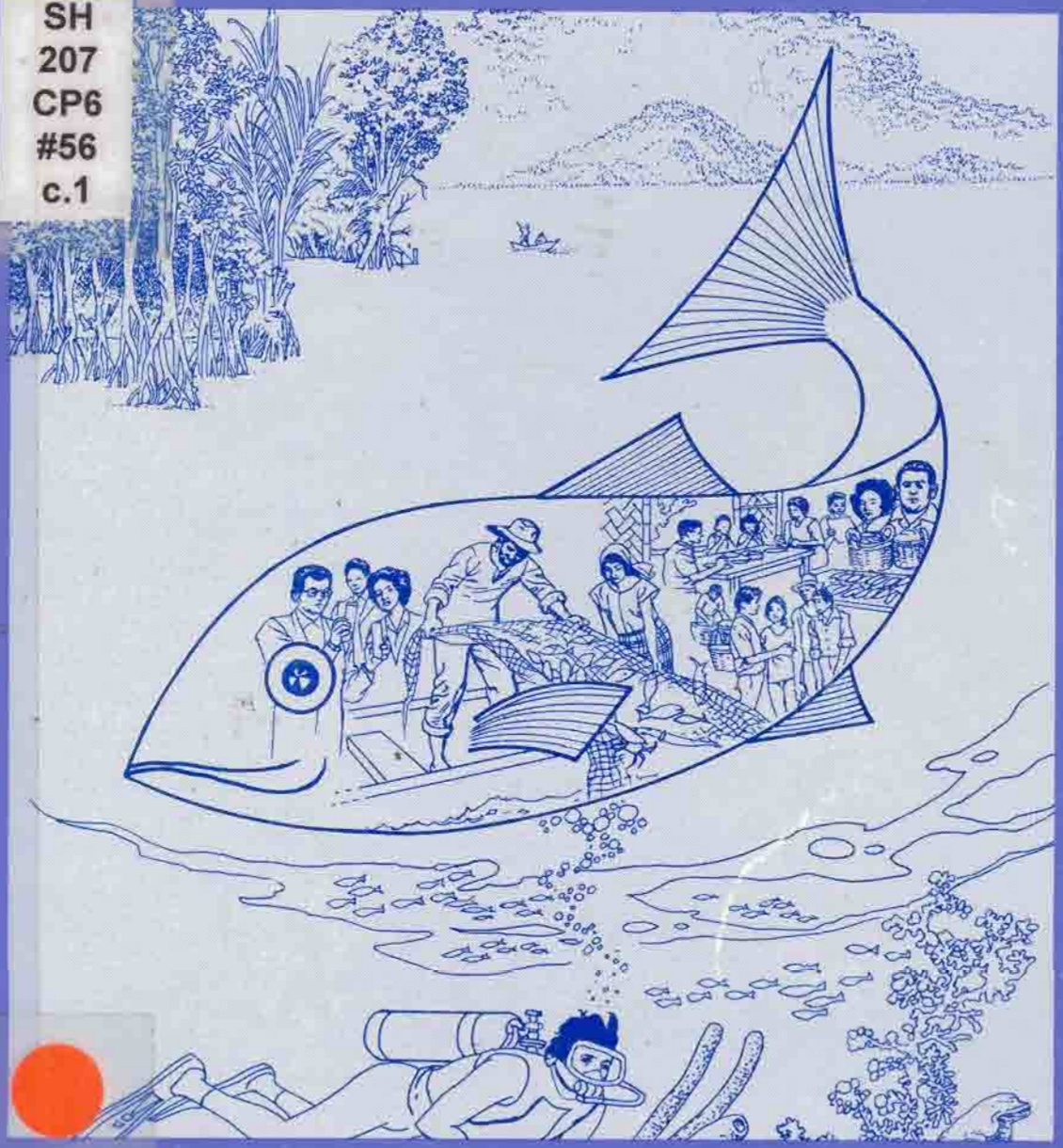
A Roadmap for the Future for Fisheries and Conservation

Edited by

Meryl J. Williams



ICLARM
International Center for Living Aquatic Resources Management

IUCN
The World Conservation Union

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Meryl J. Williams

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All documents (other than abstract and summary papers) in these series are carefully peer reviewed externally as well as within ICLARM. Those published are thus equivalent to primary literature.

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Preface

As part of the 1996 World Conservation Congress (WCC), the IUCN-The World Conservation Union convened a Marine and Coastal Workshop on 17-18 October in Montreal, Canada. These proceedings report on one of the four sessions which comprised the workshop — the fisheries session.

The aims of the Marine and Coastal Workshop were: to present and review the state of the art in marine and coastal conservation and sustainable development issues; and to discuss and develop directions, priorities and the role of IUCN in addressing these issues. In addition to fisheries, other workshop sessions were integrated coastal and marine management, marine protected areas, and international marine law and policy. Small island and coral reef issues were cross-cutting topics which were woven into each theme.

The fisheries session was convened through a unique partnership between IUCN and ICLARM, one of IUCN's members. IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. ICLARM is an international research center with a mandate to help poor people in developing countries who use and depend on living aquatic resources such as fish. IUCN, formed in 1948, has a proud record in terrestrial conservation. In the mid-1980s, it recognized the growing importance of marine and coastal conservation and began its work in these ecosystems. ICLARM was established in 1977 and has its sole focus on the use and conservation of aquatic resources, freshwater as well as marine.

Marine and coastal fisheries are among the last major natural systems exploited for food and other products. They are in transition due to the many impacts of human actions. Public concern for fisheries conservation is a recent global phenomenon.

The strength of the fisheries session was that it comprised views from fisheries, conservation and resource management experts. There was a consensus that fisheries conservation was becoming more complex. Previously the domain of fishers, fisheries managers and scientists, now, multipolar interests were concerned, including fishers and fisheries experts, consumers, local communities, civil society and other economic sectors. These interests operated at multiple

levels, from local to national and international.

In this new era of fisheries conservation, IUCN was ideally suited to play a role since its constituency encompassed many of the players. Further, multidisciplinary and interdisciplinary research such as that performed by ICLARM and others also formed one of the critical tools of the new era. However, research would have to rise to new challenges and forge new and close partnerships with society to fulfill its promise. The challenges and some of the suggested solutions are presented in these proceedings.

We wish to thank all those who presented formal papers in the fisheries session, the attendees at the plenary and the fisheries session of the Marine and Coastal Workshop and Dr. Scott Parsons (Assistant Deputy Minister of Science, Department of Fisheries and Oceans, Canada) who delivered the opening remarks at the fisheries session. The overall Marine and Coastal Workshop would not have been possible without the organization provided by Drs. M. Ngoile and P. Holthus of IUCN and the efforts of the main chairs (Dr. T. Agardy and Prof. E. Gomez) and session chairs (Mr. S. Olsen, Prof. G. Kelleher and Mr. S. Hajost). Over 200 participants from all over the world attended the workshop. Participants at the fisheries sessions were funded by IUCN and ICLARM.

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Summary

The purpose of the IUCN Marine and Coastal Workshop at the WCC was to canvass the latest issues in marine and coastal conservation and the direct role of IUCN. The fisheries session and the fisheries keynote address from the plenary described the new era of fisheries conservation and its historical antecedents.

Multilevel and multipolar interests characterize the new era in fisheries conservation, and fisheries management is beginning to recognize a new paradigm that is embodied in the precautionary approach. This approach is being enshrined in fisheries and oceans laws in countries such as Canada and being developed in operational terms as Dr. Scott Parsons, Assistant Deputy Minister of Science, Department of Fisheries and Oceans, reminded the fisheries session in his opening remarks.

Even where countries have not yet adopted the precautionary approaches, new terms and models for describing structures and processes are emerging. 'Fisheries ecosystem management' is the term used to describe several different but related concepts (see Sissenwine, this vol.). 'Governance' is used to describe social-political governing processes wherein public and private sector actors act in conjunction with each other, involving shared perceptions of the problems and solutions (Kooiman 1993). Fisheries governance is considered an important element in conservation (see Nauen, this vol.). As an example of governance in action, synergy has been demonstrated between community management and management by protected areas on coral reefs in the Philippines (see Alcala, this vol.). The science of fisheries resource and ecosystem assessment now faces new challenges to build better tools and integrate different scientific disciplines and to find a common language to assimilate the skills and approaches of actors in the governance process. The fisheries session also addressed the new conservation potential of consumer power and product certification. Independent small island developing countries which still depend so much on their marine and coastal resources were found to have special needs in the protection and use of these resources (see Adams, this vol.).

The fisheries session participants concluded that nine issues and actions were appropriate for IUCN to consider. All but the first issue arose from the structured discussion of the

session. The first issue arose from the 1996 red-listing of several commercial marine species. The nine issues and actions for IUCN are:

1. *Listing of marine species by the Species Survival Commission*

   The session considered this issue which was made topical by the recent red listing of several marine fisheries species by the Species Survival Commission (SSC) of IUCN. All present appreciated the conservation and commercial value of the listing process but some expressed concern at the process. The new criteria and their method of application to some marine fish seemed to lack an appreciation of fish population dynamics. Fisheries scientists studying the listed species were not closely involved in the considerations of the species recently listed. The scientific credibility of the SSC procedure should be upheld at all costs.

   Consequently, a resolution was agreed by participants at the fisheries session and passed to the WCC general assembly. The essential elements of the resolution were accepted, and included:

- Requests the SSC, within available resources, urgently to complete its review of the IUCN Red List Categories and Criteria, in an open and transparent manner, in consultation with relevant experts, to ensure the Criteria are effective indicators of risk of extinction across the broadest possible range of taxonomic categories, especially in relation to:
  a) marine species, particularly fish, taking into account the dynamic nature of marine ecosystems;
  b) species under active management programmes; and
  c) the time periods over which declines are measured.
- Urges the SSC to make users of the IUCN Red List of Threatened Animals more aware that the listings for some species of marine fish are based on criteria that may not be appropriate for assessing the risk of extinction for these species, and to indicate that the criteria are under review;

- Endorses the new programmatic initiatives being carried out by the SSC in fulfilment of the strategic plan, in particular:
  e) the development of a stronger specialist network on marine species and on the development of a more integrated approach to conservation of marine biodiversity ....

(WCC Resolutions and Recommendations, IUCN 1997, p. 7-8, Operational Paragraphs 5-7).

2. *Fisheries product certification and ecolabeling*

The fisheries session considered product certification and ecolabeling as interesting ideas, as illustrated by the proposed Marine Stewardship Council being formed by the Worldwide Fund for Nature and Unilever (see Sutton, this vol.). However, there is a wide range of implications in their application and many of these have yet to be better understood.

For example, significant parts of the overall fisheries conservation problem such as the transition costs of dealing with excess fishing capacity, will not be addressed by labeling. Due to the costs involved and the size and dispersed nature of the sectors, labeling could not be applied in many types of fisheries, especially small-scale fisheries.

Certification and labeling tend to shift the locus of fisheries management power from small-scale production to large-scale distribution interests and thus power may concentrate in a similar way in which it does in individual transferable quota management systems.

The fisheries session suggested that IUCN tread cautiously in applying the approach to fisheries and other sectors such as tourism due to possible unintended consequences in the small-scale segments of the sectors.

3. *Fisheries ecosystem management*

Papers by M. Sissenwine and J. Rice addressed fisheries and fisheries ecosystem analytical approaches. The session agreed that the lack of a fisheries ecosystem approach was not the reason for current fisheries conservation problems but that an ecosystem approach will be essential in the future given the extra pressures on fisheries including those from bycatch, multispecies fisheries, trophic interactions among fished stocks, shoreside development and the impacts of climate change over large areas of coast and ocean.

At least four different interpretations are presently distinguishable for the term 'fisheries ecosystem management': the application of ecological concepts to fisheries; extension of single species approaches to include other components of the ecosystem; integrated fisheries and environment policy and decisionmaking; and the large marine ecosystem (LME) approach.

If all approaches are developed further in parallel, there will likely be considerable convergence of the concepts over time.

IUCN could play a bridging role in bringing high-powered fisheries science approaches and tools together with other forms of knowledge to empower stakeholders in fisheries ecosystem management approaches, especially in developing countries. In so doing, IUCN should incorporate elements of science quality control and encourage the further

development of existing fisheries ecosystem approaches to the stage of providing useable tools for fisheries conservation decisions.

The IUCN Commission of Ecosystem Management could perhaps play a role in this, provided it incorporated fisheries management expertise.

4. *Marine protected areas*

The fisheries session strongly supported the IUCN, through its Commission on National Parks and Protected Areas (including marine protected areas (MPA)) in facilitating the setting up of MPAs both for the enhancement of fisheries resources in nearby areas and the protection or re-establishment of *threatened species*. It was further noted that:

- In developing countries, such MPAs can be a strong focus for community fishery management measures, and should involve the full cooperation of communities, with legal ownership and oversight considerations taken into account;
- MPAs should not be considered a panacea, or the only measure available, for the maintenance of fisheries;
- Further attention needs to be paid towards evaluating the effectiveness of MPAs in sustaining fisheries for different groups of organisms, and in different societal structures, and in translating experiences between developed and developing countries in both directions, and from tropical to temperate fisheries. Most successful fisheries examples for MPAs are from the tropics and the fisheries session noted that these successes could not be automatically extrapolated to temperate fisheries. Even in tropical countries, care should be taken to ensure that MPAs were given sufficient time to re-establish viable fish stocks. This takes at least four to five years and could take as long as 10 years.
- There is a danger inherent in uncritically applying MPAs without taking the above considerations into account, and of failure in discrediting MPAs as a mechanism for fisheries conservation.
- Research should be done as suggested above but decision-makers should not wait for the results before establishing more MPAs since MPAs represent a precautionary approach to management.

5. *Small-scale fisheries*

All countries have important small-scale fisheries, not just developing countries although these may have special needs (see Nauen, Adams, this vol.).

In determining its fisheries conservation priorities, IUCN should consider giving priority to geographic areas where fisheries provide a high percentage of local livelihoods and where the sustainability of artisanal fisheries is important. This will necessitate some focus on small islands. For small islands, the special problems of the carrying capacity of the land and coastal resource base is a critical issue which IUCN could lead in having assessed.

IUCN is urged to recognize the human dimension in small-scale fisheries conservation. This would mean using people's interests, especially those of women and children, as a door into management of resources. IUCN should also recognize the importance of fisheries to nutrition, health and livelihoods of households dependent on small-scale fisheries.

In its approaches, IUCN could ensure that traditional forms of fishing gear are taken into account in management decisionmaking, and that the roles of women, children and of gleaning as well as fishing are recognized and taken into account.

6. *Human resource development*

Throughout the fisheries session, the importance of different people, their interests and capacities were considered critical to better fisheries conservation. Participants felt that this is a key area for IUCN attention, including but not exclusively through the Commission on Education and Communication. Discussions on artisanal fisheries, MPAs, developing country fisheries and small islands all stressed the critical need to address human resource capacity and development issues.

7. *Legitimacy of stakeholders*

IUCN has a good track record in terrestrial conservation in getting different stakeholders with different values and different goals together and keeping them at the table. A similar IUCN role should be given priority on marine issues, especially in fisheries and across all scales from industrial to artisanal. IUCN could bring to bear its array of tools in bringing stakeholders, including technical experts, together.

8. *Food and Agriculture Organization (FAO) and IUCN*

IUCN should establish formal and extra linkages to the Fisheries Division of FAO as the international, intergovernmental agency with prime carriage of fisheries issues. IUCN should formally attend such meeting as the biennial FAO Committee on Fisheries meeting.

9. *IUCN and the fisheries sector*

IUCN could continue the process started at this Marine and Coastal Workshop in involving the fisheries sectoral experts (fishers, fisheries managers and fisheries scientists) in future activities.

Conclusion

If fisheries management adopts the new precautionary approach, better fisheries conservation is expected to follow.

The new paradigm would replace previous fisheries management paradigms including those of 'the inexhaustible seas', burden of proof on managers and scientists, the ultimate dissipation of rent as more units enter a fishery (mid-20th century in the North Atlantic and from the mid-1980s to early 1990s elsewhere), and protracted debates over the status of stocks 'until all doubt is erased' (late 20th century, especially from the early 1990s).

The present era is such that public concern for fisheries is global. Areas such as the North Atlantic have been intensely fished for much longer than is the case for many other regions where the 1982 UN Convention on the Law of the Sea opened the way for economic zones and prompted the last great expansions of fishing. Over the last several decades, conservation

concerns developed but with only a limited focus on fisheries and with little engagement on the mainstream fisheries interests. Now, a broad range of fisheries conservation issues receive public attention, including bycatch, biodiversity, habitat degradation, the effects of fishing on the environment and multispecies interactions. In addition to fishers, fisheries managers and fisheries scientists, others with different ideas, consumer power and potent advocacy skills are participating in public debate and action. IUCN has a role in promoting fisheries conservation as an integral part of marine and coastal conservation in this new era.

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Workshop Papers

Future Paths for Fisheries and Conservation*

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WILLIAMS, M.J. 1998. Future paths for fisheries and conservation, p. 2-12. *In* M.J. Williams (ed.) A roadmap for the future for fisheries and conservation. ICLARM Conf. Proc. 56, 58 p.

ABSTRACT

The recent history of public concern with fisheries is divided into three periods. In the first period to the early 1980s, wild fish stocks were regarded as nature's bounty for harvesting and only of concern to artisanal, recreational and commercial fishers, dependent communities, and an emerging cadre of professional managers and scientists. The 1980s was a short second period. The concept of sustainable yield was applied to a wide range of fisheries. The United Nations Convention on the Law of the Sea opened the way for economic zones and for nations to assume responsibility for offshore fish stocks and other marine resources. Conservation concerns developed but with only a limited focus on fisheries and with little engagement with the mainstream fisheries interests. The third period started in the early 1990s. A broad range of conservation issues received public attention. In addition to fishers, fishery managers and fishery scientists, others with different ideas, consumer power and potent advocacy skills are participating in public debate and action.

