trade is encouraging unsustainable and environmentally harmful practices. Only twenty years ago, marine aquarium fish, for example, were harvested by hand-held butterfly-type nets or large plastic suction devices that were selective and not damaging to the environment. Unfortunately, in order to feed growing demand and to increase profits, unscrupulous traders now resort to using sodium cyanide, chlorine, liquid surfactants and explosives. Such activities have impacts beyond merely the target species and in fact are threatening entire coral reef systems in the Red Sea, the Indo-Pacific and the Caribbean.

In an attempt to encourage sustainable trade — thereby promoting implementation of Article 11 of the Convention, which requires Parties to create economically and socially sound incentives for conservation and sustainable use — a group of non-governmental organizations is currently working to create a certification board to monitor the capture, storage, handling and transportation of tropical marine species for the trade, and to give consumers the choice of buying "green-labeled" fish. The premium that buyers say they are willing to pay for fish caught without the use of explosives or poisons should provide incentives for harvesters to collect and maintain marine organisms sustainably. The board will act as an industry-independent governing body to oversee certification and education, creating a widely-recognized name and logo to be used in the aquarium trade, and developing scientific criteria for sustainable harvesting practices. Because mariculture is expected to provide a significant share of the supply for the aquarium trade, the board will also assess the feasibility of certifying farming and ranching of some species. At the international level, it will be important to ensure that trade law and policy support and do not interfere with such efforts to create economic incentives for sustainable development.

Photo by Jason Dewey.

Plan Projects In the Context of ICAM. Parties should also ensure that siting and operation of mariculture projects are considered within the context of integrated coastal area management (ICAM) plans and consistent with the protection of critical ecosystems and habitats (see discussion of ICAM in Part II, Action Item 1).

Protect the Rights of Traditional Residents and Users. Parties should ensure the legal protection and enforcement of traditional property and resource use rights of local and indigenous communities over mangrove forests, coral reefs, and other critical coastal and marine areas that could be affected by mariculture. These communities should be able to exercise these rights in any government decision to grant leases or other property rights to mariculture operators, or to permit mariculture development.

2. Regional and International Level. At the regional and international level, Parties should cooperate to share information, technology, financial and technical assistance on ways to move toward sustainable mariculture (Articles 16, 17). In particular, Parties

should cooperate within the FAO to ensure that the technical guidelines reflect the need for mariculture operations to be sustainable. They should also implement the recommendation of the Jakarta Mandate that the Convention's Clearinghouse Mechanism (CHM) help provide access to information regarding biodiversity and mariculture. The work programme of meetings convened by the Secretariat of individuals on the Roster of Experts on Marine and Coastal Biodiversity could play a useful role in this regard. For example, the process could develop a set of criteria and indicators for sustainable mariculture that would be useful in designing national regulations and conducting environmental and social impact assessments. The process could identify the types of impacts from various types of mariculture on biodiversity. The meetings of experts could also prepare comments from the biodiversity perspective on the mariculture provisions of the FAO Code of Conduct for Responsible Fisheries, and could offer advice and guidance on biodiversity issues to the FAO as it prepares Technical Guidelines dealing with mariculture.

Parties could also cooperate to review the activities of multilateral development banks (MDBs) that relate to mariculture. For example, the COP might ask the MDBs to develop and establish guidelines and procedures for investment in mariculture to ensure that MDB-funded projects and programs are sustainable. An initial step would be to review past and current activities in this sector. This process might begin with a report from each MDB describing its lending practices and policies in the mariculture sector. Each MDB should assess the consistency of these activities with the requirements of the Biodiversity Convention.

In light of the major role of trade in many types of mariculture, it could be useful for the Parties to assess the overall contribution to and impact on national economies of international trade in mariculture products, and explore ways to regulate such trade to ensure sustainable production without undue depletion of the resources of producing countries. A full accounting of the costs as well as the benefits could give decision makers a better basis for making policy decisions.

ACTION ITEM 5: Prevent Introduction of and Control or Eradicate Harmful Alien Species

Take precautionary measures to minimize risks of introduction of alien species into marine and coastal zones from ballast water and mariculture, by cooperating to strengthen and apply relevant international guidelines and by using environmental impact assessments. Cooperate regionally on response plans, contingency plans and notification procedures for introductions. Ensure that negotiations on a biosafety protocol to the Biodiversity Convention address the risks of introductions of living modified organisms resulting from marine biotechnology (Articles 8(h), 8(l), 8(g), 14, 19(3)).

A. Background

The introduction of alien species into areas where they are not native can have far-reaching effects on marine biodiversity and the ecosystem in which they are introduced. They are known to cause imbalances in predator-prey relationships, introduce diseases and pathogens to native species, and cause substantial physical changes in coastal and marine ecosystems. The resulting impacts can be economically and socially damaging for the many coastal communities dependent on the stability and/or productivity of surrounding ecosystems.

The main source of introduction of alien species in the marine environment is their unintentional release during the flushing of ships' ballast waters and accompanying sediments into harbors. Ballast waters taken on in one harbor are flushed out in the port of destination, which may be thousands of kilometers away. By one estimate, "over 3000 species of coastal marine animals and plants are in transit around the world at any given moment in the ballast of ships" (National Research Council, 1995). Numerous species are thus transferred over enormous distances from one ecosystem to another. Since the ballast waters necessarily contain marine organisms, an introduction is very likely should the receiving port provide an ecologically viable habitat. Such introductions bring species against which no natural defenses may exist. In the absence of an available predatory species to keep them in check, introduced species may well be able to out-compete native

species and become dominant. The impacts — resulting from their competitive, predatory, parasitic, pathogenic and defensive strategies and effects on native species — may even initiate a cascading chain of ecosystem effects, including extinctions.

Ultimately, a continued pattern of introductions in ports could lead to simplification and homogenization of the world's marine ecosystems, with concomitant reductions in biodiversity. Such biodiversity loss can rob ecosystems of resiliency, especially important in the face of additional environmental pressures from other human activities. This in turn can have profound implications for food security, and unforeseen consequences in lost opportunities for additional, sustainable uses of marine organisms.

This is not mere speculation, as introduction of alien species in the past has had catastrophic impacts on some ecosystems. The North American comb jelly *Mnemiopsis leidyi* has devastated Black Sea ecosystems following its accidental introduction, reducing plankton biomass by up to 90 percent and resulting in steep declines in anchovy and other commercial fisheries. Introductions can also damage freshwater ecosystems, as was the case with the zebra mussel, introduced from European waters into the North American Great Lakes. The mussel population has exploded, infesting and blocking the pipes of municipal water facilities and power plants. Estimates of current and projected costs to the power industry alone range as high as $3.1 billion over ten years (National Resources Council, 1995).

Other routes for accidental introductions include the construction of canals along coasts or linking previously separated bodies of water across isthmuses or peninsulas. Further threats are posed by the deliberate introduction of alien species for mariculture, the deliberate introduction of organisms into the wild after they have been modified either through selective breeding, hatchery raising, or genetic engineering, and the accidental release of such modified organisms into the wild from contained mariculture facilities. Hatchery-raised fish, for example, may impair the viability of wild stocks either through genetic mixing or behavioral influences. If genetically engineered marine organisms are created that contain genes transferred from organisms in distant taxa, they may pose novel threats to the ecosystems in which they are released.

B. Relevant Obligations Under the Convention

The Convention calls on Parties to "[p]revent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species," as far as possible and as appropriate (Article 8(h)). In general, the Convention requires Parties to cooperate on protecting biodiversity outside of national jurisdiction, as well as on other matters of mutual interest, as far as possible and as appropriate (Article 5). Parties must also regulate or manage processes and activities within their control or jurisdiction that have negative impacts on biodiversity, wherever the impacts occur, as far as possible and as appropriate (Articles 4, 8(l)). These obligations are particularly relevant because alien species are very often transferred across national boundaries and across the high seas via international shipping. These provisions are consistent with UNCLOS, which provides that States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the intentional or accidental introduction of alien or new species to a particular part of the marine environment where they may do significant harm (Article 196).

Another relevant obligation is that contained in Article 8(g), which requires Parties, as far as possible and as appropriate, to regulate, manage or control the risks from the use and release of living modified organisms (LMOs) resulting from biotechnology that are likely to threaten biodiversity (Article 8(g)). In addition, under Article 19(3) Parties are to consider the need for and modalities of a protocol governing safe handling, transfer and release of LMOs. At the second COP, the Parties agreed on the need for a protocol focussing on transboundary movement of LMOs modified by biotechnology. Also relevant is Article 14, requiring environmental impact assessments (EIAs), with appropriate public participation, of projects that may harm biodiversity, as far as possi-

ble and as appropriate. Construction of coastal canals, or government decisions to permit introduction of alien species, are types of projects that should be subject to EIAs.

C. Recommended Actions

While some eradication and control technology options exist for alien species in the marine and coastal environment, the most effective strategy for limiting their effects on biodiversity is to prevent introductions. A number of measures are needed to reduce the chances of introductions, in particular by managing the discharge of ballast waters from ocean going ships. Most such measures must be implemented at the national level through regulations of the ships flying a Party's flag and regulations governing a Party's territorial seas and harbors.

In that respect, the obligations of the flag State and the port/coastal State are complementary. While the flag State needs to exercise effective control over ships flying its flag — ensuring that crews are properly certified, that the ships are not too old and are well maintained, and that the appropriate discharge and loading procedures are respected — conversely the coastal State needs to provide appropriate facilities in its harbors; and to maintain effective control over the discharge and loading procedures. In the case of specific critical areas, where the impact of releases would be even more damaging, the coastal State should publicize existence of the area and should establish modified sea-lanes to improve protection of the area, without unduly disrupting the maritime traffic, consistent with the 1991 guidelines of the International Maritime Organization on Special Areas and Particularly Sensitive Sea Areas. The IMO guidelines provide for restrictions on vessel discharges and changes in shipping routes, as well as designation under MARPOL of special areas that provide for similar restrictions.

In addition to national implementation, regional and international cooperation are essential to develop international standards for the management of activities that threaten alien introductions through ballast waters discharge. Regional arrangements should be developed for notification of threats, contingency plans, and response plans. It would create a major obstacle to maritime traffic worldwide if each coastal State independently imposed its own domestic measures to any incoming traffic. Realistically, ships cannot be expected to abide by a different set of rules in each port. Yet the problem of alien species is severe and demands preventive measures. Thus, strict and carefully crafted standards should be negotiated and adopted worldwide, in appropriate forums such as the IMO.

1. National Level. Coastal State Parties should take precautionary measures to minimize the risks of alien species introductions from mariculture activities. In their efforts, they can draw on the FAO/International Council for the Exploration of the Seas (ICES) Code of Practice for Conservation of Transfer and Introductions of Marine and Freshwater Organisms, 1990. Also relevant are sections of the FAO Code of Conduct for Responsible Fisheries, 1995. Technical guidelines for implementation of the Code of Conduct are still being developed, and increased harmonization and cooperation still needs to take place. The work programme on marine and coastal biodiversity launched by the second COP of the Biodiversity Convention, perhaps working through the Roster of Experts to be organized by the Secretariat, could address the biodiversity-related aspects of such guidelines, and provide feed-back to the relevant organizations involved. All State Parties need to combine and coordinate their efforts, exchange information, and learn from the experience of others.

The SBSTTA's recommendations in the Jakarta Mandate on the threats posed by deliberate introductions of alien species in mariculture include requirements for EIAs, including risk assessment prior to intentional introductions. Parties should consult with neighboring States before they proceed with the introduction of alien species into shared waters. They should also consider indigenous species alternatives and evaluate whether the possible adverse effects could be reversed within two human generations. EIAs should collect and consider all relevant biological information on the species' behavior, life cycle, and ecological relationships.

The Jakarta Mandate also recommends that Parties educate the public on the risks of introducing ornamental species or species for sports fisheries into coastal and marine areas. In addition, it states that Parties should conduct EIAs before constructing canals that link coastal water bodies. If all else fails and Parties need to respond to the accidental introduction of a species, they should exercise caution in the responses they may undertake. For instance, some studies have shown that some of the chemicals used for the eradication of targeted alien species may prove to be more harmful to the marine environment in the long run than the exotic species might have been.

2. Regional and International Level

Ballast Water Guidelines. Coastal State Parties should participate in and support the efforts of the International Maritime Organization (IMO), the primary forum for international cooperation relating to maritime transportation, in order to address the issue of alien species introductions. In particular, they should implement the IMO's International Guidelines for Preventing the Introduction of Unwanted Aquatic Marine Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges, 1993, and seek to codify the guidelines into legally binding obligations. In the Jakarta Mandate, the COP offered to provide input on biodiversity-related matters into IMO's discussions on its guidelines.

A number of technical possibilities for preventing release of alien species in ballast waters may be available, ranging from sophisticated filtering techniques to the use of some tank-coating chemicals. Developed countries should provide technical and financial assistance to facilitate the widespread use of available technical means. State Parties must ensure that vessels flying their flags cooperate with the prevention measures that port/coastal States may have adopted.

Accidental Releases — Regional Cooperation. Parties should also cooperate regionally in response to accidental releases. Once an exotic species is introduced into a new region, there is a great risk that it will spread to neighboring countries. For this reason, Parties in a region should develop plans for notifying neighboring countries when they detect accidental releases that pose a threat to biodiversity in those countries. Anticipatory procedures such as the establishment of communication channels or networks among the responsible maritime authorities, or among networks of port authorities should be considered. The opportunity to address the effects of an introduced species increases with the rapidity of the response, before it has had time to spread too widely or to impact other marine species. State Parties should therefore also develop contingency plans for how they deal with accidental releases when they occur, and response plans for invading species that are already spreading within the region. Parties might develop these cooperative measures within existing institutions such as the various Regional Seas Programmes, or other regional marine pollution programs.

Deliberate Introductions of LMOs. In their negotiations of a biosafety protocol under Article 19(3), Parties should include marine organisms within the scope of the LMOs covered in the discussions and consider the particular risks posed by the release of LMOs within marine environments. Parties should negotiate, sign, ratify and implement an effective protocol on biosafety that addresses introduction of marine organisms.

Other Cooperation. The Biodiversity Convention's three-year work programme on coastal and marine biodiversity (under which the Secretariat will convene a series of meetings of individuals drawn from a Roster of Experts) should provide an additional chance to share national experiences regarding alien introductions and learn from successes and failures. Reporting on these issues should also be considered under the national reporting requirements of the Convention. Developed countries should help developing countries achieve the steps outlined above, and should provide needed technology such as filtering systems for ballast waters loading and discharge. In addition, Parties should acknowledge the fact that some developing countries may lack the enforcement capacity to impose necessary measures — for exam-

ple, harbor regulations for ballast discharge. Developed countries thus have a special responsibility to control the activities of vessels flying their flags. Parties should also cooperate in their conduct of additional research on the impacts of the alien species in the appropriate forums.

ACTION ITEM 6: Identify Priority Components of Biodiversity, Monitor Their Status and Threats, and Identify Measures Needed for Conservation and Sustainable Use

Identify and monitor the status of high priority species, ecosystems and other components of biodiversity that need management and protection. Monitor the threats they face. Identify measures needed to ensure conservation and sustainable use of these areas (Articles 7, 8(l), 10(b)).

A. Background

To be effective, the conservation and sustainable use of biodiversity must be based on adequate knowledge. Collecting and evaluating the information needed to identify priorities for action is, therefore, essential to support the five action items of the Jakarta Mandate.

In the past, most marine conservation efforts, such as the creation of a marine park or the development of relevant legislation, arose when government, a special interest group or the local community saw a need to protect a threatened marine habitat or sought to develop an area in a sustainable fashion. The identification and siting of most marine conservation projects was therefore the result of an ad hoc process in which decision-makers took action where they could, instead of an objective analysis of marine conservation needs. As a result, projects such as the establishment of marine protected areas do not necessarily address the most urgent threats or protect the most valuable resources. The Convention's call for a systematic inventory process reflects an effort to shift policy makers toward a more rational process of identifying priorities.