The new era for fisheries can be characterized as multi-level because it involves local, national, regional and global issues, and multipolar because of the range of public actors who will be focal actors. Several of the actors on fishery issues are building coalitions, but those alliances overlap, shift and split. The focus of attention must also shift to include the developing world, which now produces the majority of the world's fish. The new era invites elaboration of routes now thought to raise some prospects for better fisheries conservation against the mounting population and environmental pressures.

INTRODUCTION

Welcome to a new era, in which fisheries are firmly on the conservation agenda and conservation is the biggest issue on the fisheries' agenda!

I want to use this workshop at the World Conservation Congress — itself a signal of the new era in fisheries management — to argue that this era forces all of us to approach the question of sustainable use of marine resources, including fisheries, in new ways. The simple roadmaps or strategies of yesterday will not suffice and tomorrow's will need to be drafted with more subtlety and greater attention to complexity and uncertainty, involving a greater number of people given a greater number of choices.

Wild fish stocks are among the last major renewable natural resource to be exploited widely for food and other economic ends. Conserving fisheries resources and their habitats for sustainable production ought to be the common concern of fisheries and conservation interests. Given the setting in which fisheries operate locally, nationally and globally, such simple alignments of interests cannot be assumed. Fisheries resource conservation is not bounded by

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simple sets of values such as sustainable yields, or local and national responsibilities, and especially not by the bounds of fisheries sectoral interests. Fisheries resource conservation needs to be addressed in ways that recognize the influences operating.

I am a fisheries professional — I have worked as a fisheries scientist and as a fisheries manager, and I now head the International Center for Living Aquatic Resources Management (ICLARM). My message is therefore directed especially to other fisheries professionals: fishers, fisheries scientists and fisheries managers.

I have divided my argument into three parts. First, I will review the history of public concern for fisheries and chart the rise of attention to conservation issues in fisheries. I will argue that conservation and fisheries issues must converge. Second, I will outline major features of the multilevel and multipolar setting of the new era. In so doing, I will sketch the outline of the roadmap that we — fishers, managers, conservationists and researchers — need to adopt in the new area. Finally, I will preview issues that will be raised in the fisheries workshop session.

HISTORICAL REVIEW

At the risk of over-simplification I divide the history of public concern with fisheries into just three periods:

1. up to 1982, when fisheries were chiefly thought of as a subject for management, and appreciation was gradually spreading throughout the world that fishery species needed to be conserved;
2. from 1982 to 1994 when concerns about conserving fishery species fully emerged; and
3. post-1994, the new era in which fisheries have become a public issue.

First period. In the first period, pre-1982, human population growth and industrialized fishery harvesting methods became significant influences on aquatic species. Natural rises and falls in fishery stocks affected people relying on them. For example, historic fluctuations in the Baltic Sea herring stock affected the economic and political development of northern Europe. Similarly, the collapse of the anchovy stock in the 1960s changed the way of life of many South Americans.

Concerns about how to exploit and who should exploit fisheries dominated this first period. More sophisticated industrial technology gave fishers more and better ways to get to their quarry, find, harvest and process it, and deliver it to consumers. Large factory trawlers are the outstanding example of the application of industrial technology. More sophisticated social organization contributed to the industrial and intellectual base that supported fishers, commercial entities that financed new fishing technology, and markets that changed fishing from a subsistence to a cash activity. More sophisticated societies ensured that fishers were more liable to government taxes and to statistics gathering. Technological advances were uneven and governments used their economic and military might to enforce the right of their fishers to harvest from, in some cases, quite distant fishing grounds.

Differences in technology helped mark the distinction between the developed industrial fishery nations and the fishing effort of developing countries. Fishing in foreign waters emerged as national borders, not just might, were recognized (e.g., the different attitude of Macassan fishers in Australian waters before European settlement vs. Japanese fishers paying for the right to fish in Australian waters after 1979, after extensive intergovernmental negotiations). International trade in fishery products, which has a long history, increased in sophistication, volume and value. Rising incomes and new transport methods brought highly

perishable and exotic fisheries products, including live organisms, within the reach of more consumers.

Population growth and industrial development had other impacts, including adding big volumes of nutrients (e.g., sewage, agricultural fertilizers, high phosphate detergents) and toxins (e.g., heavy metals) to aquatic habitats. Industrial and household pollution also emerged as issues concerning fishers, governments and some communities (e.g., the role of Minimata disease in changing local Japanese politics).

Concepts about fisheries changed because of the technological changes. Nature's bounty was thought of in terms of stocks with identified breeding cycles, migratory patterns, population numbers, natural predators, recruitment rates and historical harvest statistics.

Apart from wars and pollution crises, fisheries were of routine concern only to artisanal, commercial and recreational fishers, a few local communities and societies that depended on their local fisheries in a big way, and an emerging cadre of professional managers and scientists. Fisheries were not of general concern to the public in the developed or developing worlds.

As another sign of the times, ICLARM was established in the mid-1970s and set up its headquarters in the Philippines in 1977. ICLARM's mandate was for research and related activities to assist in living aquatic resources management in the developing world. It was the first institute of its type and, at the time, its mandate was interpreted in terms of fisheries and aquaculture efforts. Its pioneering portfolio also included economic and sociological studies on topics of importance to small-scale fishers and farmers.

Late in the first period, the fate of great whales, some other aquatic mammals and turtles, did emerge as an issue for an increasing segment of the public in the richer industrialized nations. As whaling was stopped in more countries, whaling matters were transferred to conservation departments and out of the fisheries departments. But the public in the developed world was just as interested in game fishing, celebrity game fishers (e.g., Teddy Roosevelt, Zane Grey) and the great sharks (e.g., Robert Benchley's *Jaws*).

The peak of conservation concerns relating to fishing was the World Conservation Strategy of 1980. The strategy touched on fisheries. It examined the fisheries situation and made general recommendations for sustainably utilizing all living resources, including fisheries. The strategy focused its concern on the state of resources in developed nations, many of which were at the time known to be exploited fully while a few were overexploited.

Second period. The 1982 United Nations Convention on the Law of the Sea (UNCLOS III) heralded the second period. UNCLOS radically changed the map of the world, opening the way for coastal states to declare 200 nm economic zones and assume responsibilities for offshore fish stock and other marine resources and services such as shipping routes. UNCLOS also helped stimulate the last great search for new fisheries resources in the new economic zones and on the adjacent high seas, and an upsurge in fishing effort worldwide.

The second period also saw the further growth of managerialism as a way of handling concerns about fishery stocks. Many nations developed laws and regulations to make fishery resources a public property, to be managed by the government. UNCLOS gave big new management responsibilities to national governments. Fishery professionals clung to the concept of sustainable yield, developed it for a wider range of fisheries, and sought to use it across the range of freshly exploited to depleted stocks. Armed with that idea, government managers based their activity on the principle of conserv-

ing the resource base, with secondary considerations for economic efficiency, equity and other social goals. Reconciling the goals or establishing a suitable hierarchy among them was often a problem. In many cases, fishers enjoyed special status, with controlled or open access to exploit the resource in return for paying fees or resource rent to government.

The 1984 World Conference on Fisheries Management and Development approved a strategy to improve national capabilities in fisheries to match the new responsibilities and opportunities under UNCLOS. The overall emphasis was on countries making the most of their newly claimed resources. Conservation concerns were only expressed in terms of rational utilization of resources, with reference to environmental quality.

Developments in the early 1990s fleshed out the concerns of the second period and prepared the way for the third period. These developments combined managerial concerns, such as sustainable yield, with environmental concerns. Fisheries production peaked in the developed/industrialized countries in 1988 at 45.8 million mt and had declined gradually to 34.4 million mt by 1993. The largest declines were in the former Union of Soviet Socialist Republic (USSR) and Eastern Europe. Developing country production rose throughout the whole period.

Meanwhile, the Report of the Brundtland Commission on Sustainable Development (1987) and Caring for the Earth (IUCN/UNEP/WWF 1991) included a focus on fisheries as a conservation issue, but with limited participation by actors from the fisheries sector.

The 1992 United Nations Conference on Environment and Development (UNCED) formulated the latest and most comprehensive prescription for environmentally sustainable development (Agenda 21). It had a chapter devoted to coastal resources (Chapter 17) but public attention at the time focused more on the Climate Change Convention and the International Convention on Biological Diversity. Fishery sector actors were engaged more fully on the international stage, led by the Food and Agriculture Organization (FAO).

A 1992 FAO report (FAO 1992) on the state of the world's marine fisheries drew attention to the (then) peak in world fish production and the exploitation status of world fish stocks. It presented statistics on fishery stocks. But, its conclusions remained off the public agenda, only an issue for professionals — or so it seemed for a few months.

Conservation concerns developed in this second period, but their focus was peripheral to most fishers. The public in the rich industrialized nations soon learned about marine pollution and habitat destruction. But they still regarded most aquatic species as fair game whose fate was to provide pearls, tuna sandwiches, 'shrimp on the barbie', caviar, bêche-de-mer, and calamari.

From the early start with concerns about the great whales, the public in some developed nations focused on the need to stop the whaling effort of other nations and to stop fishers killing the dolphins that preyed on the fisher's quarry. Conservationists found they had to refine their arguments, for instance in dealing with the issue of traditional hunting rights of aboriginal fishers (e.g., the Inuit and whaling, aboriginal and Pacific islander Australians and dugong). Shore and migratory birds had their lobby, a natural extension of terrestrial bird lovers. Harvesting and trade in reef corals and some mollusks emerged as an issue, but other invertebrates and fishes were still regarded as nature's bounty and fair game for all.

Third period. The mass media of the developed world heralded the start of the third period with headlines given in early 1994 to marine fisheries issues. The headlines sprang from

a UN meeting to negotiate international agreement on high seas fisheries, covering migratory species and stocks that straddle national borders. Nongovernment organizations (NGO) on conservation used the opportunity to highlight the conclusions of the 1992 FAO report. Respected news weeklies such as *Time* and *The Economist* put the conservationist concerns about marine fisheries on their covers, bringing fisheries onto the public agenda. Fishery professionals and conservationists were in general agreement about what contributed to depleted fishery stocks (see Box), but without agreeing on what needed to be done.

More international development agencies in more nations are supporting projects in coastal resource management and communities that serve as bases for fisheries. Such an approach was formerly used for forest and upland communities. Project discussions now frequently adopt the general term 'alternative livelihoods' as assistance agencies strive to reduce reliance on pressured resources.

Contributors to depleted fishery stocks

- increased fishing capacity, especially due to greater technical power;
- increasing population numbers, especially in developing countries, with more people wanting to become fishers and a growing demand for fish and all foods;
- strengthening market demand for fish, because of growing affluence and awareness of health benefits from eating fish;
- rising prices for fish worldwide, motivating people to fish even when fish stocks are in decline;
- decreased carrying capacity of the marine environment, especially inshore, because of pollution and habitat degradation; and
- increased competition for fisheries resources and the marine habitat, including the rise of demands for coastal housing and leisure facilities, and for feed for aquaculture.

By this period, ICLARM was living up to its name and was undertaking research for living aquatic resources management. It had taken a comprehensive and systems approach to fisheries and aquatic issues, studying the biology, technology, sociology, economics and policies. In the early 1990s, ICLARM broadened its work and ventured into ecosystems, resource systems, environmental and human development domains as a step toward encompassing the many influences on the sector.

Following UNCED and partly in recognition of the conservation problems in fisheries, FAO led the development of the 1995 Code of Conduct for Responsible Fisheries to add substance to Chapter 17. At the 1995 Kyoto Conference on Sustainable Contribution of Fisheries to Food Security, national conservation including government whaling officials attended along with their fisheries colleagues. Several international conservation NGO and intergovernmental bodies were also represented. Broad conservation interests have therefore started to be heard in mainstream fisheries forums.

Fisheries have remained on the mainstream conservation agenda. Public expressions of alarm over the condition of fisheries are no longer rare. While the public have not embraced other single aquatic species with the sympathy displayed for the great whales, a broad range of concerns have emerged as the public's sophistication has increased. The environmental issues receiving attention has widened to include biodiversity and climate change. The focus on single species has been displaced as community attitudes toward exploiting flora and fauna have changed.

Changes in fish production complicate the new era. A major transition from hunting to farming fish is occurring in many parts of the world, driven by high demand, good profits and new technology. Aquaculture raises new fisheries and conservation concerns.

Fisheries and conservation agendas are now converging, as they must because they deal with an interlocked set of issues.

TOWARDS A NEW ROADMAP

Fishers, fishery managers and fishery biologists have had a common interest in sustaining yields, without necessarily agreeing on what the level of yields ought to be and how to achieve it. But fishers have long had other conservation concerns not addressed by fishery managers. The quality of the environment is an example. Governments have handled such issues separately from fishing, delegating the task to, for instance, the nonfishery professionals dealing with general environmental matters. In other words, the quality of the ecosystem that included a fishery was not a 'fishery' issue. That situation suited many fishery managers, particularly while they believed that sustainable yields were possible and while they collected data and formulated regimes of restricted access and catch quotas.

The rise of conservation concerns in fisheries has changed the situation. From a narrow focus on sustaining yields, 'fishery' issues are now broader, more diverse and more numerous (see Box). The outcome of fishery issues is also less predictable. The changes are inescapable, the result of involving more people with their diverse interests, different ideas and a range of potent advocacy skills.

Even though we are in the early days of this new, less predictable era, general features are already emerging.

First, simple models of win-lose games are inadequate to describe the emerging multilevel, multipolar situation. By multilevel, I mean that the public concerns for fisheries involve local, national, regional and global issues. Fishery issues will appear separately or simultaneously in such arenas as local politics, domestic politics and economics, food security and international trade.

I use multipolar to refer to the many more actors who will be focal actors for fishery issues. To the three traditional actors — fishers, fishery biologists and fishery managers — we

Conservation concerns and fisheries

- **environment**
  - — quality of coastal ecosystems (terrestrial, freshwater and marine) affecting and affected by fisheries
  - — biodiversity at genetic, species and ecosystem levels
  - — pollutants in the marine foodweb
  - — impact of aquaculture and stock enhancement on marine resources
  - — impact of climate change
  - — impact of species introductions, including through ships' ballast water and aquaculture
  - — increasing frequency of pathological episodes such as red tides, and cholera
  - — impact of fishing on the habitat
- **resource sustainability**
  - — safe levels of exploitation
  - — species and ecosystem conservation including listing of endangered species
- **fishing practices**
  - — fisheries bycatch
  - — aquaculture effluent
  - — animal welfare
  - — protected species
- **social and economic impact**
  - — the welfare of people, especially indigenous people, relying on the resource
  - — the welfare of the people whose land and water resources are taken over by aquaculture
  - — the impact of trade on resources
  - — social, political and even military conflict generated by competition for access to scarce resources
- **human development and welfare impact**
  - — food security and access to adequate protein for basic nutritional needs
  - — livelihood change because of change in fisheries and aquaculture
  - — loss of cultural identity because of loss of traditionally used species

now see the addition of consumer groups, broad-spectrum conservation activists, narrow-interest or one-species conservation activists, farmers, the aquaculture industry, local government, community interests, shipping lines, port authorities, conservation biologists, philosophers, regional economic groupings, international organizations and more. Different issues bring opportunities for each of these players to be the focus for public debate about fisheries.

Second, not all fisheries now draw public attention, but that is not guaranteed in the future. Fisheries that withstand harvesting pressure, whether naturally or because they respond to (or are indifferent to) the efforts of managers, have so far remained the property of their traditional stakeholders: fishers, fisheries managers and fisheries scientists. But apparent management failure and controversy over catching methods have lodged other fisheries firmly under the public scrutiny.

I suspect that even the most robust fisheries will not remain off the public agenda for long. The marine shrimp fishery in Australia's Gulf of Carpentaria is an example. It is a well-managed fishery that has achieved sustainable yield for shrimps and is remote from major population centers and the mass media. Most fishers, fishery managers and the local community of the fishing port are happy with the access regime. But in the new multilevel and multipolar era, that is not enough. Other levels and other actors are now involved: international pressures and broad-spectrum conservationists. The fishery is now under public scrutiny, because of its trawling methods — the issue of bycatch and the effect of trawling on the environment.

Third, coalitions and alliances are being built, but they overlap, shift and split, depending on the issue in question or the method of addressing it. Fishers have found common interest with other folk exploiting natural resources, such as terrestrial farmers and forest workers. These groups have found much in common with respect to learning how to deal with governments, banks, markets and critics based in cities.

But fishers are also finding issues, such as the quality of the coastal environment, where their allies are conservationists with broad interests about the management of coastal ecosystems, and farmers, loggers and agricultural runoff are parts of the problem. Fishers' organizations in many countries have been more vocal than fisheries managers and fisheries scientists on the environmental quality issue.

This new alliance has been beneficial to both fishers and conservationists. Fishers have found allies among conservationists, gaining new ideas and skills in dealing with the media and the political system. Conservationists with broad concerns for the environment have learned that they can use the tangible effect of environmental degradation on fisheries as a lever to get governments to work to protect the environment.

Fourth, the focus of fisheries conservation must shift to include the developing world, because this is where the majority of the world's fish is produced. In 1993, the developing world produced 65.5% of world fisheries production, including 85% of the world aquaculture production. Aquaculture promises big benefits and concerns in developing countries where production increases are bigger than those in developed countries.

The forests conservation debate broadened, from concerns about the spotted owl and loggers in Washington (USA) to include forestry practices and forest dwellers in the Amazon, Indonesia and Solomon Islands. Now, the fisheries conservation debate is shifting to include the plight of poor fishers and environmentally damaging fishing practices such as muri-ami, dynamite and cyanide fishing on Philippine coral

reefs; the international trade in seahorses, sea cucumbers, giant clams and live reef fish; the farming of shrimps in coastal wetlands; and the effect on large marine turtles of trawling for shrimp.

Fisheries in the developing world are susceptible to many forms of influence from the developed world. Markets, economic and trade sanctions can influence resource exploitation because fishery products are among the most highly traded food commodities. Consumers, especially but not only in the developed world, with strong purchasing power can produce huge economic incentives for overexploitation of highly prized species. Conversely, the governments of big fish-importing nations have the option to impose import regimes on fisheries that do not reach their standards.

Note, however, that governments and consumers have very different natures. Governments can and will develop their national agendas to maximize advantage or counter the international policies of other nations, but the decisions of consumers are outside government control. Fruther, the World Trade Organization and other international bodies and agreements restrict government intervention in international trade. Once they have taken a stand, consumers are somewhat beyond the power of governments and international agreements, so that their decision to boycott or purchase a product may be difficult to reverse even for protected resources. The strengths of markets for some goods rival that for illegal drugs and arms, regardless of trade restrictions imposed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) for products such as giant clams and turtle shell.

Overseas development assistance is another important vehicle by which developed nations can have impacts on the direction of fisheries conservation. Many development agencies, government and nongovernment, are re-examining the type of assistance which best meets sustainability objectives.

The older established order in fisheries — the order represented by fishers, government fishery managers and fishery biologists — is facing change to cope with the new era. Fishery professionals are asking themselves if they need an entirely new approach to fisheries management or if their current approach can be modified and expanded. Government fisheries agencies argue for adaptation of the present approaches. Academic and nongovernment organizations often argue for completely new approaches. Fishers, dependent on short-term economic returns from fishing, can seldom afford to take a new approach until it is too late and stocks are seriously depleted.

Fishers are also wary of public attention and massive change. They fear that conservationists will propose more extreme access regimes than professional managers. An example is listing a fishery species as an endangered species, a move that brings public attention and restricts trade. Professional fishery managers have been reluctant to adopt such a course of action. In contrast, conservation biologists have a track record of listing species, including recommendations to list a number of freshwater fish. Certain conservation interests have already asked governments to list particular overexploited marine species. To date the evidence has not supported such requests, but this will change with time and new evidence.

Whatever fishery professionals do, in terms of new approaches or modifying their existing managerial approach, change seems inevitable. A simple outline or roadmap of the changes they must adopt is apparent:

First, stakeholders need to take multilevel and multipolar approaches. This translates to taking action at several levels (local, national, regional, global) and taking a multipolar

approach by including and interacting with other participants.

Conservation NGO have adopted such approaches over the past few decades in their work on terrestrial issues. More recently, they have used those approaches as they have considered issues in fisheries. For fishery professionals, however, multilevel and multipolar approaches are still novel.

An example of not taking a multilevel, multipolar approach and the unintended consequences forthcoming will clarify my argument. The Government of the USA recently moved to restrict the import of shrimp from nations where fishers trawl without using turtle exclusion devices (TED). Among the early reactions were those of Thailand and the Philippines, which claimed that the big majority of their shrimp production was from aquaculture, so import restrictions should not be applied to them. That suggests the USA import restrictions may spark a further rush to shrimp aquaculture and not a rush to fit trawlers with TED. The unintended consequence could be greater harm as mangroves and other coastal sites are cleared for aquaculture ponds and coastal habitats are left to cope with the nutrient load and disease byproducts of intensive aquaculture.

ICLARM adopted a multilevel and multipolar approach to research the culture and restocking of giant clams. The several species of giant clam, but particularly the largest, *Tridacna gigas*, had been overfished throughout most of their range and are locally extinct in some parts. ICLARM's studies, centered in the Pacific, first tackled the technical side of reliably raising clams of all species in the hatchery. Village growout trials throughout the Solomon Islands identified sites and husbandry practices to ensure a high survival. The studies showed that the clams remained vulnerable to many predators for at least their first three years of life and survival was low unless they were protected during this period. We concluded that restocking was going to be unaffordable and ineffective unless it was carried out in conjunction with a farming program which also provided reasonable economic returns along the way. The project therefore has a multipolar aspect, requiring commercial, conservation and scientific collaboration.

Farming giant clams has its own problems. The most lucrative market, for the adductor muscle of adult clams, provides cash only when clams are above seven years old. However, early and continuous returns are needed for farmers to protect young clams. Short-term cash flow is now being provided by selling small, live clams for the home aquarium market in North America and Europe. Markets for juvenile clams for sashimi and for shell products are being developed. These varied markets have broadened the levels of interaction to involve many actors, including: village clam growers; villagers sharing marine tenure with the growers; hatchery operators; government fisheries officials; researchers; international aquarium traders; the organs overseeing CITES; national agencies empowered to grant export permits under the International Convention on Biological Diversity and biosafety regulations; and buyers. The multilevel aspect of this conservation and industry development exercise is quite apparent.

The move by the Worldwide Fund for Nature and Unilever toward labeling product coming from sustainable fisheries adds levels and poles to conservation approaches in fisheries. Consumer advocacy (e.g., 'dolphin-friendly tuna' and other proposals to label fishery product to indicate how it was harvested) has turned fish consumers into active participants. The effectiveness of these approaches as fisheries conservation measures have yet to be measured against more traditional managerial approaches. Nevertheless, I expect that labeling will achieve some success in the near future. In the meantime, consumer awareness has been awakened.

Second, actors will nevertheless resort to confrontation to gain the influence that comes from being the focus of public attention. Marginalized actors, disempowered by the prevailing system, have always relied on confrontation to get attention. Many actors realize that they need to inject new ideas into the public, to educate them. But they do not have the time and resources for patiently educating the public, such as making urban school children aware of the great whales. Confrontation wins headlines and, at least sometimes, influence.

Third, good and properly communicated information on people, the resource, the environment and the economics of fisheries will be necessary though not sufficient to ensure sustainability. Natural resource managers, including fisheries managers, are adopting comprehensive resource management plans. Such plans, though not adequate in their own right to ensure conservation, do provide integrity, a language and a focus for the different actors. Comprehensive resource management plans also help identify gaps and priorities for action. Clear objectives will allow the future performance of these plans to be measured. Scientific and policy research in all disciplines will be needed more than ever and this will need to explode in quantity and coverage for the pressured aquatic areas in the developing world which are now the source of more than half of the world's fish.

Fourth, despite many fisheries stocks, fisheries ecosystems and the communities depending on them are going to be pushed to the brink. Recent history holds many examples demonstrating that resource scarcity provides a bigger impetus to change than patient, rational foresight. Even with foresight, proposing measures for restructuring fishing pressure, such as cutting vessel capacity by 50%, will likely not be enough. Such measures are difficult to implement, because of political and economic pressures. Even if such measures were implemented and enforceable, the vagaries of wildlife systems — not fully predictable with the current state of our knowledge — would prevail. We can therefore expect certain species to be driven to the brink of extinction and ecosystems to continue to suffer severe damage.

WORKSHOP ISSUES

The fisheries session will focus on people and the developing world where fisheries conservation is often a mainstay of food security. To explore the roadmap for the new era, the fisheries sessions of the Marine and Coastal Workshop will address:

- marine protected areas: under what circumstances are they an effective panacea for fisheries resource conservation:
- community-based fisheries management: is this a useful approach to greater resource management responsibility and accountability?
- fisheries ecosystem management: what is it and will it provide better approaches than single-species or gear-based management?
- fisheries and environmental science: can analytical models be reconciled and to what extent?
- small island states: what special problems face their citizens when they depend heavily on the resources of the sea?
- fisheries development: what is the latest thinking and why were changes needed?
- power: where is it wielded when fisheries are international affairs, controlled by trade, consumers, commercial fishers and various advocates remote from the resource base and local people and their government agencies?

The second factor was the perceived inability of governments at the local and national levels to stop the destruction of the marine ecosystems which provide direct ecological support to fisheries. For example, the destructive effect of the muro-ami fishing method on stony corals was reported to fishery authorities as early as the mid-1970s but was not banned until the early 1990s.

The third factor was the relative success of development projects in which local communities participated. This was in contrast to the failure of projects to involve the people in activities intended to improve their socioeconomic welfare. Ferrer (1992) discussed the reasons for the failure of earlier community development efforts. An example of a failed project is the Natural Resources Management Center (NRMC) Project for the establishment of protected coral reef areas to be regulated by the government. The approach can be described as a top-down, resource-oriented approach with no community participation. The basis for management was a plan prepared by technical teams to be implemented by the government without the involvement of the stakeholders of the resource. The NRMC project did not work; and reef areas designated as marine parks/reserves continued to be ravaged by fishers and other reef users employing destructive extractive methods.

The 1980s saw the rapid acceptance of the community approach to coastal resource management, especially by nongovernment organizations (NGO) and academic institutions (Ferrer et al. 1996). Government agencies, in contrast, were slow to recognize and adopt it, with the exception of the Central Visayas Regional Project, which employed community organizers to gain community support. To date, a number of successful community-based coastal resource management (CBCRM) projects have been established throughout the country by the private sector and local government units. Two national government programs, the Fisheries Sector Program (started in 1990) and the Coastal Environment Program (initiated in 1993), incorporated community participation.

MARINE RESERVES

Marine reserves, the areas of the marine environment protected from various forms of exploitation, are a key element of today's CBCRM projects in the country. Almost all CBCRM projects include a provision for the establishment of marine reserves as a strategy to allow recovery of the environment, e.g., mangroves, coral reefs and the resource, e.g., fish (Ferrer et al. 1996). The potential use of marine reserves in the management of coral reef fisheries, for example, includes the protection of a critical stock biomass to ensure recruitment supply to areas that are fished through larval dispersal and to maintain enhanced fish yields to areas adjacent to reserves through movements of adult fish (Russ and Alcala 1996). The establishment of reserves as part of CBCRM would, therefore, appear attractive to stakeholder communities.

The results of experiments and observations relating to the coral reef fisheries (reserve and nonreserve) on two islands, Sumilon and Apo, in central Philippines over the past 20 years (Alcala 1981; Alcala and Luchavez 1981; Alcala and Russ 1990; Russ and Alcala 1994, 1996) will be briefly discussed here. Sumilon has an area of 23 ha and is surrounded by a 50-ha coral reef, of which 25% is a reserve. Apo has a land area of 70 ha and a coral reef area of 100 ha, of which 10% is a reserve. A reserve is an area where there is no exploitation of resources. In Sumilon and Apo, no fishing is allowed in the reserves (Fig. 1). However, about 100 fishers using conventional gear are allowed to fish in the nonreserve area of Sumilon and about

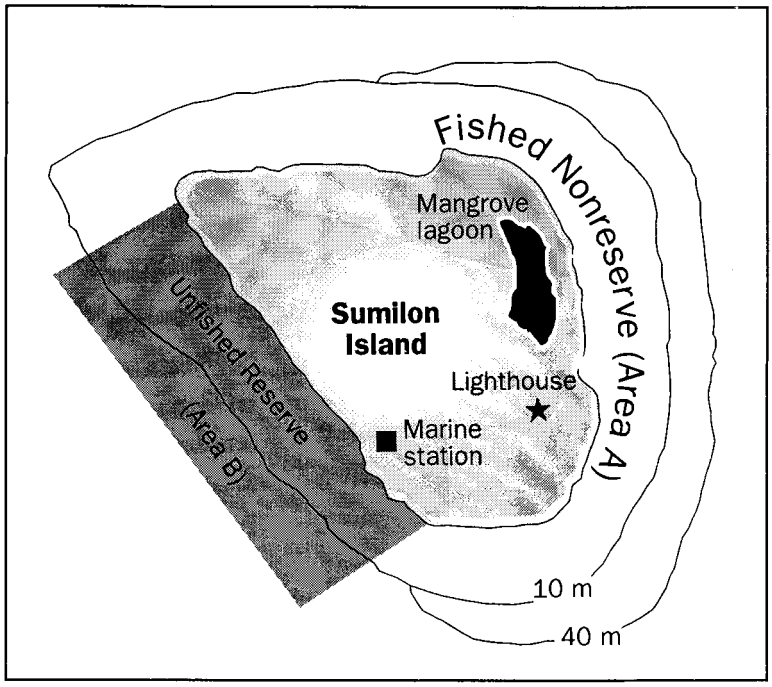

Fig. 1. Map of the Sumilon Marine Reserve, Central Visayas, Philippines.

200 fishers in the Apo nonreserve area.

At the Sumilon reserve, coral reef fishes were found in larger numbers (abundance) and in greater variety (species richness) than in the nonreserve area after a few (two to five) to several (five to ten) years of protection, depending on the species. The large numbers of fish in the reserve ensured the maintenance of a critical spawning biomass that was a guard against recruitment overfishing (Bohnsack 1993).

Another finding was that the quantity of fish caught from the nonreserve area increased steadily during the period that the reserve was protected. For example, fish yields from traps increased from 9.7 $t \cdot km^2 \cdot year^{-1}$ in 1976 to 14.0 in 1977, 15.0 in 1978, 16.8 in 1979 to 14.4 in 1980 and 16.8 in 1983-1984. When protection stopped and fishing was allowed in both reserve and nonreserve areas in 1984-1985, the fish yield from traps declined to 11.2 $t \cdot km^2 \cdot year^{-1}$. The total yield from three traditional types of fishing gear (traps, gill nets and hand lines) declined by 54%. Between 1983-1984 and 1985-1986, the catch-per-unit-effort declined by 57% for hand lines, 58% for gill nets and 33% for traps.

Fish abundance in the reserve was also reduced after protection was lifted. When protection of the reserve was restored, fish abundance again increased.

During periods of protection, fish in the reserve move out to the nonreserve area, where they are caught. Larger numbers of fish in the reserve would mean more fish moving. Our evidence for this 'spillover' effect can be summarized as follows:

At Sumilon Marine Reserve, there was a significant decline in catch rates and total catch for coral reef fish after the reserve which had been protected for 10 years was heavily fished, suggesting movement of adult fish from the reserve to the adjacent fished area. This movement enhanced fisheries yield (Alcala 1981; Alcala and Russ 1990). Visual underwater observation using SCUBA also showed caesionids moving out in the reserve. At Apo Marine Reserve, there was a significant positive correlation between density and species richness of

large predatory coral reef fish during the period of reserve protection in both the reserve and nonreserve areas. During a period of nine to eleven years of protection, there was a significantly higher density of coral reef fish in the area closest to the reserve (200-300 m).

In Japan, Yamasaki and Kuwahara (1990) provided evidence for the 'spillover' effect by demonstrating increased catch rates for snow crabs in a fished area surrounding a reserve which had been protected for five years.

The finding that fishers got more fish from 75% of the reef area during periods of protection than from 100% of the area when there was no protection appears contrary to common sense. Beverton and Holt (1957) provides a theoretical explanation for the higher yields during times of protection: at high levels of fishing mortality, as in the case of Sumilon, closing certain areas to fishing as a regulative measure can enhance yield per recruit.

Another result of establishing a reserve is that fish grow to larger sizes. Large-sized fish produce more eggs and larvae, which are carried by ocean currents to reef areas tens or hundreds of kilometers from their natal reefs (Bohnsack 1993). Evidence for this from our study has yet to be assembled, and no studies have yet been made to determine the effects of larval transport (Rowley 1994).

This brings us to the need for establishing networks of reserves (e.g., coral reefs, mangroves, seagrasses) if we are to prevent fishery collapse and protect marine biodiversity. Here we make use of the findings of marine biologists and oceanographers as a basis for the establishment of these reserves. (e.g., Leis 1984; Frith et al. 1986; Doherty and Williams 1988; Dolar and Alcala 1993). A marine reserve acts both as a source of fish larvae for export to other areas and as a recipient of larvae from upcurrent sources. These larvae settle down and metamorphose to juveniles and later to adults and contribute to the fish and the spawning stock of the recipient areas.

COMMUNITY-BASED COASTAL RESOURCE MANAGEMENT IN THE PHILIPPINES

CBCRM projects, as practiced in the Philippines, generally have the following components: (1) social preparation and community organizing; (2) environmental education and capacity building; (3) resource management planning, including protective management; (4) support activities for livelihood and financial resources mobilization; (5) research and monitoring; and (6) networking activities. The effort and duration of time allocated to these activities differ from project to project. In general, social preparation, community organizing and environmental education are given priority and importance in the early stages of project implementation. It is through these activities that a community is given the opportunity to identify its own needs and the problems it must solve to improve the socioeconomic well-being of the people through the cooperation of all its members. A result of community organizing is the formation of viable people's organizations, which would plan and implement identified development projects. So crucial is community organizing to the success of CBCRM projects that when this cannot be pursued because of serious conflicts (usually political in nature), project initiators have no alternative but to withdraw from the project area. Environmental education is also of the utmost importance during the early stages of CBCRM. The community needs to be convinced of the need to protect and manage their own resources. Ecological relationships and the role of a healthy environment in sustainable marine productivity need to be demonstrated to the community (Tiempo and Delfin 1991). The economic value of tropical ecosystems, such as coral reefs and

mangroves (Alcala 1981 and Russ 1991 for coral reef fish production; Turner 1991 for mangrove values), should be made known to the stakeholders of the resource.

The CBCRM approach requires at least one partner organization, which is usually an academic institution or an NGO. Partner organizations act as catalysts for development by providing initiative, direction, technical advice and funding. They serve as co-managers of projects. Since the goal of CBCRM is to empower and enable the communities to protect and manage their own resources, partner agencies have to withdraw from project areas after a certain period of time (Tiempo and Delfin 1991). The time frame required to complete the various CBCRM activities is usually two to three years, but often extends to four or five years. However, it is not unusual for partner organizations to maintain their links to the communities long after their withdraw.