B. Relevant Obligations Under the Convention

Parties are obligated to take several steps relating to identification and monitoring, as far as possible and as appropriate. Each Party has an obligation to identify important components of biodiversity within its national jurisdiction (Article 7(a), Annex I), and to monitor the status of biodiversity identified as important (7(b)). They must also protect traditional knowledge, apply it more broadly (with the holders' approval and involvement), and encourage equitable sharing of benefits from its use (Article 8(j)). This is an important step toward gaining needed baseline information and involving local people and others whose participation is essential. In the monitoring process, Parties must pay special attention to components of biodiversity in urgent need of conservation and components that offer the greatest potential for sustainable use (Article 7(b)). Finally, Parties have an unqualified obligation to promote international scientific and technical cooperation under Article 18.

C. Recommended Actions

1. National Level. Complete implementation of the actions recommended in this document will require an adequate base of relevant information. Each Party should inventory the marine and coastal biodiversity within its jurisdiction. Each Party should also assess the impacts on biodiversity — both inside and outside national jurisdiction — of human activities within its jurisdiction. The goal of this analysis is to identify: (1) components of biodiversity, including habitats, communities, species, and populations, that are valuable and should be protected; (2) the nature of the threats to these components of biodiversity; and (3) the nature of the measures needed to protect these resources.

In identifying priorities, government agencies, regional bodies, and local decision-makers will need to think strategically about three questions. The first is "*What* needs to be done?" That is, what are the main marine conservation problems to address, and what goals should be set to deal with them? The second question is "*Where* should it be done?" For example,

Mangroves

Rooted in the shallows of the sea on the very edge of the land, mangrove trees are true coastal residents. Mangrove forests, made up of mangrove trees and associated plants and animals, are highly productive and extremely important for local communities. They create habitats and provide nutrients for many plants and animals, and are particularly important as nurseries for fish and shellfish harvested in local fisheries. They buffer coastal communities against storms, and filter pollutants from water. By fixing carbon, they help to counteract global warming. An estimated one-half of the world's mangrove forests have been destroyed or seriously degraded over the past decade.

Mangroves at Negombo Lagoon, Sri Lanka.
Photo by Charlotte de Fontaubert.

where are the priority areas and species, and which areas or species are significantly threatened? The third question is "*How* should it be done?" That is, what measures — scientific, sociological, political, legal, or economic — should be taken to achieve the goals in the areas identified as important? Each country will develop its own process to reach its own answers to these questions, but there will be common elements among most countries. The overall process of identifying biodiversity, threats, priorities and needed actions is integrally related to the implementation of integrated coastal area management.

The question of *What* needs to be done will generally revolve around several broad topics. One is the need to protect ecologically critical habitats to ensure that resources remain available for continued sustainable use. A second is to assess the extent and relative importance of various threats, including, for example, land-based sources of degradation such as sewage runoff and resulting eutrophication, and inherently destructive fisheries such as bottom trawling or dynamite fishing.

The question of *Where* such actions should be taken involves identifying the specific geographical areas for the creation of marine protected areas or other measures. It is best done on a national, or in some cases regional basis, in the context of ICAM (see Part II, Action Item 1). Criteria for pinpointing these areas will generally include estimates of ecological importance (degree of endemism, species richness, productivity, and degree to which important ecological processes are concentrated in an area) as well as quantification of direct and indirect threats. Also relevant is the value — economic, ecological and social — to citizens and communities. In addition, selection of areas for action may depend to some extent on social and political factors. For example, an area may be selected because it is well known and projects there will have maximum value as demonstration projects.

Setting priorities will require linking the evaluation of the resources with the assessment of the threats. In general, conservation is most urgently needed where poorly planned development, overuse of

Practical Examples: Defining Conservation Priorities, The Case of Coral Reefs

Coral reefs are biodiversity-rich ecosystems found in over 100 countries that are highly valuable for coastal communities of the tropics for food and ecological services such as storm buffering. They are increasingly threatened by a range of human activities, including fishing, coral mining, tourism, sediment and pollution from land-based activities, and global warming. By some estimates, 10 percent of coral reefs have already been lost, and another 60 percent may disappear in the next twenty to forty years (Pain, 1996). Coral reefs are part of larger ecosystems including other habitat types such as seagrass beds and mangrove forests. Because of the range of threats, and the dependence of coral reefs on other parts of their ecosystem, protective action cannot be limited to the reefs alone.

Coral reefs are massive marine structures formed by the accretion of the limestone skeletons of successive generations of huge numbers of polyps, tiny, anemone-like animals. The true reef-building corals are the stony corals, composed of hermatypic polyps containing symbiotic algae (zooxanthellae) within their bodies. The algae process the coral's wastes, recycling vital nutrients and contributing to the ecosystem's high productivity. Reef-building corals form three distinctive types of structures: fringing reefs close to the shore, barrier reefs separated from the mainland by lagoons, and atolls that are circular reefs formed on the base of islands which have long since submerged. The total area of all coral reefs is about 600,000 km^2, or slightly more than 0.1 percent of the Earth's surface.

Coral reefs are the mega-diversity areas of the oceans. They are biologically rich and highly productive systems, endowed with a great diversity of species that display an equally impressive variety of organic form and color. Scientists have identified about 93,000 species of organisms found in coral reefs, and by some estimates there may be as many as one million species yet to be identified (Pain, 1996).

Human communities, especially in coastal areas of the tropics, depend heavily on intact, productive coral reefs and their resources. Reefs are crucial sources of food for many coastal communities, providing fish, molluscs, and crustaceans, and they function as breeding grounds for many commercial species upon which even inland peoples depend. They are especially important for maintaining subsistence and artisanal fisheries in island nations. Reef-related tourism can be a very important source of foreign currency and local employment (see discussion on ecotourism in Part II, Action Item 1). Reefs also buffer coastal communities against storms and wave erosion. An increasing number of biochemicals with medicinal and other valuable applications are being discovered in species from coral reefs (see Part II, Action Item 7). In addition, some recent studies suggest that reefs may counter global warming by sequestering carbon (i.e., removing carbon dioxide, a greenhouse gas, from the atmosphere).

While coral reefs are highly adaptive to natural disturbances, they are extremely sensitive to human-induced environmental change. Their fragility is compounded by their rate of regrowth, which is slow in comparison to the rate of damage. Reefs grow no more than twelve meters (and often much less) in 1000 years. They have strict environmental requirements, requiring a great deal of light, oxygen, water temperatures between twenty-two and twenty-eight degrees Celsius, and low loads of suspended sediments.

This sensitivity renders coral reefs vulnerable to a wide range of stresses. Land-based activities pose some of the most serious threats. Many corals are killed by sediment runoff due to deforestation, agriculture, and loss of mangroves, which act

Photo by Tundi Agardy

continued next page

as sediment traps. Pollution from sewage originating from coastal settlements causes eutrophication, stimulating the growth of algae and smothering corals. Run-off from agricultural development on coasts can have a similar over-fertilizing effect. Mining of live coral for use as building material is another significant impact in some places. Destructive fishing gear such as pole nets and dynamite, or fishing with poisons like cyanide, cause widespread, lasting, and sometimes irreversible damage. Diving and boating are damaging some heavily visited reefs. Human activity can have devastating indirect repercussions. For example, overfishing of algal-grazing fishes not only depletes the target species but can trigger the spread of harmful algae on the surface of the corals, causing widespread degradation by smothering.

Climate change poses a severe long term threat because corals cannot live in waters over twenty-eight degrees Celsius. Coral bleaching (in which the polyps expel the symbiotic algae) appears to be linked to water temperature increases; after repeated bleachings, the coral dies. Researchers have recorded significant increases in water temperatures within coral reef areas over the last decade (Pain, 1996; World Resources Institute, 1996; Maragos, et al., 1996).

What is needed to conserve coral reefs and their valuable resources? Areas of reef that are highly productive or harbor a wide diversity of species are obvious targets for conservation. Many less obvious areas are ecologically linked to reefs; they are equally important and must also be protected. These typically include soft-bottom communities adjacent to the reefs, seagrass meadows where many reef organisms feed and breed, mangrove forests that provide nutrients and nursery areas for many species, and the major migration corridors that link these diverse critical habitats. Any coral reef protection program will have to conserve all these critical areas to some degree in order to be effective. Necessary measures will include control of land-based sources of pollution, designation of protected areas in which uses are restricted, and regulation of resource uses to ensure sustainability.

While most attention is currently focused on reefs, it is important to note that many species of corals do not build reefs. These coral communities may rival reefs in high productivity, and merit as much conservation attention as coral reefs themselves.

resources, or indirect degradation threaten to undermine the very resource base on which coastal peoples depend. Evaluating such opportunities and threats in a systematic way helps to direct marine conservation support so that it is maximally effective and long-lasting.

Finally, the question of *How* this should be done must be answered on a case-by-case basis in each country and region. The political, social and economic appropriateness and feasibility of any particular marine conservation policy or project is something that only the local people or their representatives can assess. In addition, the policy or project must have a sound scientific basis. For example, protecting merely one part of an ecosystem that supports marine biological diversity of value will not succeed in the long run. The target area's boundaries must reflect ecological processes and linkages.

While most Parties will need to improve their knowledge base, lack of knowledge is not a reason to delay implementation of the Biodiversity Convention's conservation and sustainable use obligations. The major threats to marine biodiversity and the types of actions needed to address them are already known. As noted in the Convention's endorsement of the precautionary approach: "where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat."

The process for all aspects of priority setting should bring together diverse groups and communities, each of which can offer relevant information, including biological and social scientists; concerned citizens; non-governmental organizations (NGOs); resource conservation and use managers; women's groups; local and indigenous communities; and user groups.

2. Regional and International Level. Regional and international cooperation will be important for inventorying and monitoring. In particular, Parties should share information and conduct joint research on transboundary impacts, shared marine ecosystems, migratory species, and global environmental prob-

lems such as climate change. They should also exchange information on national experiences with inventorying and priority-setting. The Parties can carry out such activities through the institutional structure of the Convention, including the process that the second Conference of Parties established for conducting a work programme to elaborate further the Jakarta Mandate.

Other existing instruments and institutions also provide important avenues for cooperation among Parties. For example, Parties should explore the provisions of UNCLOS on marine scientific research, including those on publication and dissemination of research results and establishment of regional centers (See Appendix 2). Other existing mechanisms include the Intergovernmental Oceanographic Commission (IOC) and the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP).

ACTION ITEM 7: Build Capacity to Use and Share the Benefits of Genetic Resources

Strengthen capacity to use sustainably and share equitably the benefits derived from marine genetic resources and biochemicals within national jurisdictions (Articles 8(j), 10(b), 15, 16, 18 and 19).

A. Background

The Biodiversity Convention establishes basic principles for a new international regime on genetic resources. The Convention makes clear that Parties have the sovereign right to set the terms for access to their genetic resources, while requiring them to take steps to facilitate access for other Parties. Access shall be by prior informed consent. Parties must take measures to promote sharing of benefits, including technologies, from the use of the resources. These principles are embedded in a larger framework that requires sustainable use of biological resources (including genetic resources), as well as the consent and participation of local communities in the use of traditional knowledge. Implementation of the Convention's genetic resource provisions can support sustainable development and create incentives for conservation.

At present, however, only a few countries, such as the Philippines, have implemented the genetic resource framework through national law. Developing country Parties particularly need to build up national capacity to develop and enforce implementing laws and policies in order to achieve the Convention's objectives. The need is clear in view of the number of marine prospecting efforts already underway.

Marine biodiversity's tremendous potential as a source of new products is growing with the increase in the technological capacity to make use of the genetic and biochemical resources found in living organisms of the sea. Potential applications include medicines, environmental sensors, environmental restoration technologies (such as microorganisms that decompose pollutants), enzymes for industrial and biotechnological applications, and adhesives, antibiofouling agents, dyes, and other industrial agents.

Several industrialized countries have established government-industry consortia that are actively collecting marine organisms and researching potential applications for marine resources. In addition, many companies ranging from large multinationals to small biotechnology firms are collecting and studying specimens from biologically rich marine areas around the world. In the United States, some companies have entered into agreements to pay universities or research institutes for samples of organisms collected from the sea.

Certain types of marine habitats and ecosystems seem particularly rich in genetic resources. For example, unique ecosystems have evolved around vents of superheated, pressurized water on the deep sea-bed, where conditions may reach 350-400 degrees Celsius and 265-370 atmospheres (air pressure at sea level is one atmosphere). Some of the microorganisms in these ecosystems can withstand astonishingly high temperatures, above 100 degrees and possibly as high as 150 degrees Celsius (Gillis, 1994). These bacteria, called hyperthermophiles, are proving to be valuable resources for biotechnological applications. They are particularly useful in the replication of DNA, as they contain enzymes that are able to withstand the

Practical Examples: "Gene Pools," Marine Protected Areas as Possible Sites for Sustainable Use Through Biodiversity Prospecting

Financial resources for marine resource conservation are limited, while degradation of marine living resources worsens. "Biodiversity prospecting" or "bioprospecting" for sources of new products in Marine Protected Areas (MPAs) that are rich in genetic resources could harness market forces to provide new sources of funds for conservation and sustainable development. Many MPAs were created in the hope that they would support multiple uses compatible with conservation. Bioprospecting, like specimen collection for biological research, ordinarily involves very low level harvesting in the initial phase, making it an appropriate use of sanctuary resources — although managers should monitor harvesting carefully to ensure it does not exceed sustainable levels. Bioprospecting differs from other types of scientific research because the information and resources gleaned from marine ecosystems have great potential to contribute directly to the development of marine biotechnology and other industries.

Managers, including indigenous inhabitants, should consider options for marketing these assets and negotiating terms for access that ensure sharing of benefits and sustainable collection practices. Indeed, local people and governments could also create protected areas for the purpose of protecting and controlling access to natural concentrations of genetic and biochemical resources.

Already, scientists must generally apply for permits before they are allowed to conduct research in most parks. Park authorities should design permits that require researchers to obtain prior consent from local communities, and to channel a part of any profits they derive from samples back to the MPA and surrounding area, as support for continued conservation (in many countries, establishing such mechanisms will probably require changes in authorizing legislation at the national level). Such arrangements, often referred to as bioprospecting contracts, may take a variety of forms, and should include provisions for employment of local people, scientific information and technology, training for and joint research with host country scientists, fees for samples and a share of any future profits. In return, industry receives reliable access to protected concentrations of resources.

Any mechanism for reaping benefits from biological resources must involve and benefit the local people. This is especially true of bioprospecting, which uses local biological resources, and sometimes draws on local peoples' traditional knowledge of the habitats, habits and useful qualities of their living resources. Article 8(j) of the Convention requires protection of local and indigenous communities' knowledge, as well as their involvement and consent when their knowledge is more widely applied. It also requires governments to encourage fair sharing of benefits. Indigenous communities must receive adequate notice, and have a chance to decide on whether to begin proposed negotiations or form agreements. Governments should ensure protection of these rights as part of each country's national process of implementing Article 15 of the Biodiversity Convention.

When establishing access requirements, managers need to remember the inherent limitations of bioprospecting agreements. Only a very small percentage of samples are likely to lead to profitable products. Many researchers — especially those from academic institutions — have limited funds to share. This means that resource holders cannot necessarily expect large cash payments initially. Enforcement of agreements may be difficult, so managers should look for reliable partners. Yet at the same time resource holders should be able to insist on some minimum elements for prospecting negotiations and deals. Cooperative research, sharing of research results, and public acknowledgment of reliance on traditional knowledge, are just some examples of measures that managers should be able to require. Developing the capacity to bargain effectively and realistically will require good communication among resource holders worldwide and good sources of information on market conditions. Park managers can also enhance their returns by adding value to the resources they offer, for example by developing databases of biological information.