During the past 20 years, there have been about 20 fisheries or coastal resource-related programs and projects that either incorporate various degrees of community participation or are fully community-based in character. Some of these were small projects, limited to specific localities, while others were large, being regional or national in coverage. Funding is provided by external agencies. Three were government programs, i.e., Central Visayas Regional Project, Fisheries Sector Program and Coastal Environment Program (Ferrer et al. 1996). Most of the small CBCRM projects have been initiated by either academic institutions or NGO, but have been conducted in cooperation or partnership with local government units. Only one project with a community component was directly under a town mayor — the Carbin Reef Marine Reserve in Sagay, Negros Occidental.

Newkirk and Rivera (1996) listed eight essential features of CBCRM based on the nine projects they reviewed. These are community participation, integration, partnership with government, institutionalization, capacity building, education, impact demonstration, livelihood improvement, conducive policy environment and power against poverty. This paper has adopted another set of criteria essential for the success of CBCRM projects. A highly successful community-based project may be characterized by the establishment of (1) viable organization or organizations in the community; (2) a working marine reserve protected by the community; (3) sources of livelihood based on coastal (fishery) resources; (4) networking arrangements with government and international agencies and NGO; and (5) a capacity-building program. These criteria should ensure the sustainability of projects.

Based on these criteria, it may be asked what proportion of the 20 CBCRM projects and programs can be considered successful. As they have not been formally evaluated, a rough estimate would put the success rate at about 50%. The author's experience in CBCRM indicates that one of three or four projects would end in failure. Although not all community-based projects have been successful (Ferrer et al. 1996), the most successful projects are community-based. There is always a certain probability of failure, as the CBCRM approach is dependent on a number of social factors that are difficult to control. Furthermore, as pointed out by Scura et al. (1992), there are a number of prerequisites to successful CBCRM, including the existence of a legislative framework and the acquisition of organizational and technical skills by communities.

The critical role of community and partner organizations in the management and protection of coastal ecosystems and fisheries has been widely recognized by governments and multilateral agencies. CBCRM has, therefore, become a popular strategy to address the issue of depletion of open-access resources, such as

fisheries. These resources, unlike most land resources, are not covered by appropriate tenurial instruments as a legal basis of ownership. This is especially true of coral reefs. Mangroves are now leased under a certificate of stewardship for 25 years, renewable for another 25 years. Under the open-access situation, there are no property rights, only possession or actual use. This has been blamed for the unrestricted exploitation of fisheries, resulting in resource depletion. What CBCRM provides to resource users or stakeholders is the sense of being proprietors and claimants of a resource (Walters 1994).

In brief, for coastal communities to be effective in coastal resource protection and management, they must be recognized and empowered as the day-to-day managers of coastal resources.

SUSTAINABILITY OF COMMUNITY-BASED COASTAL RESOURCE MANAGEMENT PROJECTS

Among several issues in CBCRM, sustainability stands out prominently. It is argued that local governments and local communities usually cannot adequately manage coastal ecosystems because of their limited area jurisdiction, limited research capacity, budget constraints and dominance of parochial interests in local politics (Sorensen and McCreary 1990). The consequences of these limitations are that either management projects cannot take off at all or they cannot be sustained in the long term.

Experience shows that parochial or even selfish interests on the part of local politicians have been one of the major reasons for the failure of some projects. Community development workers had to leave their project areas (under conditions of unresolved political conflicts). Fortunately, this does not happen frequently.

The limitations in research capacity and area jurisdiction although real can still be remedied. They have been overcome by training, capacity building and networking with NGO and academic institutions in a number of cases resulting in relatively successful projects.

The most important constraint is the budget limitation. Generally, partner organizations that initiate CBCRM projects are prepared to support these projects financially for only two or three years, whereas four to five years are usually required for a community to establish viable organizations that are capable of formulating and implementing development plans. It also takes about the same amount of time to place communities on a solid footing in terms of provision of livelihood opportunities. By coincidence, four years are needed for plankton-feeding fish (eight to ten years for carnivores) to spill over from coral reef reserves to fishing areas, thereby increasing fish catches (Alcala and Russ 1990; Russ and Alcala 1994, 1996). These time frames are important guides to partner organizations in demonstrating the impact of protected areas on the fishfood supply of communities. As Newkirk and Rivera (1996) state "...concrete gains in a project are the most effective mechanism to convince people about the relevance of CRM."

Before outside financial support to communities is terminated, all arrangements should be in place to ensure that the people are engaged in livelihood activities on a sustainable basis. This is true of one of the most successful CBCRM projects in the Philippines — the Apo Island Marine Conservation Project in Central Visayas. The project began in 1981 and its marine reserve (10% of coral reef area) was established in 1982. Community organizing intensified in 1985-1986 (White 1989; Tiempo and Delfin 1991; Russ and Alcala 1996). The organized community of 500 people has successfully managed and protected the reserve for nine years with little help from the partner agency (Silliman University). The fishers

reported that their fish catches from the nonreserve area substantially increased, and they attributed this increase to the establishment of the reserve. They were happy because the reserve brought them more income through increased fish yield, tourism and scuba diving. The objective, as far as CBCRM is concerned, is to establish protected marine areas like Apo Island.

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The Concept of Fisheries Ecosystem Management - Current Approaches and Future Research Needs

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ABSTRACT

The concept of fisheries ecosystem management is yet to be clearly defined. Current fishery problems were not mainly due to failure to apply ecosystem management but rather to failure to apply single species fisheries management adequately, open access fisheries and risk-prone fishery management. In the face of uncertain scientific information, these have led to overcapacity, overfishing, and other forms of waste. Ecological effects of coastal degradation, climate variability, effects of fishing on habitat and species interactions between fishery resources have contributed to some problems and these are certain to increase as demands for use of fishery ecosystems become more diverse and greater. Proposals to manage ecosystems taking account of all factors that affect the ecosystems, including indirect effects through complicated ecological processes, are unachievable for the foreseeable future because of limitations of scientific knowledge.

At least four ecosystem approaches to fisheries management can be identified, namely: (1) holistic ecosystem approach; (2) extension of single species approach; (3) institutional cooperation approach; and (4) large marine ecosystem approach. All of the current approaches have merit in appropriate circumstances. As they continue to evolve, they will probably also converge.

Ecosystem management is a popular theme among ecologists, environmentalists and government policymakers. It frustrates many of the scientists and managers that are responsible for the stewardship of fisheries. Their frustration is twofold: (1) the emphasis on ecosystems may imply that the current fishery problems should be attributed to the failure to apply ecosystem management, and (2) it is easier to propose ecosystem management than to achieve it. The problem of overfishing and resource depletion is well documented, although not as severe as often portrayed by the popular media. While there is little room for the expansion of fisheries for wild stocks in the future, summaries of the global and US situation indicate that the majority of fishery resources are not overfished or depleted.

The problem of overcapacity (which results in poor economic performance and pressures to overfish in the future) is probably a much more pervasive problem, although it is difficult to quantify. At issue is how much a lack of ecosystem management has contributed to the current problems in fisheries. The failure of fishery management institutions to adequately apply single species fishery management tools,

which have been advocated by fisheries scientist for many decades, is the primary cause of the problem. As a result, open access fisheries and risk prone fishery management, in the face of uncertain scientific information, has led to overcapacity, overfishing and other forms of waste.

The ecological effects of coastal degradation and climate variability, and species interactions between fishery resources have caused some problems. These effects have intensified as demands for use of fishery ecosystems become greater and more diverse. A comprehensive system that take into account all factors affecting fishery ecosystems even indirectly has been proposed but it appeared impossible to achieve for the future due to the limited scientific knowledge. Nevertheless, there are several ecosystem approaches to fisheries management available for use, such as:

- holistic ecosystem approach;
- extension of single species approach;
- institutional cooperation approach; and
- large marine ecosystem approach.

The holistic ecosystem approach attempts to apply the knowledge relating to the limits of ecosystem productivity and the tropic theory to provide general guidelines on how an ecosystem should be exploited and managed. There are several examples on how to apply single species approaches to incorporate multispecies and ecosystem effects. Multispecies stock assessment models that include the effects of predator/prey interactions have been implemented for some fishery ecosystems. The biological effects of environmental stress (such as contaminants) can also be incorporated into stock assessments.

The institutional cooperation approach recognizes that many institutions have the responsibility for human activities that affect fishery ecosystems. Even with extremely incomplete scientific knowledge about the nature of the interaction between these institutions, it is necessary to establish a cooperative framework between institutions. For example, the survival of salmon fisheries in the Pacific Northwest of the USA requires the cooperation between the institutions responsible for their farming as well as for hydroelectric power and water diversion.

The large marine ecosystem approach combines the elements of the above approaches with ecosystem monitoring of fishery resources, plankton, habitat quality and quantity. Monitoring data are used in research and management, and regular assessment of the system's overall health. International donors have provided significant funding for planning and implementing large marine ecosystem studies.

All these approaches have merits at the right situations. As they continue to evolve, they will also converge. By developing the scientific capability to express in common currencies the benefits from using these approaches and the stresses to the ecosystem resulting from such usage so tradeoffs can be evaluated, the convergence can be facilitated.

Future Challenges for Fisheries Resource Assessment in the Aid of Fisheries Management

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ABSTRACT

Years ago, stock assessments went beyond the tasks of evaluating stock status from catch data, and estimating the level of some single-species objective such as maximum sustainable yield (MSY). Despite this broadened framework, growing concerns about management to foster biodiversity mean even greater challenges lie ahead. To build better tools presents new challenges of integration of science on two levels. One level is greater integration of science programs. The other level of integration is dealing more effectively with multiple objectives for the fisheries themselves.

Despite growing attention to formal methods for risk management and decision analysis in fisheries, as objectives become more diverse and more philosophically based, willingness of stakeholders to compromise may diminish. The diversity of participants introduces another new challenge. Fisheries assessment must find ways to assimilate the skills and approaches of not just sociologists and anthropologists, but also the resource users, coastal inhabitants and self-appointed defenders of the environment. Finding common language and standards to work from is a basic challenge to be met in assessments, even before we can find a common currency with which to conduct our business. The final category of challenges is presented by the very diversity of systems that stock assessment must address, and the greater completeness with which the system must be assessed. In fact, as the nature of 'managers' evolves to include many more types of people, the fundamental nature of 'advice' and 'assessment' may have to evolve as well.

Despite widespread criticisms (Ludwig et al. 1993; Hutchings and Myers 1994; Wilson et al. 1994.), fisheries resource assessment has successfully faced many challenges. The early roots of fisheries resource assessment are yield per recruit analyses (Baranov 1918; Hulme et al. 1947; Beverton and Holt 1957), surplus production models (Schaefer 1954) and stock-recruit functions (Ricker 1954; Beverton and Holt 1957). These models appear simplistic today, yet elegantly simple. They have been a sound foundation for many more complex developments.

Sophisticated analytical algorithms have been developed to address variability and uncertainty in nearly every type of fisheries data and mathematical representation of biological and fisheries processes (Deriso et al. 1985, Hilborn et al. 1993; Schnute 1994; Walters and Ludwig 1994). Multispecies interactions can be dealt with either in an intensive parametric way (Sparre 1991; Sissenwine and Daan 1991; Magnussen 1995) or with coarser multispecies equilibrium models (Christensen and Pauly 1992). Environmental forcing and non-stationarity of recruitment dynamics and survivorship are also being addressed in many ways

(Cury and Roy 1989; Bakun 1995). Advances in both concepts and methods have extended greatly the framework in which fisheries resource assessment operates.

A framework for fisheries resource assessment, despite its complexity, is only a skeleton. The skeleton requires many more organ systems before it can be considered robust and dynamic. This paper will explore the challenges for fisheries resource assessment in support of fisheries management by building a dynamic and responsive assessment entity on the current assessment framework by adding muscles, sense organs, guts, brains and heart to the skeleton.

The muscles that allow the comprehensive assessment skeleton to work are the analytical tools and models available for use. New analytical tools and mathematical models require time to implement, to develop, to test their reliability and limitations, and to evaluate their performance in different environments. New tools are being developed at a fast rate. A search of the Aquatic Sciences and Fisheries Abstracts revealed that the number of publications on asessment methods have increased more than threefolds from 1980 to 1994, with production now in the hundreds per year. This rate is deceptive and hides several dangers, one being parochialism. For example, over 90% of the analytical methods cited in the 1995 marine finfish assessment documents for the Atlantic coast of Canada were developed by assessment scientists working around the North Atlantic. Meanwhile, over 90% of the methods-related citations for the Canadian Pacific coast stock assessments were to scientists from British Columbia or Washington State.

Another danger is premature marketing. It is very difficult to conduct true performance tests of complex models, so sensitivity tests are often substituted. The 1995 meeting of the International Council for the Exploration of the Sea (ICES) Multispecies Assessment Working Group was attended by over 20 scientists, most highly experienced in the analytical aspects of multispecies assessment. Nonetheless, after three days, they identified only a small suite of feasible performance tests for the boreal multispecies models the Working Group was charged to evaluate (ICES 1995). Even that level of testing is an exception rather than the rule.

Partly because of these problems with development and testing, and partly because of the genuine complexity of the problems, the progress in adding true muscle to the assessment skeleton is uneven. Arguably, the greatest progress has been made in the development of multispecies assessment tools. A few, such as the multispecies virtual population analysis, actually have been tested and disseminated. In the context of biodiversity, this should be exciting news. However, such models are data-hungry, presenting serious limitations (Pauly 1994).

Resource assessment tools that integrate physical with biological forces of stock dynamics have progressed only by chance. The problem is not the lack of relationships between the environment and the dynamics of fish populations but because there are too many relationships with few that are reliable over time. Relationships between environmental features and properties of fish populations and communities are not mathematically smooth (Rice 1993), and often specific correlations break down over time (Drinkwater and Myers 1987). Debate continues about the usefulness of considering environmental variability in fisheries resource assessment (Walters and Collie 1988; Tyler 1993).

The history of fisheries science is rooted deeply in the study of how fish stock dynamics, particularly recruitment, varies with the changing environment (Pauly 1994, Smith 1994). Why, then, are the properties of the physical environment not a routine step in the analytical tasks of fisheries resource assessment? Why

are the sense organs with which the assessment perceives the environment of the stock(s) get stuck in looking for correlations? These questions introduce another set of challenges.

For decades, many fisheries research programs have carried the label 'multidisciplinary'. However, projects that truly integrate physical oceanography, biological oceanography and fisheries science are rare. One class of challenges is determining if true multidisciplinary studies are possible. Scale is fundamental to ecology (Levin 1993; Schneider 1994), and physical oceanographers, biological oceanographers and fisheries resource assessment scientists work at fundamentally different scales (Steele 1985; Langston et al. 1995). If each discipline is working at the scale most meaningful to its own questions, then the fact that different disciplines work best at different scales is not intrinsically bad. Successful organisms integrate several sense organs, each monitoring different environmental modalities, permitting adaptive responses to many different stimuli. Multidisciplinary studies of aquatic resource-producing ecosystems are not as well integrated. A different concept of multidisciplinary study is needed to provide an accurate, relevant and understandable advice to aid the management of biodiversity. The challenge is to conceive of studies in an integrated manner rather than as shotgun marriages of analytical tools developed to address discipline-based questions at very different scales.

It seems a simple challenge to integrate better the subdisciplines of aquatic sciences by focusing on the common goals and scales of the multidisciplinary studies rather than on those of the individual disciplines. However, the challenge of reconciling diverse goals goes beyond integrating research programs in support of biodiversity. Its wider manifestation is one of the most important challenges facing those involved in fisheries resource assessment. Fisheries management is successful if explicit management objectives have been achieved. Achievement of objectives is possible only if all involved cooperate toward their attainment of the objectives (Stephenson and Lane 1995). One of the most prolific areas of fisheries resource assessment is finding intelligent ways to reconcile diverse objectives — the brains associated with the skeleton. Sophisticated methods of decision analysis have several desirable attributes: explicit risk aversion, acknowledged diversity of viewpoints and impartiality (Leschine 1988; Lane 1992; Pearse and Walters 1992). The methods have, however, important limitations. To be successful, the participants should accept the results of the process. Some participants may not comply with the results of the process if they feel their objectives are not sufficiently reflected in the decision. Many current fisheries management problems arise from this (Rice and Richards 1996).

The new challenge to the brains of the framework is that biodiversity objectives legitimize many new participants in the process of developing fisheries management strategies. Many of the new participants have a strong philosophical stake in the fishery decisions, but no financial stake. They may have little first-hand familiarity with the resources or the resource users. Both new and traditional participants in the planning or decisionmaking process may reject the legitimacy of objectives of other participants, and be unwilling to comply with the outcome of a process, however scientific and impartial. Fisheries assessment and management already has a questionable track record in reconciling objectives of a smaller number of stakeholders, each acknowledging the rights and objectives of everyone else at the table (Horwood and Griffith 1992; FAO 1995). To include biodiversity objectives and partisan advocates in the process presents a huge challenge to expand the concepts available to fisheries management science.

From the challenge of developing concepts and processes to reconciling the objectives of a broader view of fisheries resource management, the addition of new values and classes of experts to the process follows. Resource assessment of traditional fisheries has had little difficulty developing interfaces with economics (Hannesson 1978; Clark 1985). It has been more difficult to assimilate experts from fisheries sociology and anthropology (Clay and McGoodwin 1994; Maguire et al. 1994). This is not just a problem of process. The new disciplines bring new types of knowledge, new ways of knowing things and new values to the process (McCay and Acheson 1987; Neis 1992; Dyer and McGoodwin 1994). The additional disciplines ask for a different heart inside the skeleton of the framework. Fisheries resource assessment and management is struggling to find ways to use traditional ecological knowledge of resource users, and to find common currencies for measuring the benefits of resource use on historic economic standards and measuring benefits in terms of the well-being of coastal residents or coastal communities. Accommodating ill-quantified holistic knowledge and balancing the values of completely nonutilitarian 'uses' of aquatic resources is going to be a great challenge. A common language, standard and currency in which to work have to be found. These must mean the same thing to all the different participants. Applied sciences are rich with examples of apparent compromises that only had broad support because different interests have interpreted the same words in different ways, each compatible with strongly held viewpoints that remained unreconciled by language.

All these additions to the fisheries resource assessment skeleton are of limited value without the guts of modern resource assessment: the data. The tools of contemporary fisheries assessment are data-hungry (Pauly 1994). They work best with time series data on catches in all fisheries; data on the nature and intensity of fishing effort from commercial, recreation and artisan fishers; quantitative economic (or socio-economic) performance indicators; results of research surveys and environmental monitoring; and biological studies on individual species or stocks being assessed. These data sets are costly to acquire and to standardize, and carry additional costs of long-term custodianship. Even highly developed countries generally have adequate data for intensive analytical assessments only for species of high commercial or recreational interest, and only on the spatial scale of recognized stocks or fisheries.

Biodiversity management presents two classes of challenges to the traditional view of fisheries assessment data. The first challenge is answering more complex questions with few additional data. The status and trajectories of species without long histories of exploitation (and the concomitant data sets acquired through quantifying and sampling the catches) need to be known as well as those targeted by fisheries. Also, except for highly sedentary species, fisheries resource assessments generally have been on large spatial scales. Biodiversity interests may mean working at much more disaggregated spatial scales. This would weaken the value of many good long-term data sets, if their initial spatial scale is too gross to address concerns associated with fostering biodiversity.

Assessments to answer biodiversity questions require more than additional data — additional guts. The biodiversity questions are more complex, yet more poorly framed. Only to the extremely naive does biodiversity equate to bioconstancy (Francis and Hare 1994; Cushing 1995). Even single species fisheries assessment has difficulty differentiating natural population variation from changes caused by fishing. Single species management has even greater difficulty knowing exactly how to respond to changes in stock status when several

factors contribute to the trajectory a stock is following. These difficulties occur, even though the basic objectives of obtaining high but sustainable yields and ensuring conservation of the genetic diversity of the stock are both relatively well understood and measurable.

Exactly what properties of an ecosystem should biodiversity managers conserve? The ICES Ecosystem Effects of Fishing Working Group has shown clearly that the traditional metrics of biodiversity used by ecologists for nearly half a century (MacArthur and MacArthur 1961; Peet 1974; Magurran 1988) are not adequate benchmarks for assessment and management. The metrics are easy to apply, if appropriate data sets are available, as they were for the North Sea fish assemblage studied by the Working Group. However, the metrics do not capture the processes and dynamics a 'typical concerned citizen' would expect to see fostered under biodiversity management. Natural aquatic ecosystems are not maximally diverse. Usually a few species are very common and many species are quite rare. Therefore intensive fishing is good for biodiversity as traditionally measured, if it can reduce the abundance of common species without causing extinction of rare ones. There is an additional complexity to developing good metrics for assessment. Not only do humans value different species unequally, individual species may be highly valued to some sectors of a population and a pest to other sectors. Some of these conflicts in values are addressed by the brains of the future assessment framework, which encompasses all the necessary parts of fisheries resource assessment. Money and effort can improve several other systems. The mathematical tools for more comprehensive assessments either exist or can be built with more work, so the musculature can be made equal to the future tasks. The existing possibilities to draw from related disciplines are far from being fully utilized, so the sense organs can be made more encompassing and discriminating. Money and determination can also generate more relevant data, filling the guts with a richer, more balanced diet.

That these challenges can be met with money and determination is not saying they are small. A huge amount of money is already spent on resource assessment, and many good and determined people have worked on problems for a long time to get fisheries resource assessment to where it is now. The point is that the discipline is conceptually rich enough to deal with the skeleton, muscles, sense organs and guts of future assessment challenges. However, that will give us a heartless beast with an inadequate brain. Does that make fisheries resource assessment the next incarnation of Mary Shelley's monster of technology, doing damage without meaning ill and being feared and misunderstood by the populace?

When Dorothy and her associates needed things, they went to the Wizard of Oz. At least, the Wizard needed only to give us the additional concepts to take fisheries resource assessment succesfully into the future — a simpler challenge than what Dorothy and her associates presented. We only need a brain and a heart. We have the courage to face these challenges and we are already home, surrounded by the aquatic ecosystems of the world that only require our wise stewardship

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New Approaches to Development Cooperation in Capture and Culture Fisheries

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ABSTRACT

Development aid to countries in Africa, Asia, Latin America and Oceania after World War II was inspired essentially by perceptions of the vastness of resources which provided scope for expansion in fisheries and, initially to a lesser degree, in aquaculture on the one hand, and the transfer of an industrial approach to exploitation from already industrialized countries on the other. The role of the state was seen as predominant. Even when small-scale fisheries and aquaculture were accorded increased attention in the 1980s, it was largely by down-scaling, but often with little appreciation of the resource base and the socioeconomic context in which they were embedded. The limitations, if not outright failure, of this general approach were made apparent by a number of negative evaluations of individual projects and/or sector programs of practically all donors, the growing scarcity of fishery resources, concerns for loss of biodiversity, lack of equity and growing conflict as demonstrated in research in various parts of the world.

In search of solutions, donors and other actors in development are assessing what options are available and how new approaches can be developed and implemented. Research is one of the resources identified to generate understanding and solutions. It is clear though that the complexity of the problems militates for new types of high-quality research, particularly interdisciplinary systems research. The interfaces between research and society needs special attention in order to ensure impact. Institutional and policy research ought to be accorded priority as inappropriate institutions and the lack of understanding in these areas are currently most critical.

The globalization of markets, challenge of food security, and the social and economic contribution of fisheries at the micro and macro scales represent a dynamic framework demanding adjustments by all actors and inviting differentiated analysis and action. New 'governance' processes, involving space for civil society, need three basic factors in place: creating shared perceptions about the current problems and possible solutions; strengthening or creating mechanisms to act on the shared vision; and finally having room for maneuver for action. There are considerable opportunities, however. Limited public financial resources must be used judiciously to add greatest value to efforts of all actors.

INTRODUCTION

The latest Food and Agriculture Organization (FAO) statistics of 1994 nominal catches shows that a new peak in aquatic production has been reached in excess of 100 M mt. Most of the world's aquatic production now originates from developing countries. The lion's share of world catches now relies on a smaller number of species groups, particularly pelagic species strongly susceptible to environmental variability, than what had been a decade ago. FAO has cautioned that long-term trends of environmental degradation, the overfishing of many stocks and the natural uncertainty of the aquatic environment supporting that production must not be disregarded.

The 1992 Rio Earth Summit and the meetings held before it, such as the Cancun Conference on Responsible Fishing, and the consultations and negotiations in its aftermath, have been driven by the recognition of the crises situation of nonsustainable exploitation strategies in many parts of the world. This goes together with the perceptions of the interaction between different production activities, and between the culture and capture fisheries sector and other social and economic activities. The globalization of trade in fishery commodities, its dependence on safeguarding the natural renewable resources and the biodiversity of the systems sustaining them, and the resulting interdependence between the 'north' and the 'south' have also fuelled the search for new mechanisms and modes of fisheries cooperation.

The change in the meaning of 'development' is needed in two ways:

- 'Fisheries development' should not be associated with expansion as there is little left to expand in terms of underutilized resources. It should assume a sense of 'management for sustainable benefits of sector stakeholders'. Recent research has laid open the limitations of most prevailing fisheries management schemes. These schemes have been found lacking in both ecological and economic criteria and many of the institutional arrangements sustaining them are now recognized as inappropriate for the task at hand.
- 'Fisheries development aid' associated with more or less appropriate technology and knowhow being transferred from industrialized to developing countries has revealed its limitations as the sociocultural and economic, not to mention ecological, context tended to be undervalued. Here again, institutional arrangements in the widest sense need revisiting and adjustment in the direction of proper cooperation.

This paper tries to contextualize some of the questions that hang in the air after the Rio Earth Summit and in the post cold-war era. It discusses an approach and some themes which will search for answers and reduce the current levels of conflict. Its principal objective is to stimulate discussion by posing as a sounding board for areas of potential joint understanding and action with other players and exploring the extent of common ground between environmentalists and the society which, in an ultimate analysis, must be the 'owner' of natural resources.

HISTORICAL OVERVIEW

After independence in the 1960s, many developing countries engaged in efforts to emulate the approaches of industrialized countries. In fisheries, the *de facto* reduction of fishing during World War II had acted as an overdimensioned closed season. It allowed resources to regenerate even in regions of previous heavy fishing. Combined with technologi-

cal developments, such as more powerful boats and the introduction of the power block in purse seining for shoaling species, this resulted in massive expansion of world catches. Research in this period was characterized by exploratory assessment of fish and what were to be believed virgin stocks in view of further expansion. While the euphoria for expansion lasted for the better part of the 1970s and 1980s, some scientists started to point out that rates of increase were falling and that all was not well as far back as the mid-1970s (World Bank/UNDP/CEC/FAO 1992).

The cleavage of constituencies meant though that there was relatively little meeting ground for aquatic resource scientists, industry interests, especially as far as small-scale fishers were concerned, fishery administrations, the growing community of conservationists, consumer interest groups and the processing and marketing industry, mostly urban-based, and the society at large. The disjointed nature of their perceptions and actions and the lack of institutions where exchange could take place, led to conflict and waste in economic, social and ecological terms. In the face of growing pressure on the resources as a combined effect of demography, flawed perceptions of a 'limitless' resource, overinvestment, and a few or inexistent conflict mitigation mechanisms at international, regional, national and sometimes even local levels, the situation degenerated into an open crisis by the end of the 1980s. It took a few more years before the recognition of unsustainability had made enough headway to trigger action.

The fisheries and aquaculture cooperation tended to be affected by a lag in the development of concepts and perceptions in fisheries and aquaculture at large. But the underlying pattern for a long time was, and to some extent still is, technology transfer to boost production and income of developing countries with little and usually insufficient regard of the socioeconomic, cultural and often even ecological context of the intended beneficiaries. Social and institutional aspects, notably the relative size of informal and formal economies, their interaction, influence of other economic activities on fisheries and vice-versa, the different gender roles and how they impact social and economic performance, the differentiated roles of the private, cooperative and public sectors, and interaction between customary and modern positive law are only recently becoming recognized as important factors requiring analysis to allow external assistance to have a positive impact.

Some milestones on the bumpy road to adjustment include:

- the Cancun Conference on Responsible Fisheries in May 1992;
- the United Nations (UN) Conference on Environment and Development, better known as the Rio Earth Summit, in June 1992;
- the FAO publication decrying the global waste in the fishing industry (FAO 1993);
- the entering into force of the Law of the Sea in the end of 1994;
- the FAO-sponsored Technical Consultation on Responsible Fishing leading to the adoption of a voluntary Code of Conduct for Responsible Fishing in the end of 1995,
- the concomitant UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks resulting in an international agreement initiated end of 1995, and which will enter into force upon its ratification by 30 countries;
- the work currently conducted under the aegis of the Conference of the Parties to the Convention on Biological Diversity and its subsidiary bodies, particularly the clearinghouse mechanism, and specific

work which was triggered by the Jakarta Conference focusing on oceans in November 1995; and

- the series of fisheries donor consultations started in 1989 where fishery problems were discussed to create awareness and trigger action.

However, it was only in 1993 that the issue of large-scale overfishing and unsustainable resource use pattern was brought to the attention of a wider public. This was through the initiatives of international publications ranging from *Greenpeace, National Geographic, Scientific American* to *The Economist.* The 1996 World Conservation Congress and its working groups and panels also extended the fora for debate and increased understanding, which are pre-requisites for improvement.

PERCEIVED PROBLEMS

The first set of problems pertains to the sector at large; the second set to how the first set affects development cooperation and the problems specific to developing countries.

Problems in the fishery sector can be addressed from different angles as these pertain to insufficient understanding of the role of exploited species in their ecosystem and the functioning and the dynamics of these ecosystems. The scientific basis to assess the fish growth and mortality was laid by von Bertalanffy in the late 1940s and many useful analytical tools have been developed since. But for more than 10 years, scientists have started to express concern over the limitations of single stock models. However, for lack of good alternatives, and in the face of demand by managers, stock assessment continued to be used in fisheries science and has now become more routine monitoring than innovative research.

Since Pauly's keynote address to the World Fisheries Congress in Athens in 1992 (Pauly 1992), where he showed that the paradigm change toward ecosystem management could not be mastered by biologists, work has accelerated to develop alternative assessment and management methods and approaches. Pauly (1992) showed that single species curves show a maximum (in terms of biological yield, yield per recruit, etc.) and therefore 'make sense' to the manager who tries to influence fishers and other players so that the fishery as a whole operates at the maximum (maximum biological yield). Incidentally, analyzing such data with an economic perspective will provide maximum economic yield, even though the latter is usually associated with lower than maximum biological yield, but the basic flaw of not taking into account species interaction remains. He also showed that ecosystem curves do not have maxima and therefore do not inherently provide advice on how to direct resource exploitation. Biologists and ecologists, or for that matter, economists, can then as a profession not have all the criteria required to determine what sort of fishery is right or wrong.

Biologists' and ecologists' advice is clearly precious and necessary to contribute to the understanding of the functioning and the dynamics of aquatic ecosystems so that it be conserved for future generations. But other criteria, such as economic, social and institutional, can equally be used legitimately for determining exploitation strategies, provided the resource or its ecosystem *per se* are not endangered.

It then follows that every profession has some insights to contribute to the whole picture, but that the choices must be those of society, not of one partial view or another. But even a cursory look at many existing resource management regimes show that real life is much more complex than the simplistic or technical setting being presumed. Most regimes mobilize significant scientific and monitoring capacity to give advice on how much of one or the other

species can be extracted and a total allowable catch is determined every year. Allocation is then made through various mechanisms, often involving some form of licence and a variety of secondary restrictions on means of production such as mesh size prescriptions, as well as minimum size, landing ceilings, etc. aimed at counteracting technological progress.

Practice has shown, however, that none of these can be really effective in protecting the resource base, as high discount rates are a strong incentive to exercise fishing pressure beyond sustainable levels (Christy et al. 1991; McGlade 1994). As FAO pointed out in its global assessment in 1993, the annual operational losses of the fishery sector reached $15 billion in the late 1980s and 1990s, largely as a result of subsidy schemes in industrialized countries. Boat owners from industrialized countries, particularly large-scale ones, operating under such conditions are risk takers. Such overcapacity and associated exploitation strategies could not be reigned in with, despite being generally useful, technical restrictions.

McGlade (1994) explored other forms of common pool resource management and pointed out that mechanisms based on reciprocity and social cohesion and control have been successful in pre-capitalistic economies. Understanding the social organization regulating access to the resource can provide valuable clues about the resource base itself in ways technocratic systems usually fail to capture. She therefore advocated a more systematic and systemic approach which would involve pulling interdisciplinary research capacity together with participatory analysis of social systems underpinning the fishery. Instead of top-down technocratic management, McGlade's analysis points to the need of sector governance, where governing needs in terms of the complexity and dynamics of the system have to be matched by governing capabilities of stakeholders as first suggested by Kooiman (1994) and illustrated in Fig. 1. In industrialized countries, institutions with technocratic mandates often exist; however, the fisherfolk's interests and those of other stakeholders may not be adequately involved in the process, thus making management an external process rather than a self-steering process at least partially.

While the above ideas represent important conceptual openings, the empirical evidence is insufficiently analyzed and understood to offer reliable alternatives to current regimes. This may explain why systems research, systems approaches and interdisciplinary work are now frequently recommended, but still little practised as compartmentalization persists at many levels. Institutions serving as meeting ground, promoting and practising dialogue, are preciously rare.

These problems are present in developing countries to some extent, however, their conditions are different in some ways. The countries in the tropics and subtropics have little scope for a transfer of single species approaches first developed in northern temperate waters. Only a few have developed the research capacity required to sustain the conventional technical management regimes. In many cases, it might be argued that they would not usefully devote their research resources to approaches with confirmed limitations to cope with multispecies fisheries regimes and the socioeconomic makeup in the countries concerned.