A terrestrial example of using parks as settings for bioprospecting agreements is the agreement between Merck & Co., Ltd. and the National Biodiversity Institute of Costa Rica (INBio). In this agreement, INBio provides extracts from samples of organisms collected from Costa Rica's conserved wildlands in return for Merck's technical assistance, and training and financial compensation, a portion of which is earmarked for Costa Rica's national parks fund. INBio is adding more value to Costa Rica's biodiversity by undertaking an inventory of the country's biological resources and systematically compiling that information in a computerized format that will be accessible to national and international users (Reid, et al., 1993).

Other park systems can and should reevaluate their policies on research access. For example, when an organism collected from Yellowstone National Park (U.S.) contributed to a lucrative biotechnology invention, park managers began to consider how to design research permits to ensure that the park received a share of the benefits from future discoveries that use organisms collected in the park.

Adapted from: Denno Bouman, L. 1995. *Prospecting in the Park: New Opportunities for Genetic resource Conservation and Development in U.S. MPAs.* Master's Thesis, University of Delaware. Newark, Delaware.

repeated cycles of heating and cooling necessary for this process. A similar microbe discovered in the hot springs of the Yellowstone National Park (U.S.) in 1966 contains an enzyme that was eventually used in a patented DNA replication process which has since proved to be the basis for the rapid development of the DNA diagnostic industry; it is estimated to generate sales of US$100 million per year.

Coral reefs are another type of habitat that contain significant genetic and biochemical resources. Complex interactions among the many different species that coexist in coral reefs have apparently led them to evolve unusual chemical weapons that can be the basis for pharmaceuticals and other useful compounds. Pharmaceutical research on biochemicals found in marine organisms has yielded a number of compounds now in clinical trials or undergoing preclinical studies, any of which may ultimately yield a new pharmaceutical. Derivatives of moniliid, a chemical produced by a species of sponge found in the coral reefs of Palau, and pseudopterosin, found in gorgonian corals, are currently in preclinical development as anti-inflammatory agents. Dolastatin 10, from a type of mollusc, is in Phase I clinical cancer trials. Bryostatin 1, derived from a bryozoan found off the U.S. West Coast, is in Phase II clinical cancer trials. Several other compounds derived from marine organisms are also in various stages of preclinical development as anti-tumor agents. Any or all of these materials may ultimately yield a viable drug candidate (Newman, 1995).

The U.S. National Cancer Institute (a government research institution) has been looking for pharmaceutical compounds in marine organisms collected by its contractors in other countries. The institution has recently developed a standard "letter of collection," which constitutes an agreement with the source country governing the collection of marine or terrestrial samples. In the letter, NCI agrees that if it licenses to a third party (most likely a pharmaceutical company) the right to develop a product based on a sample, the third party must negotiate an agreement with the source country, or the appropriate institution in the source country, to pay a share of the benefits. NCI also agrees to seek to arrange for a fellowship in its laboratories for one of the host country's senior researchers.

Marine resource collection agreements are becoming increasingly common between private sector parties and research institutions, but the number of agreements that involve source country institutions is low. One obstacle to the adoption of such agreements may be the absence of legal frameworks for access and benefit sharing under the Biodiversity Convention, as well as the lack of legislation implementing UNCLOS's provisions on marine scientific research. While some collecting entities, like NCI, have developed a format for prospecting arrangements, many source county governments have yet to designate an authority to receive or review resource access requests.

B. Relevant Obligations Under the Convention

Under Article 15, a Party has sovereign rights over its genetic resources, while it also has the duty to "endeavor to create conditions to facilitate access" for other Parties, for environmentally sound uses. Access shall be by prior informed consent, and shall be on mutually agreed terms. Under Articles 15 and 16, Parties gaining access must take measures to facilitate benefit sharing, such as joint research, research carried out within the providing Party, sharing of research results, and transfer of resulting biotechnologies. Article 19(1) requires Parties to take measures to provide for "the effective participation in biotechnological research activities by those Contracting Parties, especially developing countries, which provide the genetic resources for such research." Article 8(j) provides that governments that promote wider use of knowledge (such as information about medicinal plants) or innovations (such as crop varieties) that draw on traditional lifestyles must ensure the consent and involvement of local or indigenous communities who provide the knowledge or innovations.

The Biodiversity Convention is to be implemented consistently with the law of the sea (Article 22) (see Part I discussing Convention references to the "law of the sea" and "UNCLOS"). The law of the sea, as

embodied in the UN Convention on the Law of the Sea (UNCLOS), has two major implications for the Biodiversity Convention's genetic resources provisions. First, UNCLOS confirms coastal State exclusive jurisdiction over internal waters and the territorial sea. UNCLOS also affirms that coastal States have exclusive jurisdictional rights over the conservation or exploitation of living resources in the 200-nautical-mile Exclusive Economic Zone (EEZ) and sedentary species on the continental shelf. This means that the Biodiversity Convention's genetic resources requirements apply within all these areas. For example, access to genetic resources within an EEZ can only be with the coastal State's prior informed consent.

Second, UNCLOS also establishes requirements for marine scientific research within a coastal State's waters. While coastal States have exclusive rights to regulate other States' research within their territorial and internal waters, they must consent to marine scientific research within their EEZs under normal circumstances, but may withhold consent if the research is of direct significance for the exploration and exploitation of living or non-living resources. The two agreements are essentially complementary; both aim to encourage scientific research that benefits humankind generally and the host country in particular, and both involve a distinction (explicit in UNCLOS, implicit in the Biodiversity Convention) between scientific research and commercial prospecting. Many countries have already implemented the UNCLOS's provisions, and the UN Office for Ocean Affairs and the Law of the Sea has developed a guide to facilitate their implementation (Office for Ocean Affairs, 1991). Parties should ensure that implementation of the Biodiversity Convention is integrated with these existing laws, and does not create duplicative regulations or institutions. (For a comparison of the UNCLOS and the Biodiversity Convention, see Appendix 2.)

C. Recommended Actions

While the Jakarta Mandate did not specifically address issues involving genetic resources within national jurisdiction, implementation of the Mandate's recommendations must be consistent with implementation of all three of the Convention's objectives, including equitable sharing of the benefits of genetic resources as well as conservation and sustainable use. Consistent with this, many Parties at the second COP, in particular developing countries, emphasized that implementation of the Convention's provisions on genetic resources was a high priority.

Toward that end, these recommendations seek to identify ways in which Parties can implement these provisions of the Convention in the marine context. In general, these recommendations suggest that Parties should implement the Convention through national action as well as international cooperation, emphasizing measures that will build capacity in developing countries and allow communities to control access to their own resources and develop them sustainably.

Most of the following steps apply equally to the marine and terrestrial realms and should be implemented consistently for both. But Parties should also study and take into account several distinctive issues relating to marine resources, including relevant legal instruments such as UNCLOS.

1. National Action. As a first step, Parties should start a national process for implementation that involves all stakeholders, including among others the groups specifically mentioned by the Convention: local and indigenous communities; scientists; the private sector; and women's groups. Full participation provides policy makers with better information and begins building a "culture of compliance" needed for effective enforcement. The outcome should be the development of a legislative and policy framework to guide the implementation of the Convention.

While every Party must design implementing laws and policies to fit its own circumstances, an effective outcome of the consultative process suggested above

is likely to include the following elements in many or most countries.

First, each Party should designate at least one national authority for implementation of the Convention's genetic resources provisions (analogous to the Management and Scientific Authorities required by CITES). The authority would not necessarily be involved in every access and benefit-sharing arrangement, but would coordinate and oversee the government's functions in enforcing access controls. The authority might also consult with the public to develop guidelines for the negotiating process and/or a checklist of elements that would be required in all agreements.

Second, legislative measures on access and benefit sharing should cover samples of resources taken for all research uses, including analysis of biochemicals for pharmaceutical and other uses. However, measures should take into account the low probability of immediate financial rewards for much of the scientific research, as well as the non-financial rewards available. Parties should take care not to hinder unreasonably scientific research that is of value to the host country as well as visiting researchers and the scientific community at large.

Third, legislation should cover all resources within national jurisdiction, as required under the Convention. In coastal State Parties, this includes marine living resources within the EEZ and sedentary species on the continental shelf. The agencies dealing with marine and terrestrial affairs should coordinate their efforts on developing legislation. Many of the elements of legislation can be the same for both marine and terrestrial resources. Whenever possible, the work of different authorities responsible for marine and terrestrial resource management should be coordinated so as to avoid inconsistent policies and fragmented jurisdictional authority. Parties should, however, analyze whether some legislative elements need to be different for marine resources of the territorial sea and EEZ, in order to ensure that implementation of the Convention is consistent with the provisions of UNCLOS on scientific research. Biodiversity Convention Parties that are also Parties to UNCLOS should review any existing legislation implementing UNCLOS to determine whether it can be used or adapted to implement the Biodiversity Convention's genetic resources provisions.

Fourth, governments should also create legal frameworks for encouraging sharing of benefits with local and indigenous communities as required under Article 8(j) (see accompanying example on "Gene Pools," above).

Fifth, importing Parties should support efforts by countries of origin to ensure compliance with providing Parties' regulations. Such measures could include: import permits that require presentation of an export permit; requirement that domestic resource users maintain records of origin of genetic resources and traditional knowledge; and economic incentives for research cooperation, technology transfer, and other benefit-sharing.

2. Regional and International Cooperation. Parties should explore regional cooperation under the Convention. This could start with regional technical consultations. These regional consultations will strengthen the capacity of Parties to manage access to their own resources by helping them to exchange experiences and share expertise. Most regions have significant capacity, but few if any countries within a region are self-sufficient. The regional marine research centers called for under UNCLOS could play a role in regional cooperation.

Parties could explore more intensive forms of cooperation. Some commentators have proposed, for example, the formation of regional "gene cooperatives" that would negotiate agreements for access and benefit sharing on behalf of Parties in the region. Through these cooperatives, Parties could pool their investment in scientific and technological capacity, achieving greater economies of scale. They could also share the risk that particular agreements may not produce valuable products (Reid et al., 1995).

To build capacity, Parties need ready access to information. The Clearing-House Mechanism (CHM)

established under the Convention should provide access through a variety of media to: national legislation; information on existing access/benefit sharing arrangements, including those covering marine resources; and other relevant information. Access to the CHM should be open to all Parties and their nationals. Open access is essential for encouraging scientific and technical cooperation. Electronic access should be free. Information provided by other means should be priced at cost, with at least a limited number of responses to requests free for a developing country Party.

The Parties should also collaborate through the COP, SBSTTA and the Secretariat on several activities. One is to develop a checklist of information that a Party could require for prior informed consent. Another is to identify mechanisms for access and benefit sharing for traditional knowledge and biological resources within the custody of local and indigenous communities. Options to discuss could include: copyright or patent licensing models; guidelines for citation and acknowledgment of individuals, communities and countries of origin by users in publications and patent applications; and "shareware" models for voluntary, informally negotiated user fees to be paid to providing communities, countries and institutions.

As provided in the Jakarta Mandate, the Secretariat should cooperate with the UN Office for Ocean Affairs and the Law of the Sea on a study of marine genetic resources found on the deep seabed. These resources are outside national jurisdiction, whereas Article 15 of the Biodiversity Convention only applies to genetic resources within national jurisdiction. The Secretariat and SBSTTA, in consultation with the UN Office of Ocean Affairs and Law of the Sea, could also develop guidelines for implementing the Convention's provisions on genetic resources within coastal States' zones of jurisdictional rights, consistent with the provisions of UNCLOS on marine scientific research.

Action Item 8: Take Responsibility for Transboundary Harm and Global Threats to Marine Biodiversity

Prevent harm caused to biodiversity in the areas beyond national jurisdiction and within other Parties' jurisdiction due to transboundary marine or air pollution, such as discharges of oil and other pollutants, as well as pollution that affects global climate and the ozone layer. Cooperate to develop and/or implement the appropriate international instruments (Articles 5, 8(g), 8(h), 14(2), 19(3)).

A. Background

Some of the gravest long-term threats to marine biodiversity arise from activities within the control or jurisdiction of a State that have impacts outside its national jurisdiction. These threats include transboundary marine pollution, including land-based sources of water pollution and pollutants transmitted through the atmosphere, as well as pollution from offshore sources such as shipping and oil and gas development. Another such transboundary problem, the introduction of alien species or genetically modified organisms into marine and coastal environments, is treated separately in Part II, Action Item 5, above.

Global environmental problems such as climate change and ozone depletion pose serious threats to marine and coastal biodiversity and living resources. They result from the most extreme type of transboundary pollution. Emissions from one country not only cross that nation's boundaries but transcend all frontiers, affecting the Earth as a whole.

These transboundary problems all reflect the underlying need for countries to assume responsibility for the effects their activities have outside their own national jurisdiction. Another common point is that societies in developed countries as a whole bear a greater share of the responsibility for causing these problems than do developing countries.

Each of these problems, however, involves a distinctive set of physical and biological processes. Addressing each one calls for a distinct type of expertise and knowledge and involves a different combination of primary stakeholders. This section

focuses on the problems of climate change, ozone depletion, and persistent organic pollutants (POPs). (The POPs section only focuses on international cooperative action. National level measures needed to address land-based sources of pollution are addressed in the section on integrated coastal area management, Part II, Action Item 1.)

Global Climate Change. In the Jakarta Mandate, the Parties to the Convention recognized that global climate change is one of the most important present and potential threats to marine and coastal biodiversity (SBSTTA I/8, Annex I.3). An overwhelming majority of scientists agree that increases in the atmospheric load of carbon dioxide and other greenhouse gases from human activities will lead to significant increases of the average global temperature over coming decades (IPCC Working Group I, 1996). The evidence suggests that rising atmospheric greenhouse gases concentrations are already causing temperature increases. If present trends continue, the global atmospheric temperature could increase by two degrees Celsius by the year 2050, with a corresponding one to two degree rise in sea-surface temperatures (SSTs) by 2100 (Ittekkot et al., 1996).

Climate change is likely to have a number of significant impacts on oceans and coasts. By 2050, a global mean sea-level rise of forty centimeters is projected (Ittekkot et al., 1996). Sea level will rise because of thermal expansion of the oceans as well as increased melting of ice. This has serious implications for the management of coastal zones, particularly in small islands, which may bear the high end of the uneven effects of global sea level rise. Some researchers predict that low atoll and reef islands will completely disappear or become uninhabitable, displacing populations of several small island States (Bijlsma, 1996 citing Roy and Connel, 1991).

Regional changes in sea surface temperature are likely to cause shifts in the ranges of species, changing the composition of communities in some regions, and possibly leading to some extinctions (Everett et al., 1996). Ocean currents and mixing patterns may change, which would change the local availability of nutrients, and thus affect the productivity of some key ecosystems, including those containing fisheries on which growing populations increasingly rely.

The effects of substantial ocean warming on coral reefs could be catastrophic, especially when combined with the other heavy stresses imposed by human activities. Coral reefs inhabit waters whose temperatures are already close to the upper limit that they can tolerate. Increases in seawater temperatures lead to increased occurrences of coral bleaching, which can ultimately kill reefs (see example in Part II, Action Item 6). Already, there is some evidence that warming has contributed to an increase in incidents of coral bleaching. This has been most apparent in Indonesia, where seawater warming has resulted in severe bleaching of the coral which has not yet recovered. Similar results have been reported in the Galapagos and eastern Panama (Bijlsma et al., 1996).

Regional and local changes in productivity of fisheries stemming from circulation and mixing changes could impose severe burdens on dependent communities. The most dramatic impacts will probably come in small island and low-lying States, most of which are developing countries in the tropics. Valuable coastal ecosystems such as mangroves, river deltas and sand beaches in these States quite literally could be drowned (Bijlsma et al., 1996). Global sea-rise estimates represent a rate that is two to five times higher than what has been experienced over the last 100 years (Bijlsma et al., 1996). Other climatic changes, in wind strength for instance, are potentially damaging to the fishing industry as well. In some developing communities, more than half of the fishing fleet is dependent on wind and sails. Potential wind strength reductions, due to climatic change, threaten to seriously increase costs for these and similar small-scale fishers (Everett et al., 1996).

Oceans are critically important to the global carbon cycle. They store large amounts of carbon, and serve as a major carbon sink (taking up or "sequestering" carbon). It appears that marine biota contributes significantly to moderating global climate by sequestering carbon that would otherwise circulate in the atmosphere. The impact that global warming will have on the marine carbon cycle, for example

through impacts on marine biota, are unknown (Ittekkot, et al., 1996).

Ozone Depletion. Human-caused emissions into the atmosphere of chlorofluorocarbons (CFCs) and other ozone-depleting substances have caused significant depletion of the stratospheric ozone layer in past decades. Ozone depletion increases the transmission of solar UV-B radiation to the Earth's surface. UV-B radiation causes damage at the molecular, cellular, population and community levels. The evidence is accumulating that increased UV-B radiation may harm marine organisms of the ocean's upper layers (Smith, 1992). Ozone depletion over the Antarctic has led to increased UV-B radiation over adjacent seas, with demonstrated reductions in primary productivity of ecosystems. There is evidence that increased UV-B radiation harms marine organisms during early developmental stages, and some indications that higher animals such as marine mammals may suffer damage (Agardy, 1996). The long-term repercussions for productivity, species survival, and ecosystem functioning are unclear, but could be substantial, especially in combination with other environmental changes. While emissions of CFCs have declined following international negotiation and implementation of the Montreal Protocol, not all ozone depleting substances have been phased out. The ozone layer is not expected to recover fully for over one hundred years even if all countries fully comply with the Montreal Protocol's requirements (World Resources Institute, 1996).

Persistent Organic Pollutants (POPs). Persistent organic pollutants are toxic chemicals that are not easily broken down into harmless compounds. Because of their persistence, once released into the environment they can be borne widely by air and water currents and bioaccumulate in higher organisms. Although there is a great deal of scientific uncertainty at present regarding the health effects of POPs on humans and other species, the implications of sub-lethal impacts for biodiversity are very serious.

At present scientists have identified between forty to fifty compounds that act at the sub-lethal level and disrupt the reproductive, nervous, immune or developmental systems of either humans or wildlife. More sophisticated testing of chemicals, many of which have been already released indiscriminately into the environment, is likely to identify many more such compounds. The types of effects include decreased fertility in birds, fish, shellfish and mammals; decreased hatching success in birds, fish and turtles; gross birth deformities in birds, fish and turtles; metabolic abnormalities in birds, fish and mammals; behavioral abnormalities in birds (e.g., female/female pairing); demasculinization and feminization of male fish, birds and mammals; defeminization and masculinization of female shellfish, fish and birds; and compromised immune systems in birds and mammals.

Wildlife experts have reported observations from a wide range of aquatic species, including many coastal and marine populations, for example, beluga whales, common seals, bottlenose dolphins, Caspian terns, polar bears, roseate terns, sea turtles, dog whelks, and fish such as herring. Proving cause and effect is extremely difficult in most cases, but as more evidence accumulates, some experts are suggesting that declines may already be underway in a number of species as a result of exposure to man-made chemicals. One very clear example is that of the female dog whelk developing the condition known as imposex, i.e., female animals with a penis, apparently due to exposure to organotin compounds present in antifouling paints used on yachts and ships.

B. Relevant Obligations Under the Convention

Under the Convention, Parties must take several steps as far as possible and as appropriate. They must regulate or manage processes and activities within their control or jurisdiction that have negative impacts on biodiversity, wherever the impacts occur (Articles 4, 8(l)). The Convention also requires Parties to cooperate on protecting biodiversity outside of national jurisdiction as well as on other matters of mutual interest, through competent international organizations as appropriate (Article 5). Where imminent or grave danger or damage to biodiversity originates within a Party's national jurisdic-

tion, that Party must notify potentially affected States immediately and must take action to prevent or minimize the damage (Article 14(1)(d)). Also relevant is the Biodiversity Convention's requirement that Parties have in place procedures with appropriate public participation for the environmental impact assessment of projects likely to have significant adverse effects on biodiversity (Article 14(1)(a)).

C. Recommended Actions

While the Convention does not explicitly address any of the global or transboundary threats discussed above, the general obligations of cooperation and notification would apply when such threats originate within a Party's jurisdiction. These threats are clearly matters of mutual interest, and pose imminent or grave danger or damage to areas outside national jurisdiction and areas within other Parties' jurisdiction, as provided under Article 14.

There already are fora or processes in which Parties can cooperate to address these problems. For each problem, as a first step, each Party should ratify the relevant international instrument, if there is one. Each party must also participate in the relevant international discussions aimed at resolving the problem. The following recommendations identify the relevant instruments or processes for each type of threat.

1. Cooperate to address the threat of global warming. Parties producing greenhouse gases have an obligation under Article 14 to notify threatened Parties of the "grave danger" of climate change and to initiate remedial action immediately. The Framework Convention on Climate Change (FCCC) establishes an international framework within which governments commit to achieving

> stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

The FCCC entered into force in 1994 and had been ratified by 155 countries as of March 1, 1996. Biodiversity Convention Parties that have not already done so should ratify the FCCC promptly.

The first Conference of Parties of the FCCC, held in Berlin in 1995, adopted the "Berlin Mandate," in which the FCCC Parties agreed to begin efforts to strengthen developed countries' FCCC commitment to limiting greenhouse gas emissions through the adoption of a protocol or other legal instrument that will set quantified objectives for emission limits and reductions and will cover necessary implementing policies and measures (FCCC/CP/1995/7/Add.1). Countries should work together in the open-ended ad hoc group established by the FCCC COP. The ad hoc group will carry out its work in light of the best available scientific information, including reports of the Intergovernmental Panel on Climate Change (IPCC). Integrated coastal area management (ICAM) plans and programs should address rising sea level and incorporate managed retreat programs (see Part II, Action Item 1 for further discussion of ICAM).

Some form of cooperation or coordination between the Biodiversity Convention and the FCCC is needed. For instance, the SBSTTA and/or COP (perhaps after the Secretariat has obtained input from the Roster of Experts on Marine and Coastal Biodiversity) should provide information to the FCCC COP on the potential impacts of climate change on marine biodiversity and the implications for policy. Already, the Secretariats of the two Conventions are exploring mechanisms for cooperation.

2. Cooperate to address threats of ozone depletion. The Montreal Protocol to the Vienna Convention for the Protection of the Ozone Layer, which has been ratified by 150 nations, requires the phaseout of chlorofluorocarbon (CFC) production in industrial nations by 1996 and restricts the use and production of other ozone-depleting substances.

Parties to the Biodiversity Convention should ratify the Montreal Protocol if they have not already done

so. As parties to the Montreal Protocol, they must follow through on their commitments to phase out ozone depleting substances. They should also ensure adequate implementation and enforcement of its requirements. In addition, all Parties should support and cooperate in continued and expanded research on ozone depletion and its impacts on marine ecosystems and biodiversity.

3. Cooperate to address the threat of Persistent Organic Pollutants. At the initiative of the UNEP Governing Council, a negotiation process has begun, which brings together governments, industry, public-interest groups and relevant international organizations, under the auspices of the Inter-Organization Programme for Sound Management of Chemicals (IOMC). The aim of this negotiation process is to begin an assessment of a "short-list" of POPs, which will lead to a decision on appropriate international legal mechanisms. This work matches closely the recommendations of the Global Programme of Action adopted at the Washington Conference on Land-Based Sources of Marine Pollution, which called for the negotiation of a legally-binding instrument "for the reduction and/or elimination of emissions and discharges, whether intentional or not, and, where appropriate, the elimination of the manufacture and use of, and illegal traffic in, the persistent organic pollutants identified in UNEP Governing Council Decision 18/32." (See example on the Washington Conference in Part II, Action Item 1.)

Parties to the Convention on Biological Diversity should:

- Commit resources to the further development and elaboration of the Global Programme of Action to help set targets and timetables for their pollution prevention programs, policies, and laws into the next century.
- Begin negotiating a legally-binding agreement to phase out the twelve POPs listed in UNEP Governing Council Decision 18/32. There should also be a mechanism for adding substances to such an agreement as warranted. The instrument should include provisions requiring States to use cleaner production methodologies in order to promote production systems which minimize or eliminate the generation of hazardous wastes; implement pesticide reduction programs with measurable reduction targets; implement publicly accessible pollutant release and transfer registers (PRTR) to track and measure progress in reduction of POPs where immediate bans are not practicable; and create a multilateral development fund to assist developing countries in phasing out POPs.

III. FIVE GENERAL PRINCIPLES FOR CARRYING OUT THE EIGHT ACTION ITEMS

1. Consult Widely and Ensure Public Participation (Preamble 12-14; Articles 8(j), 10(c), 10(e), 11, 14, 16(4))

The degree of participation in decision-making by the public, especially stakeholders, will have a major effect on the success or failure of the implementation of the action items. A centralized approach that lacks meaningful consultation risks failure, because it may be difficult to implement measures effectively that are neither understood nor appreciated by those affected. If, on the other hand, local communities are brought into the process, they are in a position to incorporate their own knowledge, experiences and concerns, and can help ensure that the measures integrate local needs and interests as much as possible. Those who have a say in the decision are more likely to feel invested in it and committed to its successful execution. Moreover, if local communities are seriously involved in the process, they will be in a better position to appreciate that the application of the Convention contributes to the continued use of coastal and marine ecosystems — in the form of food, employment, ecosystem services and cultural benefits — for generations to come.

The Biodiversity Convention recognizes that traditional local knowledge, technology and practices of local and indigenous communities can be highly valuable for achieving the Convention's objectives (Articles 8(j), 10(c), 17(2)). Local participation will support the implementation of Article 10(c) of the Convention, which calls for measures to protect customary uses of biological resources that are sustainable. It also helps ensure that decision-making and policy reflect traditional knowledge and practices relating to sustainable use and conservation, as required by Article 8(j). The Convention affirms "the need for the full participation of women at all levels of policy-making and implementation" (Preamble). It calls for cooperation between government and the private sector (Article 10(e)). It also refers to participation by local populations (Article 10(d)), the private sector of developing country Parties (Article 16(4)), and scientific institutions (Article 18(1)).

2. Combine National Action with Regional and Global Cooperation (Preamble, Articles 5, 17, 18, 20-30)

While it emphasizes national action, the Biodiversity Convention recognizes that Parties must cooperate at the international level to achieve its objectives. The need for cooperation reflects ecological and geographic realities of an interconnected world, as well as the value of exchanging information and sharing expertise and resources among countries faced with similar problems. The need for cooperation is particularly compelling in the context of the world's interconnected oceans. A number of economically important straddling stocks of fish straddle legal boundaries, and many migratory species of fish, marine mammals, seabirds and sea turtles move regularly across boundaries. Many marine ecosystems, including ecologically sensitive areas, extend over more than one jurisdiction. Constantly circulating ocean waters move pollutants over great distances throughout the oceans. Major threats to marine biodiversity, such as ozone depletion, global warming, POPs, land-based sources of pollution and the introduction of alien species, originate in one country but have transboundary or global impacts. While each country has distinctive cultural, economic, political and ecological circumstances, there are numerous similarities among many of the issues facing countries seeking to implement the Convention in the marine and coastal context.

Consequently, resolution of the problems discussed under each Action Item under Part II above will require Parties to reach beyond national borders to the regional and/or global level. In addition, international sharing of information will support national action in Parties facing similar problems.

Practical Examples: Mafia Island Marine Park, An Example from Tanzania of Community-Based Marine Conservation

Mafia Island lies in the Indian Ocean south of the Tanzanian capital of Dar es Salaam. The coral reefs of Mafia Island are biologically very rich (Kelleher et al. 1995). Caves and grottos in the exceptionally old and extensive reefs provide numerous micro-habitats, colonized by a wide variety of plants and animals. More than 380 species of fish and hundreds of coral and sponge species have been identified at Mafia. The nearby Rufigi delta has rich wetlands that provide nursery areas for Mafia Island's marine life.

The island's ecosystems also provide food, shelter, and breeding grounds for seabirds, sea turtles, and marine mammals. The local economy is highly dependent on the island's rich fisheries. The island's inhabitants (numbering about 5000), catch octopus, finfish, sea cucumbers, and lobsters, and collect or grow seaweed, using traditional methods. The women hunt octopus with poles amidst the coral rubble along the shore at low tide, while the men go to sea to fish from boats. This traditional division of labor is believed to reduce the pressure on local fisheries. The islanders have declared the southern half of the island and the surrounding waters a marine park.

Although local exploitation has had some impact, Mafia Island's reefs remain among the least disturbed on the East African coast. Unfortunately, as in many other coastal regions, areas north of Mafia Island have become overfished and degraded, through such harmful practices as dynamiting for coral and fish. Mafia Islanders fear that, as fisheries are depleted farther north, their waters will attract more exploitation. Because the area's living resources are valuable to them, local residents have been staunch advocates for conservation.

continued next page

Member's of Women's Octopus Fishing Cooperative, Mafia Island.
Photo by Tundi Agardy

In 1988 islanders, representatives of the Tanzanian government and conservation organizations, including WWF, met to discuss ways to conserve and sustainably use Mafia Island's marine resources. The first step in this process was a series of on-island workshops where islanders could meet to frame objectives and express their expectations. In the workshops, the islanders made it clear that they wanted strong action to protect the resources upon which they depend. The outcome was a proposal to create a large, multiple use marine park.

In the next phase, Mafia residents worked with technical experts to create a multiple use zoning plan for the park. They developed three levels of protection within the reserve's boundaries. In the most protected zone, strict protection and regulations prevent the removal of any resources. Residents insisted on including large areas in this core zone, even though it entailed restricting their own activities. A second level of protection imposes regulations restricting the type and amount of fishing. The third permits general use with a minimum of controls. Dynamite fishing and other inherently destructive practices are forbidden throughout the park.

Residents also vigorously advocated changes in national law and policy to support their local decisions. As a result, the Tanzanian government passed the Marine Parks and Reserves Act in 1994, and the legislation creating the Mafia Island Marine Park in July 1995. Residents are engaged in enforcement patrols, and some are currently being trained to collect scientific information needed to gauge the success of conservation measures.

Consistent with this, the Convention requires cooperation as far as possible and as appropriate on "matters of mutual interest" relating to conservation and sustainable use, through international organizations where appropriate (Article 5). The Preamble emphasizes the importance of "international, regional and global cooperation among States and intergovernmental organizations and the non-governmental sector for the conservation of biological diversity and the sustainable use of its components." Article 23(4)(h) calls upon the COP to "establish appropriate forms of cooperation with" the executive bodies of other conventions.

The Convention establishes a set of international institutions to support cooperative action, such as information exchange on implementation at the national level, or negotiation of protocols (i.e. follow up agreements on specific points). The structure includes a permanent Secretariat, a Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), and a clearing-house mechanism for scientific and technical cooperation (CHM). The Parties meet periodically at COPs to elaborate and build on the Convention, for instance by negotiating protocols or creating and modifying annexes on technical or scientific matters. Each party must submit reports on its implementation to the COP. There is also a multilateral fund, currently administered by the Global Environment Facility (GEF), that is funded by developed countries to help finance implementation in developing country Parties.