In many cases in Africa, human and institutional resources were never sufficiently developed for a technocratic management system to function efficiently, covering the entire range from systematic routine data collection and analysis, research, legislation and regulations, enforcement, monitoring, control and surveillance. Mechanisms of conflict mitigation and resource allocation are often ineffective and inequitable. Recent reviews of governance

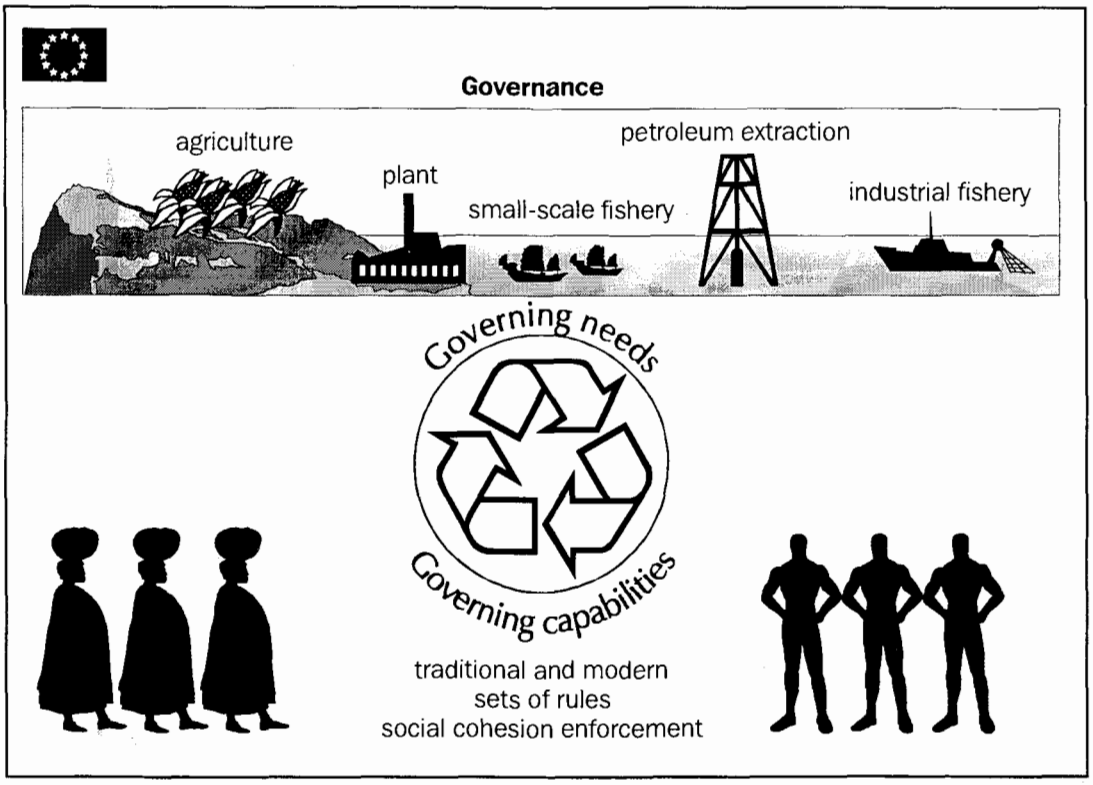

Fig. 1. Governing needs and governing capabilities according to the governance concept developed by Kooiman (1994) as illustrated for a coastal zone situation with potentially conflicting interests. Social cohesion and the adequacy of the rule set will determine the effectiveness of rule enforcement (illustration courtesy of P. Bottoni) (Nauen 1995).

problems under such conditions (Nauen 1995; Nauen et al. 1996) show that problems are often compounded by poor understanding of the ecological and socioeconomic dimension of the sector, the predominantly small-scale nature of the fisheries with its complexities, and often weak or inappropriate institutions.

Resource conservation and sustainable levels of exploitation under such conditions primarily require an understanding of the fisherfolk. More often than not, these, when working at a small-scale level, combine fishing with other economic activities. Unlike their industrial competitors, they adopt risk averse strategies as they have little or no control over external factors and largely operate in the informal economy. Women are often the backbone of postharvest activities, lend money to their husband fishers for implements and play a significant role in the overall fishing economy and social organization. Western style household concepts cannot be assumed *a priori* to offer reliable frameworks for economic and other analyses. Gender differentiated roles in productive and reproductive activities need to be understood as they affect exploitation strategies.

Conflict between customary law which is still strong in many places and modern law is

common and often a major obstacle to resource conservation, if not initially a major source of resource degradation as documented in numerous cases. Internal and external factors, such as demography, weak professional organization of fisherfolk, influx of excess labor from agriculture, currency fluctuations, tariff and nontariff barriers to trade, and underdeveloped road and communication infrastructure constitute major constraints to sustainable development which would integrate conservation concerns.

Given the circumstances, small-scale fisherfolk often have an amazing economic performance. At the same time, the lack of infrastructure, services and integration into the overall economy, creates largely sub-optimal use of human and natural resources. The demographic growth, demand on land and water resources for a variety of purposes, and urbanization processes, especially in the coastal zone, have created pressures on both land-based and aquatic resources leading to significantly increased levels of conflict. The vicious cycle between environment degradation, poor economic performance, social disruption and more pressure on the resources is all too visible. The globalization of markets, while contributing to better performance of some countries or certain economic sectors, has not, so far, been able to rectify equity problems and reduce poverty to the extent promised and has not addressed some of the deeper social and institutional issues (Demery and Squire 1996).

DONORS' SEARCH FOR RESPONSES: HIGHLIGHTS OF THE EUROPEAN COMMISSION EXPERIENCE

Fisheries cooperation under these conditions has not escaped from the fallacies of direct technology transfer and other simplistic approaches which often had little consideration for the socioeconomic context, the sketchy knowledge of the resources and the ecosystem as a whole, the institutional makeup of the sector and the way it is embedded in society. As already highlighted in 'A study of international fisheries research' (World Bank/UNDP/CEC/FAO 1992), performance of projects, which is the preferred delivery mechanism of many donors, fell short of expectations and in some cases increased problems rather than solved them.

In the case of the European Commission (EC), the systematic search for improvement began with a sector evaluation in the second half of the 1980s (North Sea Centre Group and Centre ivoirien de recherches economiques et sociales 1988), and the active participation in the process leading to the study of and 'strategy of international fisheries research'. It continued with regular interaction with other European fisheries cooperation advisers, particularly from member-states, numerous individual project evaluations, participation in major international conferences and negotiations from the United Nations Conference on Environment and Development to the latest series of international fisheries negotiations mentioned above, which did, and continue to, influence thinking about the necessary adaptation of cooperation to changing perceptions and needs.

As a result, experimental work diversifying cooperation with nongovernmental players and exploring more participatory working methods is underway. The major steps in this continuing learning process have been reflected in published reports and working documents (Spliethoff et al. 1990; Campbell 1993; Anon 1995a, b).

The search for better quality and more relevant cooperation has led to a progressive conceptual opening, first toward a more coherent sector approach, and soon toward a redefinition of sector work within a wider socioeconomic setting. Concern for the environment as well as for the socioeconomic dimension of development cooperation, in particular gender

sensitivity, are now believed to be essential cross-cutting themes.

The ultimate success in translating such concerns into sustainable resource utilization depends to a large extent on the institutional arrangements and mechanisms, and the equitable sharing of benefits between stakeholders.

Unsurprisingly, the thrust of cooperation is therefore changing toward investment into human and institutional capital as a prerequisite to recovery regimes and the ultimate achievement of sustainable resource use. Governance issues, new government-society interaction, and concerns about transparency, proactiveness, reciprocity and trust influence the way development cooperation in capture and culture fisheries are approached. These areas having been neglected in the past, are now believed to deserve a special effort to achieve a new quality of development cooperation.

As a result, these are the priority themes for the research sponsored under the Africa, Carribean, Pacific-European Union (ACP-EU) Fisheries Research Initiative, an interregional partnership between ACP countries and the EU, to underpin development by research. Given the recognition of interdependence of the fisheries sector with other social and economic activities, the resulting complexities create demand for reliable and relevant analysis to permit proactiveness and forward planning. At the same time, there is comparatively modest capacity to deliver on these new ambitions.

It is therefore important to invest in an enabling environment to build this capacity. Indeed, one might argue that the interdependence between industrialized and developing countries when it comes to environment conservation, social and economic development, and international trade would militate for a shift from a donor-recipient to partnership. Such a partnership approach seems well adapted to suit the medium to long-term interests of ACP and EU countries alike as it takes account of the fact that 'nobody has it all, but everybody has something'.

The production of information, while extremely important, is, however, not in itself sufficient to improve its utilization in the planning and decisionmaking processes. The interface between research and society at large is therefore essential to ensure that feedback mechanisms are established. Such interface will help sharpen research efforts. Likewise, a greater effort is required in communicating such information to meet the needs of different stakeholders. Broadening the local base for decisionmaking is also the most realistic way to secure the financial and other resources required to enable research, information generation and management.

Electronic media, while not a panacea, offer new opportunities to bring together different types of stakeholders in the sector and share information and experience. Much of the ease and informality of this exchange will influence attitudes to work and interaction in many ways. Care must, however, be taken to ensure that the technology remains a vehicle for such exchange and that financially strong partners in the process secure that the 'passengers' and content have first priority in the use of such vehicles. There would otherwise be a risk in accentuating the current gap between industrialized and developing countries rather than contributing to bridging it.

OUTLOOK

The geopolitical changes, globalization, and environmental and fisheries crises are having profound impacts on the perceptions of fisheries development cooperation. The limits of public resources have brought home the need for rethinking roles and relationships between actors in the sector and in society at large.

The public sector must concentrate its efforts and resources on supporting mechanisms and investment which cannot be shouldered by other actors. Its foremost responsibility is to sustain the aquatic resource base for future generations and to ensure equitable appropriation of benefits. To do this, the public sector must help develop new relationships with other stakeholders. It must also develop or help develop mechanisms allowing other stakeholders to share in this responsibility in a structured way, thus reducing conflict.

The private sector plays an increasing role but it needs a regulatory framework so it can develop from the current threat it poses to resource sustainability, to being supporters of conservation, in order to defend its long-term interests.

Fisherfolk in particular are likely to undergo major changes in their perceptions of their profession and their role in society. Will they add to their production function a new role as the guardians of the aquatic environment, something they empirically know better than most? However, they will only live up to such a new role, if alternative economic options are developed, underpinned by revaluing the resource and their environment.

In the dynamic change we all go through, some vision is needed for the future. The first factor is consensus building and the creation of shared perceptions about where the sector wants to go from where it is now. Given its interdependence with other sectors mentioned above, this may require broader societal dialogue beyond the sector 'specialists'. The second factor is to create or adapt mechanisms on how to translate this vision into action. Institutional arrangements vary greatly from one country or region to another and comparative work and collaboration are prime sources of developing such 'implementation' mechanisms. The third factor is to create room for maneuver to ensure that the action has impact. The current crisis affecting the fisheries sector and conventional development aid, demands difficult adjustment from those directly involved. As in any crisis, however, it also offers many new opportunities and the will to explore alternative options. The whole process can be called sector governance and is likely to be the underlying theme for much of sector work at large and development cooperation in particular.

It would be encouraging to see some concerted action agreed upon and set up around the theme of capture and culture fisheries governance, to build up the knowledge base necessary for success. FAO has recently suggested a number of pilot studies and field activities to make progress towards sustainable management. The Worldwide Fund for Nature and Unilever have sounded the case of the establishment of a Marine Stewardship Council modelled on the tropical timber experience.

Governance processes, the socioeconomic dimension of fisheries and the ecology and dynamics of aquatic resource systems are still poorly understood. An iterative approach maintaining flexibility through a learning-by-doing attitude is likely to be the best way to minimize risks associated with change. But the current unsustainable practices and the potential rewards militate to take action without further delay. The moves by several actors, public, associative and private, in the direction of addressing governance problems are already producing the contours of new options compared to earlier deadlock.

In the spirit of the partnership that EU member-states and the EC seek to develop with ACP countries and institutions and well beyond, we would be interested in synergies, and if possible, joint action with others to search for solutions to the problems in the fishery sector and the aquatic environment. The starting point is to ask questions and try to understand. This

goes hand in hand with the identification of the major problems. This is less trivial than it sounds, as agreeing on some common ground may mean having the key to a more sustainable future.

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Coastal Fisheries and Marine Development Issues for Small Islands

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ABSTRACT

The small island groups considered include those of the independent, developing countries in Micronesia, Polynesia and parts of Melanesia in the Pacific Ocean; those in the Seychelles, Mauritius and Chagos archipelagos in the Indian Ocean, and much of the Caribbean region. The problems that are unique to small islands are often problems of scale. Small island developing nations are usually too small to be able to develop the requisite specialized human resources and institutions within the time-scales demanded by development projects and externally funded cooperation initiatives and may be too small to ever sustain the full range of necessary specializations within their borders. There are few economies of scale possible.

Small islands, by definition, are almost entirely composed of "coast" and thus coastal and marine issues are amongst the most important concerns of their governments. Small islands contain only a very small fraction of the Earth's human population and thus tend to be overlooked in efforts to tackle the major problems of the world. However, with the establishment of 200-mile zones under the International Convention of the Law of the Sea, small island nations are required to manage a very large proportional share of the world's oceans. The suggestion is put forward that international assistance in national global marine and coastal issues should not be prioritized according to absolute human population numbers but according to the marine and coastal areas over which stewardship is exercised.

Current coastal fisheries and marine development issues include:

- the high export demand for specialty, seafoods especially in Asia, is leading to local overfishing of certain species and groups of organisms such as sea cucumbers. This could be controlled by the re-empowerment of community management, international cooperation and better trade monitoring to ensure responsible operations by international entrepreneurs;
- small island coastal waters encompass most of the world's coral reefs but there is as yet no good idea at what level fisheries production should be managed to be sustainable; even the area of these coral reefs is largely unknown;
- a large proportion of the populations of small island developing states rely on coastal fishing for subsistence nutrition which does not enter the cash economy and is rarely taken account of in development plans, or quantified in national accounts;
- many small island archipelagic nations are subject to steady urban drift, and the concentration of population on capital areas usually causes coastal environmental degradation through erosion, siltation and eutrophication resulting in reductions in fishery carrying capacity;
- communications and transport are prohibitively expensive for small island nations, and work against sustainable income generation (particularly from fisheries and aquaculture) in outer islands, or the development of appropriate export fisheries;
- development has induced the false expectation in many rural areas that subsistence lifestyles will be rapidly replaced by the cash economy, and thus there is less need to conserve coastal subsistence resources or pass on traditional knowledge about them for future generations.

INTRODUCTION

The small islands considered in this paper include those in Micronesia, Polynesia and parts of Melanesia in the Pacific Ocean; those in the Seychelles and Mauritius archipelagos in the Indian Ocean; and much of the Caribbean region. To avoid complexity, it reflects the priorities of independent, developing, small island countries rather than those of small islands that are part or territories of larger or developed countries.

Problems of scale are unique to small islands. Islands, whatever their size, are expected to be, or to become, self-sufficient in their capacity for marine development and coastal management. Yet small island developing nations are usually too small to develop the needed specialized human resources and institutions within the time scales demanded by development projects and externally funded cooperation initiatives. Some may be too small to sustain the full range of specializations within their borders. Few economies of scale are possible on small islands where the scale is forever limited, and the pooling of resources becomes a pragmatic necessity for economic survival, not just a means of economic enhancement.

Small islands, by definition, are almost entirely composed of 'coasts', and most of the inhabitants live in the coastal zone. Coastal and marine issues are thus among the most important concerns of small island governments. Or they should be. Often, the agendas of small island governments are modelled on, or driven by, concerns of large nations, and may inappropriately prioritize management and conservation issues. Conversely, the marine and coastal issues that are identified as priorities by small island governments in international fora may be diluted by the prioritizations of more populous and larger countries. This is a particular problem in international organizations that consider large heterogeneous regions as a unit, as in 'Southeast Asia and the Pacific', or 'South Asia', or 'Central America and the Caribbean'.

Small islands contain only a very small fraction of the Earth's human population and thus understandably tend to be overlooked when international entities try to tackle the major problems of the world. However, with the establishment of 200-mile zones under the International Convention on the Law of the Sea, small island nations are required to manage a very large proportional share of the world's oceans. A change in perspective may be called for. International assistance in national marine and coastal issues should not necessarily be prioritized according to absolute human population numbers. It should consider the marine and coastal areas over which the population must exercise stewardship.

TRENDS

Population growth

Small island coastal fisheries are under increasing pressure as human populations expand. The trend toward increasing human populations is not a general rule. Several very small island nations actually suffer a steady loss of population due to emigration, particularly if they are closely affiliated with a developed country. However, many more islands are burdened with high population growth rates. Evidence shows that population growth rates have not yet outstripped the capabilities of nationwide coastal fisheries to supply subsistence protein nutritional needs, despite the very high per-capita consumption of fish in most small island nations. (Adams et al. 1997). However, there are problems emerging on the smaller scale, particularly around capital islands and urban areas. In addition to heavily increased fishing pressure from people drifting to urban areas, increasingly disenfranchised from traditional sys-

tems of constraint, there is a reduction in the carrying capacity of urban coastal ecosystems due to increased siltation and other runoff.

Problems are more acute in some other small island regions. Where there is no millennial tradition of community-wide subsistence harvest, spreading effort across a wide range of organisms, fisheries are more commercial and targeted on a narrower range of high-value species. Such systems are more unstable and may be more prone to catastrophic collapse.

Economic development

Compared with larger countries, a much larger proportion of the total natural resources available to small island nations comes from the sea. Thus, many of the hopes of national economic development lie with fisheries. Unfortunately, the few high unit-value resources that are economically viable for export from small islands (which are beset by poor trade linkages and high freight costs) are typically prone to commercial exploitation, particularly when it is carried out at a pace that overwhelms the capacity of developing fisheries management infrastructures.

This is not to say that coastal fishery resources cannot contribute to the economic development of small island nations. They are often the only direct way in which outer-island rural communities can obtain the needed cash to support the increasingly money-driven lifestyles dictated by modernization and development. But the trend of increasing exploitation is too fast in most areas, and regulatory infrastructures need time to catch up. Many small island governments now recognize this and starting to look at alternative means of using the sea for economic development.

Some islands look at Singapore as an example of a small island nation with limited natural resources that has been able to develop as a trade nexus, but there is no room for many Singapores in this world.

An alternative form of economic development that is being encouraged in some small island nations is marine-based tourism and this trend has accelerated during the past five years. Most small island country coastal zones are characterized by coral reefs that are attractive to tourists. These coral reefs, coupled with a generally easy-going culture, and the general attraction that small tropical islands hold over the human psyche, are one of the few competitive advantages of small island nations over larger nations. Local wage rates are generally higher in small island nations than in the big, populous, manufacturing-based economies of Southeast Asia. When coupled with high transport costs, these make industry difficult to develop.

Reef-based ecotourism is not an easy path for a small island nation to embark on. Air fares are high on most routes because total passenger volumes are low, but the success of some islands on the major trade routes has encouraged others to try. Unfortunately, tourist diving and snorkelling does not sit well with commercial reef fishing, since many of the fish taken, particularly the large fish targeted by commercial spearfishing, are those that would be most visible to the tourist diver. Those who have dived on the Great Barrier Reef noticed that the larger emperors, snappers and parrotfish have become scarce. The absence of marine protected areas may greatly devalue an island's competitive advantage in ecotourism. Conversely, tourists have to be fed, and a typical 'island style' meal of reef fish is high on their list of priorities.

Sport gamefishing, particularly tag-and-release, is an increasing trend. Gamefishing has long been a major activity in the Caribbean but is becoming increasingly important in the Pacific and the Indian Oceans as anglers search further afield for records. At the same time,

small-scale longlining for the larger tunas is rapidly expanding as small island nations try to gain a larger economic foothold in a fishery that has traditionally been dominated by distant-water fishing vessels from large countries. The worry about interaction between local longlining and gamefishing has led to lobbies being developed on both sides, although the interaction is still more potential than actual in some waters.

ISSUES

Current coastal fisheries and marine development issues in small island nations, in no particular order of priority, include:

Export commodity overfishing

The high export demand for specialty marine products is leading to local overfishing of certain species and groups of organisms such as sea cucumbers. There has always been a large and comparatively lucrative market for particular seafoods in Singapore, Hong Kong and Taiwan, and China is now opening up as a huge new market. These are specialized fisheries for comparatively high-value species. Concentrating in the past mainly on nonperishable products like bêche-de-mer (dried sea cucumber) and mother-of-pearl shells (pearl oyster, trochus and greensnail shells), improved methods of transport, coupled with depletion of stocks close to markets, have seen a recent rise in shipments of live reef-fish, particularly groupers.

Such fisheries are typically organized, or financed, by itinerant Asian-based companies which extend operations over several countries, often sequentially as higher-value species groups decrease. The comparatively high prices on offer, even though the Asian resale value may be far higher, provide the leverage to bypass traditional constraints on exploitation, particularly where the commodity being exploited is not an item of regular subsistence nutrition.

This is not a problem restricted to small island groups. The same problems are experienced, on a much larger scale, in Southeast Asia. However, the effects on small islands are proportionately larger. The trade structure is such that the minimum quantity of products needed to make up a viable export unit may be much greater than the sustainable production of a small island and the fact that itinerant traders can only offer a short 'window of opportunity' for export means that exploitation must be intense and rapid. Small islands do at least have the advantage that opportunities for marketing may not be as continuous as in larger countries, and stocks may have some respite between pulses of heavy fishing. Unfortunately, the remaining stock is usually not enough to regenerate a population within a reasonable time frame, and increasingly sophisticated efforts are developed to cover the less accessible fractions of the stock as prices climb.

This type of fishery often has considerable side effects. Bêche-de-mer processing can consume large quantities of firewood. Mangrove wood is typically to hand and the taking of excessive amounts can, in turn, reduce the capacity of nearby fisheries. Underwater breathing apparatus carried from island to island by itinerant traders is used by untrained villagers working long hours, leading to a high toll in human life and decompression injuries. Where a community is able to obtain a loan to purchase their own breathing apparatus, the repayments often have to be financed through the commercial harvesting of remaining deeper-water stocks of other species, and subsistence food reserves, when the sea cucumbers become scarce. In the Galapagos, the sea cucumber fishery has had deleterious effects in pristine reserve areas, particularly the introduction of exotic terrestrial species, such as tomato plant. In the case of live fish export, the temptations to use broad-spectrum poisons, such as cyanide, to obtain a

reasonable catch-per-unit effort, are considerable. Fortunately, it has not yet spread far into the oceanic islands, for economic reasons, and island governments have taken note of the problems that have been experienced in more accessible areas of Southeast Asia.

These fisheries are not a problem, and currently target only a small fraction of the range of organisms which are available for subsistence nutrition and local commerce. They are only one of the few sources of direct income for rural communities. But the intensity with which they are carried out and their side effects can be overwhelming. Most communities and leaders recognize that these fisheries would be of far more long-term cash benefit if exploited on a smaller scale, but the mechanisms with which to regulate these are usually inadequate. The re-empowerment of community management is considered by many to be the only realistic way of controlling overexploitation. However, it requires a very strong community, together with a virtual suppression of individual entrepreneurialism (at a time when many small island governments are desperately trying to encourage such entrepreneurialism), to withstand the temptations.

International cooperation and better trade monitoring would go a long way toward ensuring more responsible operations by international entrepreneurs, and providing additional leverage for community leaders to restrict local exploitation for longer term benefit. Trade restrictions do not sit well with modern international politics, particularly when they are proposed for species that are not considered extinct. However, the success of some international restrictions on the recovery prospects of high-value export commodities such as turtle and giant clam may provide some guidelines for the future. These restrictions have not been successful, and the organisms involved live long and reproduce irregularly. It will take some time to show a definite increase in their population, but these restrictions have had a definite effect on people's attitudes toward their excessive exploitation, which is the root of the current problem.

Lack of basic knowledge and monitoring

The coastal waters of small islands encompass most of the world's coral reefs. This should hopefully encourage many small island governments to invest in the International Year of the Reef in 1997. However, there is no information yet at what level reef fisheries production should be managed to be sustainable. The fact that most small island reef fisheries can still support human subsistence nutrition is perhaps a matter more of good fortune than effective management, either by governments or by communities. However, a knowledge of the limits of sustainable exploitation will become increasingly important as the population and the cash economy grow.

The lack of basic knowledge about how tropical reef species interact and respond to exploitation is obvious. It is less obvious, particularly to scientists in countries with highly commercialized fisheries, that the current level of production is not even known on most small island coral reefs, and historical production is almost entirely conjectural. For example, it is only recently that the first rough estimate of total fishery production for the Pacific Islands region has been compiled (Dalzell et al. 1996). Thus even a major part of the basis on which to gain knowledge about the responses of species to exploitation is missing.

This monitoring problem is partly due to the scattered nature of small island multifarious subsistence and small-scale commercial fisheries, the small size of these nations causing an inability to support the necessary infrastructure for monitoring, and the inappropriate prioritization. Planners feel that coastal fisheries will look after themselves or that the bounty

of the sea is inexhaustible. Many development prospectuses still associate the adverb 'teeming' with marine resources.

Although a small-sized island is easy to monitor, logbook systems are almost impossible to apply to small-scale rural fisheries without considerable backup. Government fisheries officers in small island nations are few, and are too busy to spend time counting fish. Institutional activities tend to be driven by crisis rather than by plan. The available information tends to come from occasional (particularly questionnaire) surveys, usually under external assistance projects. Surveys, which may be decades apart and local in scale, often apply different methodologies or target different sectors of fishery and cannot be readily compared.

Most small island nations or regions would benefit from a concerted long-term effort to perform a series of rapid quantitative assessments (not just species counts) on a methodical sample of sites, using identical methodologies, to boost this basic knowledge. It is unlikely that such an effort would lead to an accurate absolute assessment of the status of reef fishery resources with respect to sustainability, but it would certainly enable reefs to be rigorously compared and priorities for further action be identified.

At this stage, even the area of coral reef present in small island nations is unknown, although the Caribbean region has more information available than others. Without this knowledge, it is impossible to apply scaling factors to surveys of individual reefs to estimate production potentials for the whole nation, statistics that are obviously very important in promoting wise national planning for small islands.

It is possible to manage fisheries without a detailed knowledge of the history of exploitation, or the ecology of the species involved, by regularly adjusting catch potential to perceived changes in stock abundance. Where community management exists, it normally relies on this mechanism (coupled with restrictions on access and supplemented by traditional ecological knowledge). However, where community management does not exist, or has been disenfranchised, such strategic management measures are only applicable by authorities to reef fisheries if there is a means of monitoring changes in the stock on a reef-by-reef basis. Such comprehensive means are largely denied to the fisheries departments of small islands.

Poor awareness of the economic importance of subsistence fisheries

The large proportion of the populations of small island developing nations rely on coastal fishing for subsistence nutrition. For example, around 80% of the coastal fish and invertebrates caught in the Pacific Islands probably do not enter the cash economy. But this is rarely taken account in development plans, or quantified in national accounts.

Fisheries are not ignored in national plans, but they are mostly seen in terms of their economic development potential only and not on their contribution to the subsistence economy or the nutrition of small island nations. This view now seems to be changing, and the World Bank (e.g., Bettencourt et al. 1995) has had considerable influence in this area. However, it is likely to be some time before this recognition is reflected in government departmental infrastructures.

The effects of this lack of government recognition have been mitigated in most small islands. Government fisheries officers working in the field intuitively account for the subsistence nature of coastal fisheries. One advantage of working on a small island is that an officer often knows the whole community and its activities, and there is less of the isolation behind an office desk which is experienced in larger countries. However, this disparity between central

government expectations and the experience of the field officer can lead to some interesting conflicts.

Urban drift

Many small island archipelagic nations are subject to steady urban drift onto capital islands and cities, and the concentration of population on capital areas usually causes coastal environmental degradation through erosion, siltation and eutrophication. Resulting reductions in fishery carrying capacity exacerbate problems caused by increased subsistence fishing pressure and will accelerate the collapse of coastal fisheries.

Many of the problems of coral reefs are blamed on fishing, particularly the use of destructive fishing methods which is fairly limited in small island nations, at least in the Pacific Islands region. Trawling is not economically feasible due to the very limited area of soft bottom shelf in small oceanic islands. Dynamite fishing is common only in limited areas, and has declined markedly since the end of World War II with the lack of military munitions. The use of cyanide to catch fish for live export does not appear to have penetrated far past Southeast Asia, and traditional fish stupefacients, while they may lead to local overfishing and community changes, do not appear to destroy corals. The situation may be different in other small island regions, but in the Pacific the main problems of coral reefs and the local food fisheries, occur as a result of terrestrial runoff. Urbanization and population concentration encourage construction and sewage, intensive agriculture requires fertilizer and pesticides, and nonselective logging leads to erosion, all of which lead to effects on the reef.

Fishing does have its own direct and indirect effects on small island reefs, but these appear to be minor by comparison with terrestrial influences. Some of the side-effects of the fishery export trade have already been mentioned. Additional potential effects include the possible loss of bioturbation capability on lagoon floors and reductions in algal grazing caused by overharvesting of sea cucumbers and *Trochus niloticus* (although these may be compensated by population expansions of related, noncommercial species); anchor damage from fishing boats and coral breakage caused by bottom-set gillnetting (although this is largely self-limiting, due to net damage).

Much of the fishing-induced damage to reefs resulting from human population concentration on small islands is caused by reef-gleaning for small fish and invertebrates. In the Pacific Islands, this is carried out mainly by women and children, and the up-turning of boulders and the breaking of coral with crowbars to extract small clams is commonly seen in heavily populated areas. There has been a welcome emphasis on the development of economic opportunities for women in the fisheries sector (particularly the post-harvest sector) in the past few years. However, there is still little attention paid to the role of rural women in fisheries management, particularly when women have to target resources, which are vulnerable to continuous, intense fishing.

High transport and communications costs

Communication and transport are prohibitively expensive for oceanic small island nations, and work against sustainable income generation (particularly from fisheries and aquaculture) in outer islands, or the development of appropriate export fisheries. The high unit-value export fisheries that pass through high transport cost involve fragile or rare resources.

This is a blessing in some ways because many marine resources that would otherwise be exported remain to fulfill local nutritional needs, and the imperative for continuous expansion that is inherent in most commercial

ventures has not led to the decimation of resources. However, this is not true for all small islands, particularly those which are close to high-value export markets, either within the same country or abroad. 'Close', in this sense, is an economic term, and more islands are coming 'closer' to markets as cash economies expand and transport improves.

Small islands are at a great competitive commercial disadvantage compared with continental areas, and it is only the depletion of marine organisms around these major markets that makes possible the increasing commercialization of island fisheries. A great deal of money has been spent in the past to develop small-scale commercial fisheries in island nations, but it is gradually becoming accepted that commerce will develop with minimal government intervention, given an appropriate market, and that the resources of government and development assistance are more usefully directed toward improving infrastructure and information.

While high transport costs lead to a competitive disadvantage in trade and tourism development, concomitant high communication costs also cause problems in the availability of information, both for trade, and for regulatory and education purposes. Because of high telecommunication costs, and the small available unit markets for service providers, the internet revolution sweeping the world is largely passing the islands by. Libraries are scarce, and even the sharing of experience — one of the most valuable tools in fisheries development and management — is expensive.

Erosion of traditional links with the sea

One of the more unfortunate aspects of development is that it has induced the expectation in many rural areas that subsistence lifestyles will be rapidly replaced by the cash economy, and there is less need to conserve coastal subsistence resources for future generations. Many islands are too small to support schools and rural children are often required to attend boarding schools on other islands, or even in other countries, and thus lose the opportunity to learn from the elders of their own culture. Ironically, high levels of literacy may be only obtained at the expense of reduced environmental awareness.

Recently, much has been made of the small island inhabitant's traditional links with the sea, and how community systems of marine tenure and management can mitigate problems of overfishing when introduced to communities which do not have such traditions. More recently there has been some backlash against this idea, where even the strongest traditions of reef custodianship have not prevented certain invertebrate resources from being decimated for export. As usual, both points of view have some merit.

Government fishery managers cannot afford to blindly place all their trust only in the community to wisely use marine resources, particularly when much of the new generation's wisdom is gained in western-system schools, and where the need for cash to support external linkages is increasing. A basic regulatory infrastructure, plus information and support to the community is necessary. At the same time, the fishery managers of small islands cannot expect to regulate coastal fisheries entirely at the government level. Artisanal and subsistence multispecies fisheries are too widespread and diffuse, and most of the resources of small island governments and their specialized manpower are too few to even approach the task of monitoring fisheries on a reef-by-reef basis. If small island governments wish to maintain coastal fisheries at long-term levels of economic (and subsistence) yield, they should be involved at this stage in:

- providing information to local communities to supplement the loss of oral knowledge, and providing a network

through which local communities can share experiences;

- defining local communities and their borders of jurisdiction, including a mechanism for review and appeal;
- maintaining a basic infrastructure of resource management regulations, including the provision for more detailed local community action, and a mechanism whereby communities can bring offenders to justice, where such offences are not resolvable within community systems; and
- monitoring and applying resource-specific restrictions at strategic bottlenecks, particularly trade and export outlets. This is not a trade restriction, although it is viewed by many as such, but is the most realistic way of effectively applying resource maintenance measures such as size limits and conservation measures for endangered species.

A management system that puts most of the responsibility for daily maintenance of resources and decisionmaking on local communities is a form of co-management. The scarce resources of small island government can be directed to the tasks that cannot be effectively carried out by communities alone: linking communities; distributing information derived from the outside world; backing up local resource management decisions at the point of trade or export; and providing a means of arbitrating conflict, particularly with outsiders. Also, since it involves the whole local community, not just the fishing community, it can take into account the requirements of local tourism initiatives and more conservative elements.

This system is already in place in many Pacific Island nations. It needs strengthening flexibility of regulation, information dissemination, and more formal recognition of community responsibility and may not always be recognized as such, even by governments. It is not perhaps a system that could be transferred wholly to all small island countries, particularly those with highly commercialized fisheries or where communities do not claim traditional ownership of coastal areas. These islands might require a more structured approach, with formal councils involving government, fishing communities, traders and other stakeholders. It will certainly have little application in an industrial fishery, where short-term economic survival usually overrides all longer-term custodial impulses. However, it is a system that works in many islands and, provided it receives more formal recognition at the government level, promises much hope for the future.

High levels of fish consumption

Most small island inhabitants eat a lot of fishery products. Japan is a nation of fish-eaters, but the inhabitants of some of the outer islands of Kiribati regularly top 200 kg per year on average. This high level of consumption by an increasing population does not appear to have outstripped potential production in most areas, at least where the catch is based on a broad range of species and the society is still largely traditional. However, it does make island inhabitants very vulnerable to future catastrophic changes in marine ecosystems, through urban drift-induced fisheries collapse, pollution or natural catastrophe. Such marine events can change the structure of small island economies or societies much more rapidly than in larger countries. The votes of small island countries deserve to be given considerable weight in any international forum on marine issues.

CONCLUSION

Sharing and communication among small island nations had proven to be a good strategy to offset some of the disadvantages present in

more populous continental countries, particularly for oceanic fisheries. However, formal cooperation on coastal issues lags behind in small island nations, despite a largely common set of issues. Even less evident are linkages between different small island regions, and these are usually confined to an extremely high political level.

As with all developing countries, information is a major problem, either about fisheries, or about the ecology of tropical coastal fisheries biosystems. With the former, there is little information about local levels of exploitation reaching the government as well as fisheries specialists. With research, it is not so much the quantity of basic research that is a problem, but the scarcity of effective means of disseminating existing information, and re-packaging it at an intermediate level.

Human resource development is another major issue. There are training opportunities; the problem is the lack of human resources to develop. It is no coincidence that the largest 'small' island countries generally have the greatest reserves of specialized manpower. In the smallest islands, specialization is difficult, and fisheries staff are required to cover a wide range of duties, from mending boats to stock assessment.