At the second COP (Jakarta, 1995), the Parties agreed in the Jakarta Mandate to supplement these institutions with a mechanism for carrying out a three-year work program on marine and coastal biodiversity. The Parties directed the Secretariat to establish a multidisciplinary Roster of Experts, based on country nominations. The Secretariat will organize a series of regionally representative meetings of individuals selected from the Roster.

The intended result will be recommendations for elaborating further the Jakarta Mandate. The recommendations will: (1) identify options for applying an ecosystem approach to conservation of marine and coastal biodiversity; (2) identify gaps in knowledge about marine and coastal biodiversity; (3) develop analyses of the Biodiversity Convention's implications for other international agreements affecting marine and coastal biodiversity; (4) include assessment of Parties' needs for scientific, technical and technological capacity building and technology transfer; and (5) incorporate local and indigenous communities' knowledge as well as community and user-based approaches to conservation and sustainable use.

In addition to continuing work within the Convention's structure, Parties should also imple-

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Sea Turtles: An Example of Highly Migratory Marine Species

Photo courtesy of U.S. Fish and Wildlife Service.

The life cycle of sea turtles dramatically illustrates the need for regional cooperation as well as the links between land and sea. Like all sea turtles, the leatherback turtle, *Dermochelys coriacea*, is migratory. It nests on tropical beaches, but spends most of its time in polar and subpolar waters. Sea turtles live nearly all their lives in the water, except when mother turtles emerge to lay their eggs on beaches. Only about one in 100 of these hatchlings will survive to adulthood. All species of sea turtles are listed as endangered under CITES. Major threats to sea turtles include fishing gear, destruction of nesting habitat through coastal development, and unsustainable harvesting for commercial markets. The leatherback is especially threatened by garbage that floats in higher latitude seas; the leatherback often mistakes pieces of plastic for jellyfish, its preferred food.

ment obligations under existing international or regional instruments that will help protect marine biodiversity. An analysis of selected relevant instruments is attached as Appendix 1. In cases where these existing instruments do not address biodiversity concerns, Parties to the Biodiversity Convention should explore how their implementation could be adjusted to take better account of the Convention's objectives. Working within the Biodiversity Convention's international structure, Parties can review biodiversity aspects of such other instruments' implementation; they may then offer information or advice to institutions associated with those instruments on how to better achieve the Convention's objectives in the course of implementation. If there is a significant gap in the coverage of existing instruments, and institutions associated with the relevant instruments are not acting to fill the gap, Parties to the Biodiversity Convention could develop or propose the development of a new instrument or other initiative under the Convention.

Parties to the Biodiversity Convention should also monitor actions and policies of international organizations, to ensure that they advance the Convention's objectives and do not interfere with its implementation. For example, the policies and practices of the World Bank have significant impacts on biodiversity in developing countries. The Parties should ensure that the Bank's policies and procedures are reviewed for consistency with the Convention. Other such institutions include the World Trade Organization, the International Monetary Fund, and the regional development banks. It may be useful for the Parties to provide input into these other bodies regarding the impacts on biodiversity of their activities.

3. Provide Technology and Financing (Articles 16, 18, 20)

Much of the world's biodiversity is found in the tropics, which is generally a developing region. Coral reefs, for example, are almost entirely limited to warm tropical waters. Yet many developing countries

have limited resources — technical, scientific, technological, financial, or institutional — to devote to achieving the Convention's objectives. While biodiversity is, as noted in the Convention's preamble, a "common concern" of humanity, the capacity to conserve and sustainably use it is unevenly distributed. In addition, there is evidence that developed countries, whose more industrialized economies consume natural resources at a much higher rate than do the economies of developing countries, have a disproportionately large impact on biodiversity. This places a higher burden on developed countries to address threats to biodiversity through implementation of the Convention.

Consistent with the broader principle that developed and developing countries have common but differentiated responsibilities to respond to global environmental issues, developed countries agreed to shoulder a heavier share of the burden of achieving the shared benefits of the Convention's implementation. In particular, they committed to supporting developing country Parties' implementation through transfer of and access to technology, technical assistance, and transfer of new and additional financial resources.

Article 16 requires the Parties to provide and facilitate access to technologies for the conservation and sustainable use of biodiversity. Similarly, Article 18 calls for the promotion of international technical and scientific cooperation "through the appropriate international and national institutions" and through the "development and implementation of national policies." Article 18 also calls upon the Parties to promote and establish joint research programs and joint ventures for the development of relevant technologies. In addition, Parties must provide new and additional resources to developing nations to enable them to implement the Convention.

There are numerous actions identified in Part II that developed country Parties could support through technology transfer under the Convention. For example, they could provide access for developing countries to geographic information systems (GIS), which allow for the mapping and analysis of geographic areas. GISs are extremely valuable technologies for integrated coastal area management, the identification of important marine and coastal biodiversity, and marine protected areas (MPAs) (Action Items 1, 2, and 6). Developed country Parties could also provide access to remote satellite information as well as air-borne sensing and automated sensing devices (Action Items 1, 2, and 3). Technologies for information and communication, such as biodiversity data bases, electronic mail and access to the Internet would also be extremely useful in implementing the Convention (all Action Items).

In addition, developed country Parties could cooperate to limit the spread of destructive techniques and technologies that contribute to habitat destruction and excessive bycatch, and provide assistance to developing country Parties to help them replace or modify technologies and techniques that are destructive, for example by providing turtle excluder devices to be placed on nets in existing fleets. (See example on shrimp farming and fishing in Part II, Action Item 4.)

For purposes of efficiency, all international funding, including assistance from multilateral development banks (MDBs), should be reviewed to ensure that it furthers rather than obstructs achievement of the Convention's objectives. For example, MDBs should commit funding only to commercial fisheries that are managed sustainably (see also Action Item 3). International lending institutions should also establish sustainability standards to be implemented before Parties can receive funding for projects such as mariculture and the harvesting of genetic resources. Appropriate financing should also be provided to the Parties to implement the FAO Code of Conduct for Responsible Fisheries as well as the Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks.

While the Convention emphasizes the need for developed country Parties to support developing country Parties implementation, it also calls generally on all Parties to cooperate through a number of activities, including transfer of technology.

Related International Agreements: The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR)

The 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) is among the few international agreements in which legal jurisdiction is based on a biological boundary. It encompasses the biologically productive Southern Ocean, defined as the entire area south of the Antarctic convergence — a natural boundary between the cold Antarctic waters moving north and warm subtropical waters moving south. The Convention sets precedent in international law by taking an ecosystem approach to stock management. It sets a maximum sustainable yield for target species, but also requires that equal consideration be given to the likely effects on other species and the marine ecosystem as a whole.

Living resources in the area covered by CCAMLR are plentiful. Krill (the so-called Antarctic shrimp), are the primary food source for many species of marine mammals, fish and birds. When some countries started developing distant water fleets to harvest krill, it quickly became apparent that the repercussions on animals higher on the food web could be dramatic, possibly endangering the recovery of the great whales. The role of the krill as the keystone of the Southern Ocean food web was one of the determining factors in the adoption of CCAMLR's ecosystem approach.

CCAMLR is part of the Antarctica Treaty System (ATS), which began with the 1959 Antarctic Treaty. The ATS began with the 1959 Treaty, a gathering of 12 Contracting Parties which had staked claims on parts of the continent and wanted to protect their territorial and security interests. Through the decades, however, the ATS has evolved into a broader-based understanding among the original claimants, "non-consultative nations" (Parties to the Antarctic Treaty without full decision-making rights) and even international organizations and NGOs, covering environmental protection and conservation of resources. The ATS also includes the 1964 Agreed Measures for the Conservation of Antarctic Fauna and Flora, the 1972 Convention for the Conservation of Antarctic Seals (CCAS), which entered into force in 1978, the 1988 Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA), which has not yet entered into force, and the 1991 Protocol on Environmental Protection.

CCAMLR's ecosystem-based approach and ecological definition of jurisdiction can serve as models for future regional cooperation to achieve the Biodiversity Convention's objectives. Regrettably, implementation of CCAMLR is hindered by its requirement that decisions be made by consensus. Furthermore, it permits Parties to harvest marine resources until harm to the ecosystem can be proven, contrary to the precautionary principle. Placing the burden of proof on those States that favor conservation over unchecked exploitation certainly weakens CCAMLR's effectiveness and is inconsistent with the Biodiversity Convention's endorsement of the precautionary approach.

Source: L. Kimball, 1994. "Environmental Law and Policy in Antarctica." In P. Sands, ed. *Greening International Law.* New York: The New Press.

APPENDIX 1

Synergies Between the Convention on Biological Diversity and Selected International Instruments Relating to Marine and Coastal Biodiversity

The objectives of the Convention on Biological Diversity (CBD) are: the conservation of biodiversity; the sustainable use of its components; and the equitable sharing of the benefits from the use of genetic resources. Achieving these objectives with respect to marine and coastal biodiversity will require that Parties coordinate actions in their respective maritime zones of jurisdiction, as well as in areas outside national jurisdiction, such as the high seas. Accordingly, Article 5 of the Convention requires Parties, as far as possible and as appropriate, to cooperate on conservation and sustainable use of biodiversity outside national jurisdiction as well as other matters of mutual interest, working through competent international organizations as appropriate. The Convention also explicitly provides that Parties shall implement it consistently with the law of the sea, which is embodied in the UN Convention on the Law of the Sea (UNCLOS).

Thus, the CBD can build upon and work in concert with relevant provisions called for in other international instruments that relate in various ways to marine and coastal biodiversity. To help fulfill this potential for synergy, the Second Conference of Parties (COP) directed the Convention Secretariat to work with the Roster of Experts on Marine and Coastal Biodiversity to "[r]eview the mandates and activities under international agreements that affect marine and coastal biological diversity, and develop analyses that can be offered by the Conference of the Parties to the relevant institutions as to the implications of the Convention on Biological Diversity for these activities" (COP2 II.10, Annex II.1.c).

This Appendix briefly reviews selected international instruments through which Parties can work to achieve the Convention's objectives with respect to marine and coastal biodiversity. The sections below highlight the potential for linking or strengthening the international actions of States under the Convention with related obligations under other international instruments. Several of the listed agreements would also be relevant to actions taken by States at the national level, as already noted in the main text. While other instruments (among the more than one hundred multilateral instruments relating to the marine environment) could also build on and interact with the CBD in constructive ways, only those multilateral instruments with the greatest potential for synergy with the Convention have been selected.

1. United Nations Convention on the Law of the Sea, Montego Bay, 1982 (UNCLOS)

The United Nations Convention on the Law of the Sea (UNCLOS) establishes numerous rights and obligations for conservation of marine living resources and protection of the marine environment that complement the CBD's objectives and obligations. When it was adopted after more than ten years of negotiations, UNCLOS was dubbed "a new constitution for the oceans" because it aimed to regulate practically all marine activities in any area of the sea. Agenda 21 (discussed below) declares that UNCLOS "provides the legal basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources" (Agenda 21, Chapter 17, para 17.1). The many parallels between UNCLOS and the CBD are detailed in Appendix 2.

While the Convention on Biological Diversity does not refer explicitly to UNCLOS, it is generally understood to embody the law of the sea, i.e., customary international law that is binding upon all States. UNCLOS was opened for signature in 1982 but did not come into force until November 16, 1994, because of a controversial part of the Convention that deals with deep seabed mining (Part XI). This prob-

tainable use of fisheries resources. The FAO Code of Conduct, which is non-binding, applies UNCLOS-consistent conservation and sustainability requirements to fisheries for all stocks in all areas of the seas.

The FAO is developing technical guidelines for the implementation of the Code. The Second COP decided that it "can offer the technical expertise of the Subsidiary Body on Scientific, Technical and Technological Advice in the elaboration and implementation of [the FAO] guidelines, in line with the objectives and provisions of the Convention on Biological Diversity." Similarly, it would be useful to evaluate how best to ensure achievement of the Convention's objectives in implementing the Straddling Stocks Agreement, and to transmit findings and conclusions to subregional or regional fisheries management organizations, as well as to the review conference provided for under article 35 of the Straddling Stocks Agreement.

4. The UN General Assembly Drift-Net Resolution 46/215, 1991

As discussed in Part II, Action Item 3 above, large pelagic drift-net fishing has had devastating impacts on biodiversity. In response to international outcry over the use of this fishing method, the UN General Assembly adopted Resolution 46/215 in December 1991, which called for a moratorium on the use of drift-nets longer than 2.5 kilometers on the high seas by December 31, 1992. While many countries have complied with this resolution, instances of abuse are still being reported, including alleged violations by Parties to the CBD. Enforcement is difficult because much driftnetting takes place in remote areas, and fishers often avoid regulation under flags of convenience. The Parties to the CBD should take responsibility for controlling the destructive activities of their nationals and flag ships, as required by the Convention and called for by the Resolution.

5. UNEP Conference on Protection of the Marine Environment from Land-Based Activities, Washington, 1995

As discussed previously, UNCLOS requires States to address land-based sources of marine pollution, which is a principal threat to marine and coastal biodiversity. Recognizing that specific implementation of this general obligation is complex and demands significant resources, the international community affirmed in Agenda 21 the need to implement their obligations to protect coastal and marine environments against land-based sources of pollution.

At the Washington Intergovernmental Meeting on Protection of the Marine Environment from Land-Based Activities (October 23-November 5, 1995), governments adopted a Global Programme of Action to prevent, reduce and control marine pollution from land-based activities. The Programme focuses on providing practical guidance on how to identify problems and priorities and implement sustained action with respect to nine specific source categories of land-based pollution; it discusses national, regional and international strategies for mobilizing human, institutional and financial resources; and it recommends approaches to managing land-based pollution for each source category.

The Programme of Action also calls on States to negotiate and implement a legally binding instrument to address, where appropriate, the issue of production and consumption of persistent organic instruments (POPs). This elaboration of more specific strategies on reducing land-based sources of marine pollution enables States to begin devising and implementing national management regimes which should ultimately form a major part of the actions needed to protect marine biodiversity (see also the discussion in the section on integrated coastal area management, Part II, Action Item 1).

6. Protocol on Substances that Deplete the Ozone Layer, 1987 (Montreal Protocol)

The Montreal Protocol aims to protect the ozone layer by taking measures to control global emissions of ozone-depleting substances. It does so by binding Parties to phased reductions in production and use of substances that are known to deplete the ozone layer, leading to phaseouts for most such chemicals. Developing countries can receive a ten-year grace period from reduction obligations. The Protocol also restricts trade in ozone depleting chemicals and pro-

lem was addressed through the negotiation of the 1994 Part XI Agreement, which adopted a modified regime for these mineral resources found on the seabed in the high seas. Over 100 nations have ratified UNCLOS, many more have signed it and indicated their intention to ratify it shortly, and many nations either have or are in the process of accepting the Part XI Agreement.

UNCLOS provides that coastal States have exclusive jurisdiction for various matters over designated zones of the oceans along their coasts, including coastal zones. At the same time, coastal States are obligated under Articles 192 and 61.2 to conserve and manage the living marine resources under their jurisdiction. States also have obligations to protect the marine environment and conserve its living resources beyond areas of national jurisdiction. For example, the freedom to fish on the high seas is limited by the requirements of Articles 117-120 that States cooperate to conserve and manage living resources of the high seas. UNCLOS also provides that States are to prevent, reduce and control pollution of the marine environment. In addition, States are obligated to share monitoring and assessment information and also to collaborate at the international level to undertake additional studies and research concerning the marine environment.

Several recent international efforts build on principles articulated in UNCLOS. These include: (1) the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (1995); (2) the UNEP Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (1995); and (3) the FAO Code of Conduct for Responsible Fisheries (1995). These instruments are discussed separately below.

2. Agenda 21, Rio de Janeiro, 1992

Agenda 21 is a program of action for sustainable development that was adopted at the UN Conference on Environment and Development in June 1992. While this instrument lacks the force of binding international law, the signature of this text carries with it a strong political obligation to ensure its full implementation. Moreover, the consensus achieved in Agenda 21 already has spurred the conclusion of a number of international initiatives, such as the adoption in 1995 of the UN Agreement on Straddling and Highly Migratory Fish Stocks and the 1994 Conference on the Sustainable Development of Small Island Developing States. Agenda 21 provides additional evidence of the international community's broad support for the tasks to be undertaken pursuant to the Convention.

Two chapters of Agenda 21 are particularly relevant to the protection of marine biodiversity: Chapter 15 on the conservation of biological diversity; and Chapter 17 on the protection of the oceans, including open, enclosed and semi-enclosed seas, and coastal areas, including the protection, rational use and development of their living resources. Of the two chapters, Chapter 17 provides the broadest support for actions to protect marine biodiversity and promote sustainable use. For example, Chapter 17 specifically calls for coastal States to undertake measures to maintain biological diversity and productivity of marine species under national jurisdiction (de Fontaubert.b, 1996).

The UN Commission on Sustainable Development meets annually in New York to review progress in implementing Agenda 21. At the 1996 meeting, countries reviewed implementation of Chapter 17 of Agenda 21. CBD Parties should make themselves aware of the Commission's activities and findings with respect to ongoing efforts to implement marine and coastal biodiversity measures.

3. UN Agreement on Straddling and Highly Migratory Fish Stocks, New York, 1995, and FAO Code of Conduct for Responsible Fisheries, Rome, 1995

The UN Agreement on Straddling and Highly Migratory Fish Stocks and the FAO Code of Conduct for Responsible Fisheries are discussed in detail in Part II, Action Item 3. The Straddling Stocks Agreement articulates three conservation principles which build upon and strengthen the conservation requirements of UNCLOS: the precautionary approach, protection of biodiversity in the marine environment, and sus-

vides for the exchange of information and technology relating to substitutes for ozone-depleting substances.

Ozone depletion can have serious consequences for marine biodiversity (see Part II, Action Item 8). Parties must coordinate their efforts in order to address this global threat. All Parties should ratify the Protocol, and implement and enforce its requirements effectively.

7. The Framework Convention on Climate Change, Rio de Janeiro, 1992 (FCCC)

The FCCC, which entered into force in 1994, has been ratified by 157 countries. It addresses the release into the atmosphere of substances that contribute to the "greenhouse effect," where gases trap some of the heat radiated from the Earth's surface within the lower atmosphere, causing global temperatures to rise. The rise in anthropogenic emissions of greenhouse gases is expected to cause increases in temperature, and indeed may already be causing such increases. This in turn changes the pattern of heat distribution on the Earth's surface, alters ocean circulation patterns and causes sea-level rise (see discussion in Part II, Action Item 8). The Framework Convention on Climate Change recognizes that no one State can solve this problem alone, but that every State has the responsibility to control its own contribution to the global problem and cooperate with other States in trying to prevent and reduce damage. The first COP of the FCCC in Berlin, in 1995, produced the "Berlin Mandate," in which the FCCC Parties agreed to begin efforts to strengthen the commitments made in the FCCC through the adoption of a protocol or other legal instrument that will set quantified objectives for emission limits and reductions, and will cover necessary implementing policies and measures (FCCC/CP/1995/7/Add.1). The CBD could provide advice and information to the FCCC Parties on the potential effects of climate change on marine and coastal biodiversity, as they implement the Berlin Mandate, working for example through the Secretariat and the Roster of Experts on Marine and Coastal Biodiversity.

8. United Nations Conference on the Sustainable Development of Small Island Developing States, Bridgetown, 1994

The United Nations Conference on the Sustainable Development of Small Island Developing States was held in Barbados in May 1994. The participants to the UN Conference on Environment and Development (the Earth Summit) had recognized the particular needs of these countries and their dependence on marine and coastal resources, as well as the threats they faced due to climate change and sea-level rise. Consequently, Chapter 17 of Agenda 21 specifically called for the convening of this Conference. Its objectives were to examine the nature and special vulnerabilities of these States and to define a number of specific actions and policies relating to environmental and development planning to be undertaken by these States, with help from the international community. After more than a year of negotiations, the Parties adopted the Barbados Programme of Action for the Sustainable Development of Small Island Developing States.

This Programme includes a number of measures that the small island States can take to manage sustainably their marine and coastal resources, and also calls on developed States and the international community to provide them with financial and technical assistance to achieve this goal. The Programme of Action adopts a holistic approach, and reviews comprehensively each of the essential aspects of the sustainable development of small island developing States. The marine dimension of these islands is clearly emphasized and specific chapters of the Programme deal, *inter alia*, with climate change and sea-level rise, coastal and marine resources, tourism resources, biodiversity resources and regional institutions and technical cooperation. The adoption of an integrated coastal area management approach is clearly identified as a required condition for the sustainable development of the island States, particularly to mitigate impacts of sea-level rise. In this respect, the Programme of Action contains many of the recommendations contained in Part II, but they are specifically tailored for the specific conditions and needs of the countries it aims to assist (de Fontaubert, 1994).

9. Convention on International Trade in Endangered Species, Washington, 1973, (CITES)

CITES, which has over 125 Parties, seeks to ensure that international trade in animal and plant species, defined as including subspecies and populations, is sustainable. In periodic Conferences of the Parties, CITES Parties identify species that are, or may be threatened by trade, listing them on Appendix I to CITES. They also identify species that may become threatened unless trade is regulated, listing them on Appendix II. These determinations are made based on biological criteria and evidence concerning the species' status and threats to their survival. Specimens of listed species can be traded only with permits from the country of export; Appendix I species must also have prior permits from the country of import. Commercial trade is forbidden for species listed on Appendix I. While not banned, it is strictly regulated for species on Appendix II, and Parties are to monitor trade impacts and adjust regulation as needed. A number of marine species are listed under CITES. For example, all species of the order Cetacea (whales and dolphins) and all species of sea turtles are listed under either Appendix I or Appendix II. A number of species of coral are also listed under CITES.

Both CITES and the CBD affirm the need to adopt a precautionary approach. States that are Parties to the CBD should ratify and implement CITES, if they have significant involvement in the wildlife trade and if they have not already done so. Parties to both agreements should support and follow recent scientifically-based CITES listing criteria and efforts to adopt comprehensive management measures for certain listed species.

The enforcement experience and scientific expertise that CITES has amassed over the years can be used to enhance implementation of the CBD. For example, the COP or the SBSTTA might consult with the CITES Secretariat or COP on the use of trade measures to encourage sustainable use. CITES's experience with import-export controls of international trade could also be useful for Parties to the CBD as they develop measures for implementing the Convention's provisions on access to genetic resources and sharing of their benefits.

10. International Convention for the Prevention of Pollution from Ships (MARPOL), 1973 – 1978

Pollution from ships poses a great danger to marin biodiversity. Highly productive estuaries and othe coastal areas are particularly at risk from discharge The 1973 MARPOL Convention and its 197 Protocol aim to protect the marine environment b eliminating intentional discharges of oil and othe harmful substances and minimizing accidental di charges of such substances by vessels sailing unde flags of State Parties. Parties to the Convention opt t abide by one or more of the five annexes that de with various substances and cargo loads: Annex (oil); II (noxious liquids carried in bulk); III (pacl aged substances); IV (sewage); V (garbage and pla tics). MARPOL also provides for designation "Special Areas" of enclosed or semi-enclosed sea based on ecological and traffic conditions, in whic discharges are especially restricted. The IMO h developed guidelines for identifying special areas. new annex to MARPOL is under development reg lating the discharge of ballast water for the purpose preventing alien species introductions.

MARPOL has had some success in helping to redu the number of operational discharges at sea, b implementation could be greatly strengthene Implementation of Annex I on oil has had the m success. By signing, acceding to the Annexes a implementing MARPOL, Parties can reduce t harm to biodiversity due to activities of their natic als, whether in their own areas of jurisdiction, in t areas of another State or in a global commons ar Parties should maintain their commitment to ongo efforts under MARPOL, such as attending techni meetings.

11. The Convention on the Prevention o Marine Pollution by Dumping of Wastes and other Matter, London, 1972 (London Convention)

The Convention on the Prevention of Mar Pollution by Dumping of Wastes and other Mat also known as the London Convention, was adop in 1972 and entered into force in 1975. The disp

of wastes at sea can have severe impacts on marine biodiversity. The London Convention is designed to control the dumping of waste in the sea, and to encourage the formation of regional agreements to supplement the Convention. It requires States to limit the disposal at sea of such substances as radioactive materials, biological and chemical warfare agents, persistent plastics, heavy metals and toxic organics. Importantly, the Convention applies to activities of vessels flying flags of State Parties beyond national jurisdiction.

This Convention should be signed and implemented by all Parties to the CBD. In addition, countries should seek to adopt the Convention's pollution prevention approach at the national level. Moreover, UNCLOS Article 210.6 indicates that States are required to implement the London Convention's pollution reduction and prevention requirements because they qualify as globally applicable ocean dumping requirements (Birnie and Boyle, 1992). Through communication and cooperation, including communication of the findings of the Roster of Experts, the COP and Convention Parties can support and benefit from the activities of the International Maritime Organization (IMO).

12. Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971 (Ramsar Convention)

Ramsar, which has been in force since 1975 and has 93 Parties, aims to stem the progressive encroachment on and loss of wetlands, now and in the future. While Ramsar focuses on wetlands that are important for migratory waterfowl, it recognizes the overall values of wetlands, including their fundamental ecological functions and their economic, cultural, scientific and recreational value. Ramsar defines wetlands broadly to include freshwater, brackish and saltwater marshes, including marine waters up to six meters deep at low tide, and any deeper marine waters contained within the wetland area, as well as adjacent islands and coastal areas.

Ramsar Parties are to designate at least one national wetland of international importance; many Parties have designated more than one. Designation of these areas should be an element of the process of identifying priority components of biodiversity under Article of the Convention (see Part II, Action Item 6). Under Ramsar, Parties are also required to establish wetlands nature reserves and cooperate in the exchange of information for wetlands management, obligations that are consistent with the obligations to establish marine protected areas and cooperate on scientific and technical matters under the CBD. Ramsar also requires Parties to assess the impacts of any changes in use on identified wetland sites, which is consistent with the CBD's requirement in Article 14 that Parties establish environmental impact assessment procedures. Finally, Ramsar requires Parties to take responsibility for conservation, management and wise use of migratory stocks of waterfowl, an approach that is also taken in Annex I of the CBD, which identifies ecosystems necessary to migratory species as being potentially important for purposes of conservation priorities.

13. Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972 (World Heritage Convention)

The World Heritage Convention, which has been in force since 1972, has the objective of creating international support for the protection and maintenance of sites demonstrating outstanding cultural and natural heritage of universal value. It provides for identification and protection of such sites under international law and encourages public and official attention to the value and the need to preserve such sites. Each of the 146 Parties to the World Heritage Convention assumes an obligation to identify, protect, conserve and transmit to future generations its unique cultural and natural heritage. In addition, the World Heritage Commission selects sites nominated by Parties to be placed on the World Heritage List. The criteria for selecting sites were revised in 1994 to provide for identification of sites that are the most important and significant natural habitats for *in situ* conservation of biological diversity. The World Heritage Convention provides for identification of World Heritage Sites within the "territory" of its Parties. Thus, whi

Parties may nominate Sites within their internal and territorial waters, it is unclear whether Sites can be identified within Parties' EEZs.

The World Heritage Convention was ahead of its time in setting up a multilateral fund, the World Heritage Fund, to finance protection of World Heritage Sites in developing country Parties. However, the amount of funding contributed by developed countries has been minimal, generally amounting to between US$ 2 and 3 million per year.

Measures under the World Heritage Convention are related to the obligations of States under the CBD to identify and protect ecosystems of particular importance. In encompassing both natural and cultural heritage, and providing for identification of sites rich in biological diversity, the World Heritage Convention implicitly recognizes that biodiversity's cultural as well as natural values are important, consistent with the Preamble of the CBD, which recognizes the many values of biodiversity including its cultural value.

One useful step that Parties to both Conventions could take would be to review and augment their national inventories and protective measures for natural and cultural heritage in light of the CBD's call for national inventories of biodiversity, the 1994 revision to the World Heritage Convention, and the developing awareness of the value of biodiversity for humanity.

14. International Convention for the Regulation of Whaling, Washington, 1946 (ICRW)

The ICRW was initially created to regulate the commercial take of whales in order to conserve whale populations for future commercial harvesting. The ICRW created the International Whaling Commission (IWC) which set catch limits for whales within and outside national jurisdiction, and disseminated scientific information on whales. Parties are bound by catch limits unless they file objections within a specified time.

In recent years, the IWC's membership has evolved to include a number of nations that do not engage in commercial whaling. As a result, its vision has grow beyond regulation of whaling alone to encompas conservation of whales more broadly, and its decision have acquired a precautionary orientation. Thus, i 1982, the IWC voted for a broad moratorium on com mercial whaling, although some countries objected t the moratorium and one country continues commer cial whaling. The IWC has also established sanctuar ies in the Southern and Indian Oceans where com mercial whaling is forbidden. The IWC has recentl organized scientific workshops on the potentia impacts of chemical pollution and climate change o whales.

APPENDIX 2

The Convention on Biological Diversity (CBD) and the UN Convention on the Law of the Sea (UNCLOS): Selected Provisions on Conservation, Sustainable Use and Research.

The CBD provides that "Contracting Parties shall implement this Convention with respect to the marine environment consistently with the rights and obligations of States under the law of the sea" (Art. 22.2). This table reviews examples of the complementary and parallel provisions in the CBD and the UN Convention on the Law of the Sea, which embodies much of the law of the sea. There are many opportunities to implement these agreements together in ways that are consistent, mutually supportive and productive.

	Convention on Biological Diversity	Convention On The Law Of The Sea (UNCLOS)
International Cooperation on Conservation and Sustainable Use	**Cooperate on Matters of Mutual Interest.** Parties shall cooperate in respect of areas beyond national jurisdiction and on other matters of mutual interest, for conservation and sustainable use of biodiversity (Article 5). **Cooperate on Implementation through the Conference of the Parties (COP).** The Parties shall meet periodically in a COP to consider and take actions needed to achieve the convention's objectives (Article 23). **Cooperate Within the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA).** The SBSTTA shall advise the COP by assessing the status of biodiversity, assessing implementation measures and answering questions for the COP (Article 25). **Cooperate on Providing Financial Resources to Developing Country Parties.** A financial mechanism (under the authority of the COP and currently operated by the GEF) distributes funds provided by developed Parties to developing Parties for implementation (Article 21). **Establish a Clearing House Mechanism.** The COP shall set up a CHM to promote technical and scientific cooperation through information sharing (Article 18.3).	**Conserve and Develop Shared EEZ Stocks.** Coastal States sharing stocks of living resources within their exclusive economic zones (EEZs) shall seek to agree upon the measures necessary to co-ordinate and ensure the stock's conservation and development (Article 63.1) **Conserve Straddling Stocks.*** Where stocks occur in areas both within and adjacent to an EEZ, the coastal State and the States fishing in the adjacent area shall seek to agree upon measures to ensure the conservation of these stocks in the adjacent area (Article 63.2). **Conserve and Use Optimally Migratory Species.*** Coastal States and other States whose nationals fish in the same region for highly migratory species shall co-operate with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region. In regions for which no appropriate international organization exists, States shall co-operate to establish such an organization and participate in its work (Article 64). **Elaborating on these obligations, UN negotiations have produced an Agreement for the Implementation of the Provisions of the UNCLOS Relating to the Conservation and Management of Straddling and Highly Migratory Fish Stocks, opened for signature in December 1995.* **Conserve Marine Mammals.** States shall cooperate with a view to the conservation of marine mammals and may take additional actions to regulate their exploitation more strictly. (Articles 65 and 120). **Conserve and Manage Anadromous and Catadromous Species.** Where anadromous stocks or catadromous species migrate into or through the EEZ of a State other than the State of origin, the States involved shall co-operate with regard to the conservation and management of such stocks (Articles 66.4 and 67.3).