In summary, the potential responses to the issues raised include the need for:

- prioritization of international assistance on marine issues according to the area under custodianship as much as by the human population number;
- adequate prioritization of coastal issues by small island governments;
- adequate prioritization of small island government views in international marine fora;
- more comprehensive international trade and trader monitoring (not necessarily restriction) for export fishery products of small islands (it may be beneficial to set up regional codes of conduct);
- recognition of the continuous need by small island nations to pool specialized expertise, knowledge and resources at the regional and subregional levels;
- zonation and maintenance of 'no-fishing' areas for communities wishing to gain a competitive advantage in ecotourism, and the maintenance of separate fishing areas for subsistence and supply to tourist restaurants;
- zonation of urbanizations and capitals as areas in need of special fisheries management attention, better linkages with land-use planning processes and recognition of the fact that nontraditional resource users have to play in the management process;
- less eagerness by government trade-promotion authorities to approve permission to trade in, or export, particular resources. A regional code of conduct and certification scheme might assist in making decisions on permits;
- more awareness of the potential dangers to sustainable reef fisheries posed by modern technology and entry into the cash economy;
- support for regional campaigns under the International Year of the Reef in 1997;
- better public awareness for importing countries of the fragile nature of certain specialty seafood resources. The market demand is so large that it is unlikely to have a major effect on the volume of trade, but it is less likely to increase prices (and thus the profitability of exploitation) than trade restrictions;
- better recognition of the deleterious influences that polluted runoff and poor land-use practices can have on the coast and coastal fisheries. It is too easy to blame the fishing community for all the

overexploitation, when it may be a result of a lowered carrying capacity of the environment;

- more statistics about noncommercial fishing activity in small island states, and more estimates of stock status. It is unrealistic to expect that absolute assessments can be provided, but rigorous comparative assessment and prioritization should be made possible. Initiatives for monitoring coral reefs should also encourage the existing infrastructure to quantitatively monitor the status of resources;
- assistance to the government planning offices of small island governments in quantifying the value of subsistence fisheries;
- in the absence of resources for information sharing and communication, realistic subsidies by small island telecommunications providers or governments for overseas internet linkages, until the market for commercial providers is established; and
- curriculum development, both in small island nations and overseas schools taking a high percentage of small island students, to cover coastal fisheries stewardship and responsibility.

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A New Paradigm for Managing Marine Fisheries in the Next Millenium

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ABSTRACT

The history of modern fishery management is replete with spectacular failures. Conservationists have responded by seeking to strengthen laws and treaties and stimulate government action. But many commercial fishers and their organizations in developed countries, dependent on a steady income to sustain boat mortgages and marginal businesses, have steadfastly resisted change. The resulting political stalemate has helped make the decline of world fisheries virtually impossible to reverse. Reversing the fisheries crisis will require a major overhaul of contemporary fishery management.

Nongovernmental organizations (NGO) can play an important part by arousing public concern and harnessing market forces in support of new international norms. A series of necessary reforms is presented, based on reviews of past NGO attempts to influence the course of modern fisheries. Current impediments to NGO activity are discussed, and I suggest how, by working together, conservationists, scientists, fishers, industry and governments can help shape the future of world fisheries. WWF and Unilever Corporation, a major buyer of frozen fish products, have taken a first step by launching the Marine Stewardship Council initiative, an innovative plan to bring consumer power to bear in favor of well-managed fisheries.

INTRODUCTION

The need for fundamental reform of marine fishery management has become abundantly and painfully clear over the past decade (Earle 1995; Parfit 1995; Safina 1995; Weber and Gradwohl 1995; WWF 1996a,b,d). Fisheries that once sustained coastal communities have suffered catastrophic declines. In some areas, excessive fishing has driven staple species such as northern cod and the Atlantic halibut commercially extinct. The Food and Agriculture Organization of the United Nations (FAO) (1995) reported that 70% of the world's commercially important marine fish stocks are fully fished, overexploited, depleted or slowly recovering. Governments pay an estimated $54 billion each year in fisheries subsidies to catch only $70 billion worth of fish (FAO 1993). Increasingly volatile 'fish wars,' such as the 1995 dispute between Canada and Spain, have erupted over what remains. Marine catches could no longer reach 500 million mt · year^{-1}. Undoubtedly, modern commercial fisheries have exceeded the limit of the seas.

The essential question is not whether the past model of marine fishery management has

failed, but why. What lessons can we draw for the future? Throughout modern history, governments have largely managed worldwide marine fisheries for the growth and development of their associated commercial fishing industries. Decisionmakers have paid scant attention to the sustainability of those fisheries, much less to the health of their associated ecosystems or the needs of artisanal fishers exploiting the same species. In virtually every case, the short-term socioeconomic needs of a region's fishing industry have rendered long-term sustainability of catches a futile management goal. In many parts of the world, subsidized fleets have become grossly overcapitalized (FAO 1995). Unsustainable fishing has literally become an industrial addiction.

This predicament cannot be attributed to lack of scientific information. Fisheries scientists have provided nearly accurate models of fish population dynamics and estimates of fishery production for years. In most cases, fishery managers, more concerned with political than scientific realities, have ignored the implications of the best available science. Politicians have frequently intervened in decisions about specific fisheries. Governments facing undeniable disasters have typically devised politically expedient 'solutions' and then described them as environmentally necessary. Management actions that might have prevented the disastrous collapse of fisheries but which carried a price unacceptable to industry have been scrupulously avoided. Society has simply lacked the political will to forestall the fishing industry's tendency to use up its living capital and thereby destroy itself.

Turning this situation around will require more than merely reinventing contemporary fishery management. Two overlooked influences will have to be harnessed to help reverse the fisheries crisis and forge a new paradigm of management: public support and market forces (Sutton 1997). First, greater public awareness, concern and involvement in fishery management must be generated. Somehow, the same worldwide public concern that motivated governments to ban the trade in elephant ivory and outlaw commercial whaling must be brought to bear. Second, market-led economic incentives must be created to promote sustainable fishing.* Conservationists, working with responsible, progressive seafood companies and other stakeholders, must develop market reforms that will encourage consumers to purchase seafood products that come from sustainable, well-managed fisheries.

This paper will outline 10 essential reforms for marine fishery management and suggest how conservationists, scientists, fishers, industries and governments, by working together, can help shape the future of world fisheries and the marine environment

RESTORING ABUNDANT SEAS: 10 ESSENTIAL REFORMS

To reverse the fisheries crisis, long-term solutions must be developed and made politically feasible through public pressure and economic incentives. The following package of 10 reforms will be essential to speed up the transition to sustainable, well-managed and ecologically sound fisheries:

- Strengthen national, regional and international capacity to manage marine fishes. Governments must allocate sufficient funds to develop the scientific and technical capabilities needed to adequately manage their marine fisheries. Nations suffering from a fishery management system rife with conflicts of interest must

*'Sustainable use' means using renewable resources such as marine fisheries 'at rates within their capacity for renewal' (IUCN/UNEP/WWF 1991).

reform their laws (WWF 1995b). International commissions charged with managing shared fisheries and those on the high seas must immediately implement the provisions of the 1995 United Nations (UN) Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks. This requires regional bodies to open their decisionmaking procedures to public scrutiny. Fishery management at all levels must be relieved from sweeping political interference aimed at satisfying the short-term economic needs of fishers rather than the long-term requirements of fish populations and the marine ecosystem. To ensure that these reforms are carried out, the UN should create a high-profile Global Oceans Forum to elevate fishery conservation and other ocean issues on the international political agenda. The Oceans Forum could report annually to the UN Secretary General on the state of the oceans, especially marine fisheries (WWF 1995a).

- Focus management programs on limiting effort and restricting access to fisheries. Past efforts on fishery management have been characterized by ineffective measures such as mesh-size restrictions and trip limits that simply attempt to mandate inefficiency (WWF 1995b). These techniques should be abandoned in favor of management schemes that limit fishing effort, especially in fisheries that are overfished or depleted. Effort should be reduced to levels consistent with sustainable fishing and the recovery of depleted species. Limited-access programs should prevent new entry into fisheries that are fully subscribed. Such programs should form a part of comprehensive management plans for each fishery. Private property rights in fisheries, if any, should be created with extreme caution to safeguard the public interest in these resources.
- Enact and implement recovery plans for depleted species. Many overfished species, even those that have been severely depleted, are not subject to any kind of recovery plans. As a matter of priority, fishery managers should develop and implement effective recovery plans that include target population sizes and timetables for achieving them. Primarily, the biological requirements of the fish populations involved, and not the short-term demands of the local fishing industry should drive the targets and pace of these plans. Well-managed fisheries that are allowed to recover from past overfishing would help restore the vitality of the marine ecosystem and concurrently yield far more to fishers.
- Reduce and eliminate the subsidies that sustain commercial fisheries. The $54 billion in subsidies that is propping up unsustainable fisheries must be eliminated immediately, including those funds for shipbuilding and construction, refitting of fishing vessels, market research and development, industry bailouts, low-cost industry loans and development of fisheries 'for underutilized' species. Where subsidies are provided, they should be part of a comprehensive plan for the future of the fishing industry, including decommissioning of fishing vessels and retraining of fishers, where necessary.
- Accelerate programs for decommissioning excess fishing fleet capacity. Overcapacity due to unbridled growth of the world's fishing fleets is one of the most serious problems facing marine fisher-

ies today (WWF 1996e). At a minimum, funds available for vessel buyback and decommissioning programs should be increased as quickly as possible to expand these programs and achieve an immediate reduction in fishing effort (House of Lords Select Committee on Science and Technology 1996). Capacity-reduction targets specific to each fishery should dictate the funding of future decommissioning programs. Governments should make the appropriation of these funds a top priority in drawing up their annual fisheries budgets.

- Expand programs for retraining fishers displaced by overfishing and lack of skills. The legacy of past open-access fisheries is a population of fishers that far exceeds the number required to catch what fish are available. Many of these people have few skills or professional abilities other than fishing or fish processing. Training programs that will teach displaced fishers about other sources of livelihood and move them to productive employment in other sectors as quickly as possible are needed. Funds for this retraining should be a priority; these and the funds for decommissioning programs should be always made available.
- Develop social and economic incentives for sustainable, well-managed fisheries. Ironically, today's social and economic forces provide incentives for unsustainable, destructive fishing and not for sustainable, well-managed fishing. Governments should take the lead in developing and enacting economic incentives for sustainable fishing, thus providing a 'carrot' rather than merely the 'stick' of prescriptive regulations. Voluntary, market-led incentives for sustainable fishing must be created to swing market forces and consumer power behind efforts to recover and sustain clean, well-managed fisheries. This will require the alliance of conservation organizations and progressive seafood companies to educate consumers about the enormous potential effect of their purchasing decisions.
- Reduce the 'footprint' of developed countries on Third World fisheries. Northern states pay huge amounts to secure access to the fisheries of other nations, notably in the developing world. In 1994, for example, the European Union (EU) spent 36.7% of its fisheries budget of more than 750 million ECU to subsidize access to foreign fisheries by the EU distant-water fleet (EC 1994). International standards for distant-water fishing should be developed as a matter of priority and enforced by UN mandate. No state should be permitted to purchase fishing rights from a foreign government without a full assessment of the impacts of such fishing on the specific fisheries involved, their associated marine ecosystems and indigenous fishers that have relied on the same resources for generations. The use of fishery development funds by northern countries to coerce political favors from developing nations, such as their votes at the International Whaling Commission, should be actively discouraged.
- Eliminate destructive fishing practices such as the use of poisons and explosives. Destructive fishing practices should be phased out immediately in favor of more sustainable, less destructive alternatives. Enforcement of laws that prohibit cyanide, bleach and dynamite fishing should be strengthened. Funding should be provided for programs that train fishers to use techniques other than poisons and

explosives (Veitayaki et al. 1995). Governments and industries should ban the use of poisons and explosives used by illegal fishers. Where specific fisheries have traditionally used poisons, such as cyanide in the 'live fish' trade of East Asia, simple tests should be devised that allow inspectors and customers to determine when poisons have been used.

- Reduce and eliminate the bycatch of marine wildlife in commercial fisheries. Commercial fisheries currently kill and waste an estimated 18-40 million mt of fish and other marine wildlife annually (Alverson et al. 1994). Modern fishing practices have a devastating effect on marine biological diversity and the physical environment of the oceans (Dayton et al 1995; Lee and Safina 1995; National Research Council 1995; WWF 1996c). Effective bycatch reduction devices on fishing gear can prevent this enormous destruction and waste of marine life. Mandatory programs that require the use of such devices should be imposed immediately wherever they are available. Incentives such as bycatch quotas should be imposed or made available to encourage the use of the least destructive fishing gear and practices. When implementing programs to reduce waste by allowing the landing of bycatch, governments should use extreme caution to ensure that these programs do not impede bycatch reduction efforts. The reduction of waste should go together with the elimination of bycatch.

CREATING INCENTIVES FOR SUSTAINABLE FISHERIES

Regulation alone, whether at the local, national, regional or international levels, cannot be expected to resolve the fisheries crisis. At best, governments and multilateral organizations such as treaty bodies merely instate the lowest acceptable standards of practice. Moreover, the recent experience with the International Commission for the Conservation of Atlantic Tunas and other regional fishery management bodies suggests that reliance on governments and international organizations alone to achieve conservation goals would be unwise (Safina 1993; Sutton 1996).

The next century will likely see further worldwide movement toward deregulation, privatization, trade liberalization and decentralization of government authority. According to Elizabeth Dowdeswell, Secretary General of the United Nations Environment Programme, the market is replacing the democratic institutions as the dominant force in society (Dowdeswell 1995). In the future, it will be increasingly necessary for conservation organizations to find industry partners to build incentives for sustainable fishing. Market forces themselves must be engaged to counter unsustainable fishing and its powerful proponents. History has shown that sustainable use of resources is most likely to occur where conservation and economic goals can be made to coincide (Meadows et al. 1992). This is especially true in the case of large-scale extractive industries such as timber and fisheries (Sullivan and Bendall 1996).

In early 1996, as part of its Endangered Seas Campaign, the Worldwide Fund for Nature (WWF) formed a conservation partnership with Unilever Corporation, a major buyer of frozen fish and manufacturer of the world's best known frozen fish products under such brands as Iglo, Birds Eye and Gorton's (Maitland 1996). Unilever and its subsidiaries control about 20% of the frozen seafood market in Europe and North America. With sales of close to $50 billion in 1995, Anglo-Dutch Unilever is one of the world's largest consumer products companies. It produces and markets a wide range of

foods and beverages, soaps and detergents, and personal care products. Unilever operates through some 500 companies in 90 countries worldwide, and employs more than 304 000 people.

The purpose of the WWF/Unilever partnership is to create economic incentives for sustainable fishing by establishing an independent Marine Stewardship Council (MSC) by early 1998. WWF seeks a new approach to ensure more effective management of marine fisheries. Unilever is interested in long-term fish stock sustainability to guarantee a future for its successful fish business. The motivations are different, but the objective is shared: to ensure the long-term viability of global fish populations and the health of the marine ecosystems on which they depend.

Modeled on the Forest Stewardship Council set up in the early 1990s by conservationists and timber companies, the MSC will be an independent, nonprofit, nongovernmental body. The organization will establish a broad set of principles and criteria for sustainable fishing and set standards for individual fisheries. Only the fishery that meets the standards will be eligible for certification by independent, accredited certifying firms. Seafood companies will be encouraged to join sustainable buyers' groups and make commitments to purchase their fish products only from certified sources. Ultimately, products from fisheries certified to MSC standards will be marked with an on-pack logo. This will allow seafood consumers to select fish products with confidence that they come from a well-managed source.

A senior project manager will coordinate a team of consultants that will work on the development of the MSC. The project team will combine expertise in certification (i.e., ecolabeling) schemes with intimate knowledge of the commercial fishing industry. The team members will consult with a broad range of experts representing all stakeholders in marine fisheries. The team will draft the broad set of principles for sustainable fishing that will underpin the MSC. It will draw on the standards and guidelines embodied in existing international agreements, such as the Food and Agriculture Organization Code of Conduct for Responsible Fishing and the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks. It will enlist new information and expertise in the fields of marine conservation biology, economics, seafood marketing and commercial viability to help current thinking move forward.

WWF and Unilever will circulate the draft principles and criteria to a broad spectrum of stakeholders in fisheries: conservationists, fishers, seafood industry officials, fishery managers, lawmakers, etc. The partners will then sponsor a series of national and regional consultations and workshops worldwide. The purpose of these workshops will be to refine and strengthen the principles and develop a process for international implementation. WWF and Unilever are actively seeking the widest possible involvement of other organizations in this initiative.

If the experience of the Forest Stewardship Council (FSC) is any indication, prospects for the success of the MSC initiative are excellent. By the end of 1995, FSC-accredited companies such as Scientific Certification Systems had certified 20 forests comprising more than 4 million ha as conforming to sustainable forestry practices. More important is the fact that more than 100 timber companies and retailers worldwide had joined buyers' groups and made commitments to purchase only FSC-certified timber.

The creation of MSC can significantly alter worldwide fishing practices in favor of more sustainable, less destructive fisheries. When Unilever and other major seafood companies make commitments to buy their fish products

only from well-managed fisheries certified to MSC standards, the fishing industry will be compelled to modify its current practices. Governments, laws and treaties aside, the market itself will begin to determine the means of fish production.

CONCLUSION

Fisheries are the last major world industry that exploits wild natural resources for food. Only a series of fundamental reforms of fishery management, coupled with heightened public interest and powerful economic incentives, will stop chronic overfishing and shift the paradigm of fishery management from development and exploitation to conservation and sustainability. If marine fishes are to survive into the next millennium—both as important sources of food and vital components of ocean ecosystems—conservationists must bring to bear the same worldwide public concern that drove the international community to protect the great whales, tigers and elephants. This increased public support, together with market forces and consumer power, must be used to create social, economic and political incentives for sustainable, well-managed fishing. That will not be easy: fish neither sing like whales nor look like pandas. But the stakes are high: the future of world fisheries, their associated marine ecosystems and the millions of people that depend on them for food and employment.

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