		Conserve and Manage High Seas Living Resources. States shall cooperate in the conservation and management of high seas living resources. They shall cooperate to establish sub-regional or regional fisheries organizations with a view to taking the measures necessary to conserve the living resources concerned (Articles 117-119).
Environmental Impact Assessment and Notification	**Introduce Assessment Procedures.** Introduce procedures requiring environmental impact assessment of proposed projects in order to minimize adverse effects on biological diversity and allow for public participation (Article 14.1.a). **Exchange Information on Activities Affecting Biodiversity.** Promote notification, exchange of information and consultation on activities which are likely to affect the biological diversity of other States by encouraging bilateral, regional or multilateral arrangements (Article 14.c). **Notify Other States of Imminent or Grave Danger to Biodiversity.** In the case of grave danger to biological diversity, notify immediately the potentially affected States and initiate action to prevent or minimize such damage (Article 14.d). **Co-operate Globally or Regionally on Environmental Standards.** States shall co-operate in formulating and elaborating international rules, standards and recommended practices and procedures for the protection and preservation of the marine environment (Article 197).	**Assess and Report Potential Effects of Activities.** Assess the potential effects of activities that may cause substantial pollution of or significant and harmful changes to the marine environment and report the results (Article 206). **Notify Other States of Imminent Damage.** When a State becomes aware of cases in which the marine environment is in imminent danger of being polluted or has been polluted, it shall immediately notify other States likely to be affected and international organizations (Article 198). **Cooperate on Pollution Contingency Plans.** States shall jointly develop and promote contingency plans for responding to pollution incidents in the marine environment to eliminate the effects of pollution and prevent or minimize the damage (Article 199).
Conservation and Sustainable Use Within National Jurisdiction	**Manage Biological Resources for Conservation and Sustainable Use.** Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas with a view to ensuring their conservation and sustainable use (Article 8.c). **Establish System of Protected Areas and Buffer Zones.** Establish a system of protected areas where special measures are needed to protect biodiversity. Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas (Article 8.a, e).	**Conserve Living Resources in the EEZ** Coastal States shall ensure through proper conservation and management measures that the maintenance of the living resources in the EEZ is not endangered by over-exploitation. Nationals of other States fishing in the EEZ shall comply with these measures (Articles 61.2 and 62.4). **Maintain or Restore Populations of Harvested Species.** Such measures shall also be designed to maintain or restore harvested species populations at levels producing the maximum sustainable yield, as qualified by relevant economic and environmental factors (Article 61.3).

	Minimize Impacts of Use of Biological Resources on Biological Diversity. Adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity (Article 10.b). **Develop Regulation to Protect Threatened Species.** Develop regulation needed to protect threatened species or populations (Article 8.k).	**States May Take Stricter Measures to Protect Marine Mammals.** States may prohibit, limit or regulate the exploitation of marine mammals in their EEZs more strictly than provided for in this part (Article 65). **Comply With Coastal State Regulations.** Nationals of other States fishing in the EEZ shall comply with the conservation measures, terms and conditions established in the laws and regulations of the coastal State (Article 62.4). **Conserve Anadromous Stocks.** The State of origin has primary interest and responsibility for anadromous stocks. It shall regulate fishing in its own EEZ to conserve stocks, and may set total allowable catches for all fishing of stocks after consultation with other interested States (Article 66).
Monitoring and Regulating Harm	**Identify and Monitor Activities Harming Biodiversity.** Identify activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects (Article 7.c). **Regulate Harmful Activities.** Where a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities (Article 8.l). **Regulate Living Modified Organisms.** Establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms that could affect the conservation and sustainable use of biological diversity (Article 8.g). **Prevent and Control Introduction of Alien Species.** Prevent introduction of, control or eradicate those alien species that threaten ecosystems, habitats or species (Article 8.h).	**Take Measures to Prevent, Reduce and Control Pollution.** States shall take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source (Article 194.1). **Protect Threatened Species and Ecosystems.** These measures shall include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life (Article 194.5). **Monitor Pollution of the Marine Environment and Publish Results.** States shall observe, measure, evaluate and analyze the risks or effects of pollution on the environment (Article 204.1). States shall also keep under surveillance the effects of any activities that they permit or in which they engage in order to determine whether these activities are likely to pollute the marine environment, and publish reports on the results of the above studies (Articles 204.2 and 205). **Prevent, Reduce and Control Pollution from Use of Technologies or Introduction of Alien Species.** Pollution and harmful changes to the marine environment resulting from the use of technologies or introduction of alien or new species shall be prevented, reduced and controlled (Article 196).

Research	**Parties Shall Facilitate Access For Other Parties to Their Genetic Resources.** Parties shall endeavor to create conditions to facilitate access to genetic resources for environmentally sound uses and not to impose restrictions that run counter to the objectives of this Convention (Article 15.2). **Parties Shall Gain Access Only on Mutually Agreed Terms and by Prior Informed Consent** (Article 15.4, 15.5). **Parties Shall Share Research and Development Results.** Parties shall take measures aimed at sharing equitably the benefits of research and use of genetic resources (Article 15.7). **Encourage Wider Use of Traditional Knowledge and Practices With Consent of the Communities and Benefit-Sharing.** Encourage the equitable sharing of the benefits arising from the utilization of knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity, and promote the application of such knowledge with the holders' approval and involvement (Article 8.j). **Carry Out Joint Research and Development.** States shall endeavor to develop and carry out scientific research based on genetic resources provided by other Parties with their full participation (Article 15.6). **Help Build Capacity.** States shall take measures to provide for the effective participation in biotechnological research activities by the Parties providing the genetic resources, especially developing countries (Article 19.1).	**Cooperate on Scientific Studies, Research and the Exchange of Information.** States shall cooperate to promote studies, undertake scientific research and encourage the exchange of information about marine pollution and shall promote international co-operation in marine research for peaceful purposes. States shall provide other States with an opportunity to obtain information necessary to prevent and control damage to persons and the marine environment (Articles 201 and 243). **Right of States and IGOs to Conduct Marine Scientific Research and Duties to Provide Coastal States with Results and Assistance.** All States and competent international organizations have the right to conduct marine scientific research subject to the limitations of this Convention. States will provide the coastal State with preliminary reports and conclusions after the completion of the research, with access to all data and samples derived from the project and, if requested, with assessment assistance (Articles 238 and 249). **Right of Coastal States to Regulate Marine Scientific Research in the Territorial Sea.** Coastal States have the exclusive right to regulate, authorize and conduct marine scientific research in their territorial sea (Article 245). **Right of States to Conduct Marine Research in EEZs and the Continental Shelf (With Exploitation Exception).** Coastal States shall, in normal circumstances, grant their consent for marine scientific research projects by other States or competent international organizations in their EEZ or on their continental shelf, to be carried out exclusively for peaceful purposes and in order to increase the scientific knowledge of all. Coastal States may withhold consent to the conduct of a project if that project is of direct significance for the exploration and exploitation of natural resources, whether living or non-living (Articles 246.3 and 246.5a). **Publish and Disseminate Scientific Information.** States shall make available information on programs, objectives and knowledge resulting from marine scientific research. States shall actively promote the flow of scientific data and knowledge resulting from marine scientific research, especially to developing States and shall promote the strengthening of the autonomous marine scientific research capabilities of developing States through education and training programs (Article 244).

Transfer of Technology	**Facilitate Access to and Transfer of Technology.** Parties undertake to provide and facilitate access for and transfer to other Parties of technologies that are relevant to conservation and sustainable use or make use of genetic resources and do not cause significant damage to the environment. Access shall be under fair and most favorable terms, including on concessional and preferential terms where mutually agreed, and shall be consistent with adequate and effective promotion of intellectual property rights (IPRs) over proprietary technology except where Parties agree that IPRs interfere with the Convention's objectives (Article 16).	**Cooperate to Develop and Transfer Marine Technology.** States shall co-operate in accordance with their capabilities to promote actively the development and transfer of marine science and marine technology on fair and reasonable terms and conditions (Articles 268-274, 278). **Provide Assistance to Developing States.** States shall, directly or through competent international organizations, promote programmes of scientific, technical and other assistance to developing States for the protection of the marine environment and the prevention, control, and reduction of marine pollution. States shall also provide appropriate assistance, especially to developing States, for the minimization of serious pollution from major accidents and for the preparation of Environmental Impact Assessments (Article 202; see also Article 203). **Promote the Establishment of Research Centers.** States shall promote the establishment, especially in developing coastal States, of national and regional marine scientific and technological research centers in order to stimulate research and to enhance their national capabilities to utilize and preserve their marine resources for their economic benefit. All States of a region shall co-operate with the regional centers therein to ensure the more effective achievement of their objectives. The functions shall include: training, education, study programs related to protection of the marine environment and pollution control, acquisition and dissemination of marine scientific data, and technical co-operation (Articles 275, 276 and 277).
Dispute Resolution	**Process for Settlement of Disputes.** In the event of disputes between Parties concerning this Convention, the parties shall seek solution by negotiation. If they cannot reach agreement, they may request mediation by a third party. If a dispute is not resolved by these means, the Parties agree when ratifying or approving the Convention that their dispute shall be settled by Arbitration or by Submission of the dispute to the International Court of Justice. If the Parties do not accept this procedure, the dispute shall be submitted to conciliation (Article 27).	**Dispute Settlement Provisions.** States may choose among four options for compulsory, binding settlement: the International Court of Justice; the International Tribunal for the Law of the Sea; an arbitral tribunal; or a "special" arbitral tribunal. (This is a one-time choice; it does not arise each time a new dispute occurs (Article 287)). There are no limitations on the application of compulsory, binding dispute resolution with regard to protection and preservation of the marine environment. In situations in which serious harm to the marine environment may result, the Tribunal may prescribe provisional measures to prevent harm; the parties to the dispute must comply with the provisional measures (Article 290). This in no way affects the institution of civil proceedings in respect of any claim for loss or damage resulting from pollution of the marine environment (Article 229). Only monetary penalties may be imposed for violations of these national laws or applicable international rules and standards by foreign vessels, except in the case of a wilful and serious act of pollution in the territorial sea (Article 230).

APPENDIX 3

Key Elements of the Jakarta Mandate

The Conference of Parties (COP) of the Convention on Biological Diversity, at its second meeting held in Jakarta in 1995, outlined a program of action for implementing the Convention with respect to marine and coastal biodiversity. In the declaration adopted during the COP's ministerial segment, the ministers termed this program the "Jakarta Mandate." The Jakarta Mandate consists primarily of the recommendations to the COP from the Subsidiary Body on Science, Technology and Technical Advice (SBSTTA), which were adopted at its first meeting held in Paris in 1995. It also includes several additional points agreed upon by the COP.

Most of these points were positive additions to the SBSTTA's recommendations. A minority of Parties, however, noted some concerns about the SBSTTA's recommendations. For example, some countries felt that the SBSTTA over-emphasized fishery issues in comparison with other issues such as pollution. Some countries also pointed out that the issue of fishery subsidies was "politically sensitive, with potential trade implications." In the end, however, the COP supported the SBSTTA's recommendations, while noting the minority views. *COP II/10 Annex.*

The following summary reviews the major substantive points of the Jakarta Mandate. The COP also directed the secretariat to launch a process for developing recommended options for implementation of the Jakarta Mandate. This process will include meetings of experts drawn from a Roster of Experts on Marine and Coastal Biodiversity.

Integrated Marine and Coastal Area Management (ICAM)

Integrated marine and coastal area management (ICAM) is the most suitable framework for addressing human impacts on marine and coastal biodiversity and for promoting conservation and sustainable use. *COP II/10.2; SBSTTA 1/8.10.* Parties should prom ICAM as the framework for addressing impacts land-based activities. *SBSTTA I/8.10 (a).* ICA should address the socio-economic needs of coa communities. *SBSTTA I/8.10 (d).*

Governments should establish or strengthen institutional, administrative, and legislative arran ments for the development of integrated mana ment of marine and coastal ecosystems, plans a strategies for marine and coastal areas, and their in gration within national development plans. C *II/10.3.*

Integrated management measures for environmen ly sound land and coastal resource use practices sho be based on precautionary ecosystem managem approaches and best management practices. *SBST I/8.10 (b)(ii).*

In addition to protecting specific stocks, the pro tion of ecosystem functioning should be emphasi in modeling, assessment, and conservation measu The present mono-species approach to modeling assessment should be augmented by an ecosys process-oriented approach, based on research ecosystem processes and functions, with an emph on identifying ecologically critical proces Interdisciplinary scientific groups should deve models of ecosystem processes, and apply them in development of sustainable land and coastal reso use practices. *COP II/10 Annex I (v).*

Governments should carry out environmental im assessments of all major coastal and marine deve ment activities, paying special attention to ma and coastal biological diversity and taking account cumulative impacts. *SBSTTA I/8.10* Governments should undertake systematic moni ing and evaluation of project impacts during im mentation. *SBSTTA I/8.10 (c).*

The impacts of land-based activities on marine coastal biological diversity should be assessed addressed, in close cooperation with the impleme

tion of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities. *SBSTTA I/8.10 (f)*.

Relevant sectoral activities are crucial components of ICAM. They include, inter alia, construction and mining in coastal areas, mariculture, mangrove management, tourism, recreation, fishing practices, and watershed management. *COP II/10 Annex I (ii)*. Sustainable tourism planning and management should be incorporated into ICAM. *SBSTTA I/8.10 (b)(iii)*.

Current sectoral approaches to the management of marine and coastal resources have generally not proven capable of conserving marine and coastal biodiversity. Governments should develop new models based on precautionary approaches and ecosystem management principles. *SBSTTA I/8 Annex 6*.

The impacts of desludging and pollution by maritime vessels on marine and coastal biological diversity, in particular in those countries which border international waterways, should be assessed, and measures adopted to mitigate adverse effects. *SBSTTA I/8.10 (g)*.

Parties are encouraged to undertake and exchange information on ICAM demonstration projects. *COP II/10 Annex I (iii)*.

Governments should promote rapid appraisal techniques to improve the conservation and management of marine and coastal biodiversity. *SBSTTA I/8 10 (e)*

Marine and Coastal Protected Areas

The value of living marine resources for biodiversity conservation should be an important criterion for the selection of marine and coastal protected areas, within the framework of integrated marine and coastal area management. Conservation measures should emphasize the protection of ecosystem functioning, in addition to protecting specific stocks. *COP II/10 Annex I (iv)*.

Parties should explore means to incorporate marine and coastal protected areas within a broader framework for multiple use planning, as exemplified in UNESCO Man and the Biosphere Program. *SBSTTA I/8.11 (c)*.

Parties should encourage local communities and resource users to participate in the planning, management, and conservation of coastal and marine protected areas. *SBSTTA I/8.11 (d)*.

In the context of ICAM, Parties should establish or consolidate representative systems of marine and coastal protected areas (MPAs), and enhance linkages and information exchange among the sites. *SBSTTA I/8.11 (a)*.

Parties should promote the research and monitoring of MPAs to assess their value for the conservation and sustainable management of biodiversity. *SBSTTA I/8.11 (b)*.

Rapid assessment techniques should be applied, as appropriate, to assess the conservation requirements of MPAs. *SBSTTA I/8 11 (b)*.

In the development and implementation of management plans, all three levels of biological diversity, (ecosystem, species, and population or genetic) and factors determining their structure and function, should be considered. *SBSTTA I/8 11 (e)*.

Sustainable Use of Coastal and Marine Living Resources

In their national plans and programs, Parties should ensure, as far as possible and as appropriate, that:

Management decisions are based upon a precautionary approach. *SBSTTA I/8.12 (a)*.

Management decisions are based on the best available and sound scientific knowledge, research and information, taking into account ecosystem impacts. *SBSTTA I/8.12 (b)*.

Waste (e.g., through discard, spoilage, or mortality) in the trade in living organisms is reduced *SBSTTA I/8.12 (c)*.

Local communities, users, and indigenous people are involved in the conservation and management of resources. *SBSTTA I/8.12 (d)*.

There is national legislation that ensures the conservation and sustainable use of living marine and coastal resources, which is in conformity with the Convention on Biological Diversity, UNCLOS, and Agenda 21. *SBSTTA I/8.12 (e)*.

The provisions of the FAO Code of Conduct for Responsible Fisheries are followed. *SBSTTA I/8.12 (e)*.

Countries accede to existing international agreements addressing the over-exploitation and conservation of marine and coastal resources, and fully implement and enforce them, especially the Agreement on Straddling and Highly Migratory Fish Stocks. *SBSTTA I/8.12 (f)*.

Monitoring mechanisms are used or established to assist in the sustainable management of marine and coastal living resources. *SBSTTA I/8.12 (g)*.

National plans and programmes incorporate the basic management elements described above. *SBSTTA I/8.12*.

FAO efforts to provide advice on management and technology tools recommended in the FAO Code of Conduct are supported. *SBSTTA I/8.13*.

They identify constraints, including economic, for conversion of fishing gear and phase-out of fishing over-capacity, and consider the possibility of reducing subsidies for fisheries. *SBSTTA I/8.14 (a)*.

They take into account the ecosystem functions and processes, identifying and targeting critical processes for the conservation and sustainable use of biodiversity. *SBSTTA I/8.14 (c)*.

They promote cooperation between regional fisheries bodies and regional organizations for the protection and conservation of the marine environment. *COP II/18 Annex I (viii)*.

Implementing Environmentally Sustainable Mariculture Practice

Parties should implement environmentally sustainable mariculture practices, as far as possible and appropriate, including the following:

Integrated marine and coastal zone management plans should incorporate mariculture, paying special attention to the vulnerability of areas of high biological value. *SBSTTA I/8.15 I (a)*.

Mariculture activities should be subject to prior environmental and social impact assessments (in accordance with Article 14), as well as regulations (Article 10), incorporating the participation and needs o local and indigenous communities. *SBSTTA I/8.15 I (b)*.

National reports and national biodiversity strategies should include an examination of mariculture operations and steps to avoid significant adverse impacts *SBSTTA I/8.15 IV*.

The use of chemicals for therapeutics and other mariculture applications should be minimized. *SBSTTA I/8.15 I (c)*.

High nutrient release and freshwater diversion should be minimized in mariculture operations, and eutrophication should be avoided. Chemicals should only be used in a prescribed and responsible manner, involving improved waste treatment and feed technology and integrated farming and polyculture. *SBSTTA I/8.15 I (c)*.

Natural stocks should not be overexploited through the harvesting of wild larvae for mariculture. *SBSTTA I/8.15 I (d)*.

In mariculture, the introduction of alien species, the products of selected breeding and living modified organisms resulting from modern biotechnology should be treated as an introduction into the wild. Adherence to international codes of practice should be a minimum requirement. *SBSTTA I/8.15 I (e)*.

Because of the potentially high risks of introductions of species, prior impact assessments should be rigorous, and must reflect application of the precautionary principle. *SBSTTA I/8.15 I (e)*.

An appropriate monitoring program must be put in place if introduction goes ahead. Preference should be given to the use of indigenous species. The development of technology to ensure a more complete containment should be encouraged. *SBSTTA I/8.15 I (e)*.

Knowledge of the genetic structure of the local populations of marine species subject to stock enhancement and sea-ranching activities should be improved. This knowledge should be used in the management of breeding stocks according to sound genetic principles that take into account the use of local populations for stock selection, minimum breeding numbers, and the renewal frequency of the breeding stock from the wild population. *SBSTTA II/10 Annex I (ix)*.

The conservation of genetic diversity in the wild stocks from which farmed populations are derived should be an objective of overall management. *SBSTTA I/8 15 I (f)*.

Where appropriate and practical, Parties should prevent the physical alteration, destruction or degradation of vital habitats, and pursue the restoration of degraded habitats, including spawning areas and nursery grounds. *SBSTTA II/10 Annex I (ii)*.

Parties should, where possible, undertake restoration programs in areas where unsustainable mariculture operations have already degraded or destroyed natural habitats and ecosystems, including spawning areas and nursery grounds. *SBSTTA I/8.15 I (g), II/10 Annex I (ii)*.

The clearing-house mechanism should be used to link databases and information networks to collect and disseminate data related to responsible mariculture measures, and other information relevant to mariculture, such as information on infectious agents, parasites, and disease outbreaks. *SBSTTA I/8.15 II 17(a)*.

Introduction of Alien Species

Parties should include in national plans and programs, as far as possible and as appropriate:

Means to prevent, control or eradicate alien species which threaten ecosystems, habitats, or species, in accordance with Article 8, paragraph (h). These means might include the implementation of international protocols and guidelines (e.g., IMO ballast water guidelines, or the International Council for the Exploration of the Sea Code of Practice). *SBSTTA I/8.16 I (a)*.

Conduct environmental impact assessments, including risk assessment, prior to intentional introductions. *SBSTTA I/8.16 I (b)*. The assessment could include:

- the identification of primary pathways for unintentional introductions,
- the identification of types of organisms with the greatest potential to be dangerous,
- mitigation techniques to minimize unintentional introductions,
- monitoring to identify the establishment of alien species,
- and the development of means for the elimination of hazardous alien species.

Parties should consult with neighboring States before introducing alien species into shared waters. *SBSTTA I/8.16 I (b)*.

Before intentionally introducing non-native species, Parties should assess possible indigenous species alternatives, whether the introduced species can be adequately monitored (per Article 7, paragraph (c)), and whether adverse effects can be reversed within two human generations. *SBSTTA I/8.16 I (c)*.

Prior to intentional introductions, parties should also assess biological information on the species in its native habitat, including life states and trophic level, the results of previous introductions of this species

elsewhere, the potential impacts on indigenous species, through for example predation and competition, or on ecosystem function, the associated pathogens and parasites and the ability to treat or screen for such organisms, the potential for habitat modification by the introduced species, and the potential for interbreeding with deleterious genetic impacts on indigenous species and stocks. The assessment should take into account that organisms transferred from one ecosystem to another may not maintain the same characteristics in the new ecosystem. *SBSTTA I/8.16 I (c)*.

Parties should conduct environmental impact assessments before constructing canals linking coastal water bodies. *SBSTTA I/8.16 I (d)*.

Parties should educate the public on the possible dangers to the ecosystem that could result from the release of ornamental species and unauthorized releases of species for sport fisheries. *SBSTTA I/8.16 I (e)*.

In addition, Parties should conduct further research on the impacts of alien species on in-situ conservation, such as:

- ecological surveys and ballast discharge water surveys to help establish baseline data and level of risk associated with introductions through ballast water, including on the effects of the introduction of harmful algal species through ballast water;

- the long-term effects of species replacements due to introductions on ecosystem functioning.
  SBSTTA I/8.16 II.

ACRONYMS

ATS . . . . . .Antarctic Treaty System
CBCRM . . . . . .Community-Based Coastal Resource Management
CBD . . . . . .Convention on Biological Diversity
CCAMLR . . . . .Convention on the Conservation of Antarctic Marine Living Resources
CCAS . . . . . .Convention for the Conservation of Antarctic Seals
CFC . . . . . .Chlorofluorocarbon
CHM . . . . . .Clearing-House Mechanism
CITES . . . . . .Convention on the International Trade of Endangered Species
COP . . . . . .Conference of Parties
CPAN . . . . . .Circumpolar Protected Area Network Plan
CSD . . . . . .Commission on Sustainable Development (UN)
EEZ . . . . . .Exclusive Economic Zone
FAO . . . . . .Food and Agriculture Organization
FCCC . . . . . .Framework Convention on Climate Change
GEF . . . . . .Global Environment Facility
GIS . . . . . .Geographic Information System
GMO . . . . . .Genetically Modified Organism
ICAM . . . . . .Integrated Coastal Area Management
ICRI . . . . . .International Coral Reef Initiative
IMO . . . . . .International Maritime Organization
IOC . . . . . .Intergovernmental Oceanographic Commission (UNESCO)
ITQ . . . . . .Individual Transferable Quota
IUCN . . . . . .World Conservation Union
IWM . . . . . .Integrated Watershed Management
LBS . . . . . .Land-Based Sources
LMO . . . . . .Living Modified Organism
LME . . . . . .Large Marine Ecosystem
MDB . . . . . .Multilateral Development Bank
MPA . . . . . .Marine Protected Area
MSY . . . . . .Maximum Sustainable Yield
NCI . . . . . .National Cancer Institute (U.S.)
NGO . . . . . .Non-Governmental Organization
OY . . . . . .Optimal Yield
POPs . . . . . .Persistent Organic Pollutants
SPFFA . . . . . .South Pacific Forum Fisheries Agency
TAC . . . . . .Total Allowable Catch
TED . . . . . .Turtle Excluder Device
TNC . . . . . .Transnational Corporation
SBSTTA . . . . . .Subsidiary Body on Scientific, Technical and Technological Advice
UNCLOS . . . . .United Nations Convention on the Law of the Sea
UNDP . . . . . .United Nations Development Programme
UNEP . . . . . .United Nations Environment Programme
UNESCO . . . . .United Nations Education, Scientific and Cultural Organization
UNGA . . . . . .United Nations General Assembly
UV . . . . . .Ultraviolet

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II. Eight Action Items

1. Institute Integrated Coastal Area Management ("ICAM")

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INDEX

IUCN Biodiversity Policy Programme (BPP)

The Biodiversity Policy Programme (BPP) brings species, protected areas and sustainable use concerns together with the social, economic and political dimensions of biodiversity. It works together with IUCN members, partners, IUCN offices and thematic programmes, and various international institutions, especially in relation to the Convention on Biological Diversity. The BPP facilitates regional fora and regional biodiversity programme development. It has undertaken activities in South and South East Asia, East Asia, Latin America, North Africa and the Middle East. The BPP produces publications and reports, contributes to workshops and training courses, and responds to requests for technical and policy advice on biodiversity and sustainable use.

IUCN Environmental Law Centre (ELC)

The Environmental Law Centre (ELC) and the Commission on Environmental Law (CEL) jointly carry out IUCN's Environmental Law Programme (ELP). The ELP has been addressing emerging issues in international and national environmental law for more than 25 years. The ELP has three components: Environmental Law Development; Environmental Law Services; Environmental Law Information. Based in Bonn, Germany, the ELC houses the world's largest specialised databank on environmental law and policy, the IUCN Environmental Law Information System (ELIS). ELC staff provide theoretical, technical and documentation services on a wide range of environmental legal issues. The ELC's work focuses particularly on biodiversity-related legal issues.

IUCN Marine & Coastal Programme

The Marine and Coastal Programme (MCP) contribute towards conservation of marine biodiversity by promoting, influencing and catalysing sustainable uses and equitable sharing of the resources as well as protecting the ecosystems. Its objectives are: to develop and implement a focused Union-wide marine and coastal program; to establish active networks and partnerships for the implementation of the program; to increase capacity in marine conservation and management; and to influence global debate and decisions concerning the conservation, management and sustainable use of marine and coastal resources. The MCP works closely with other IUCN thematic programmes, members, commissions and partners, and undertakes field activities with IUCN Regional and Country Offices.

IUCN Washington Office

The IUCN/US office develops policy and programmatic initiatives in support to the global programme of IUCN. It provides linkages for the Union and its members to key international organisations and U.S.-based environmental bodies, including The World Bank, the U.N. system, the InterAmerican Development Bank, and a variety of U.S.-based foundations. The Washington Office also functions as a global centre for the Union, housing global programmes such as Global Policy, Sustainable Use, Indigenous Peoples and Species Survival, and providing global policy support on environmental law, marine and coastal biodiversity, forests, trade and environment.

Eight Key Actions to Implement the Convention on Biological Diversity in Marine and Coastal Habitats

Marine and Coastal Program of Action Under the Jakarta Mandate

1. Institute Integrated Coastal Area Management (ICAM). Parties should develop and implement integrated coastal area management (ICAM), including: identification of sectoral impacts and the relative importance of their effects on marine and coastal biodiversity; consultations among stakeholders; development of best practice guidelines; and assumption of sectoral responsibility for environmental impacts, particularly those resulting from land-based activities affecting the marine environment. ICAM should incorporate community-based coastal resource management systems. Parties should also cooperate to implement the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (Articles 5, 6, 8, 10).

2. Establish and Maintain Marine Protected Areas for Conservation and Sustainable Use. Establish marine protected areas for the conservation and sustainable use of threatened species, habitats, living marine resources and ecological processes (Article 8(a), (b) and (e)).

3. Use Fisheries and Other Living Resources Sustainably. Manage fisheries by setting ecologically sustainable levels of use, managing ecosystems rather than single stocks, reducing bycatch and incidental impacts on non-target species, and eliminating subsidies that encourage overfishing. Where artisanal fisheries are sustainably managed, protect sustainable management systems through measures such as legal recognition and enforcement of community based resource management systems and recognition and protection of traditional sea tenure (Articles 6(b), 8(c), 8(j), 10(b), 10(c), and 11).

4. Ensure That Mariculture Operations Are Sustainable. Conduct environmental impact assessments of siting, design and cumulative impacts of mariculture projects. Ensure protection of traditional property and use rights. Develop and enforce standards for mariculture to minimize its impacts on marine and coastal ecosystems(Articles 6(b), 8(c), 8(g), 8(h), 10(b), 10(c), 14(1)(a) and (b)).

5. Prevent Introduction of and Control or Eradicate Harmful Alien Species. Take precautionary measures to minimize risks of introduction of harmful alien species into marine and coastal zones from ballast water and mariculture, by cooperating to strengthen and apply relevant international guidelines and by using environmental impact assessment. Cooperate regionally on response plans, contingency plans, and notification procedures for introductions. Ensure that negotiations on a biosafety protocol to the Biodiversity Convention address the risks of introductions of living modified organisms resulting from marine biotechnology (Articles 8(h), 8(l), 8(g), 14, 19(3)).

Other Supportive Actions

6. Identify Priority Components of Biodiversity, Monitor Their Status and Threats, and Identify Measures Needed for Conservation and Sustainable Use. Identify and monitor the status of high priority species, ecosystems and other components of biodiversity that need management and protection. Monitor the threats they face. Identify measures needed to ensure conservation and sustainable use of these areas (Articles 7, 8(l), 10(b)).

7. Build Capacity to Use and Share the Benefits of Genetic Resources. Strengthen capacity to use sustainably and share equitably the benefits derived from marine genetic resources and biochemicals within national jurisdiction (Articles 8(j), 10(b), 15-16, 18-19).

8. Take Responsibility for Transboundary Harm and Global Threats to Marine Biodiversity. Prevent harm caused to biodiversity in the areas beyond national jurisdiction and within other Parties' jurisdiction due to transboundary marine or air pollution, such as discharges of oil and other pollutants, as well as pollution that affects global climate and the ozone layer. Cooperate to develop and/or implement the appropriate international instruments (Articles 5, 8(g), 8(h), 14(2), 19(3)).