OVERCOMING FACTORS OF UNSUSTAINABILITY AND OVEREXPLOITATION IN FISHERIES: SELECTED PAPERS ON ISSUES AND APPROACHES

INTERNATIONAL WORKSHOP ON THE IMPLEMENTATION OF INTERNATIONAL FISHERIES INSTRUMENTS AND FACTORS OF UNSUSTAINABILITY AND OVEREXPLOITATION IN FISHERIES

Siem Reap, Cambodia, 13–16 September 2004
Cover photograph:
Fishing for trey riel (*Henicorhynchus siamensis*) on the Tonle Sap Great Lake of Cambodia, where it represents the second most important staple food after rice. Courtesy of Peter Degen.
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PREPARATION OF THIS DOCUMENT

With financial support from the Government of Japan, an FAO project, GCP/INT/788/JPN, was initiated in 2001 to address issues related to factors of overexploitation and unsustainability in fisheries. The aim of the project is to improve fisheries management through better knowledge of factors leading to unsustainability and overexploitation in fisheries, and to improve the framework for the implementation of international fisheries instruments.

A first workshop on factors contributing to unsustainability and overexploitation in fisheries was organized in the context of this project in Bangkok, Thailand, from 4 to 8 February 2002 ("the Bangkok Workshop"). *

A second workshop on the implementation of international fisheries instruments and factors of unsustainability and overexploitation in fisheries was held in Mauritius, from 3 to 7 February 2003 ("the Mauritius Workshop"). **

A third workshop on international fisheries instruments and factors of unsustainability and overexploitation was held in Siem Reap, Cambodia, from 13 to 16 September 2004 ("the Siem Reap Workshop").

This document contains the report of the Siem Reap Workshop and eighteen discussion papers submitted by the participants. The report includes a summary of each paper and a synthesis of views expressed during the discussion, followed by the overall conclusions and recommendations of the workshop.

This document was compiled and edited by Ms Judith Swan, Consultant, and Dr Dominique Gréboval, Senior Fishery Planning Officer (FAO Fisheries Department) and Technical Secretary of the Workshop.

Distribution

Participants in the Workshop
FAO Fisheries Department
Fisheries Officers in FAO Regional Offices


ABSTRACT

An international workshop was organized in order to identify factors of unsustainability and overexploitation in fisheries and review major issues in the implementation of international fisheries instruments. The workshop referred closely to the results of two previous workshops held in Bangkok in 2002 (International Workshop on Factors Contributing to Unsustainability and Overexploitation in Fisheries) and in Mauritius in 2003 (International Workshop on the Implementation of International Fisheries Instruments and Factors of Unsustainability and Overexploitation in Fisheries). The Workshop focused on: the way main factors are addressed in international fisheries instruments; the difficulties and obstacles for States and regional fishery bodies to implement existing fisheries instruments; the way these difficulties and obstacles can be overcome; the lessons learned from the implementation of fisheries instruments in relation to overexploitation and unsustainability in fisheries; and the identification of possible gaps.

The Workshop was based on a review of eighteen discussion papers that took into account the outcomes of the previous two workshops and addressed the following themes: (1) Governance and fisheries management: causes or solutions for unsustainability; (2) Access and fishing rights; (3) Fishery management and sustainability dimensions; and (4) Small-scale issues and developing country perspective.

This document contains the report of the Workshop and discussion papers submitted by the participants. The report includes a summary of each paper and a synthesis of views expressed during the discussion, followed by the overall conclusions and recommendations of the workshop.
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INTRODUCTION

This is the third workshop in a project that aims at improved fisheries management through better knowledge of factors leading to unsustainability and overexploitation in fisheries, and an improved framework for the implementation of international fisheries instruments. The project, GCP/INT/788/JPN: *Factors of Overexploitation and Unsustainability in Fisheries*, was initiated in 2001 by FAO with financial support from the Government of Japan against a background of increasing concern for the rapidly deteriorating state of our marine fisheries.

Over the last 15 years, the marine fishery resources of the world have been increasingly subjected to overexploitation, detrimental fishing practices, and environmental degradation. The phenomenon now affects a majority of fisheries worldwide, with very severe consequences in terms of resource unsustainability, massive economic waste, increasing social cost and food insecurity.

Over the last decade, the international community has become increasingly aware of this situation. At the global level, a number of major legal instruments have been developed to address the management of marine fisheries. Among these are: the 1995 FAO Code of Conduct for Responsible Fisheries, the 1995 UN Fish Stocks Agreement and more recently the International Plan of Action for the Management of Fishing Capacity and the International Plan of Action on Illegal, Unreported and Unregulated fishing. Regional fisheries management organizations have also been strengthened, with a number of new ones having been created in recent years.

Yet the effective implementation of these instruments appears to be a slow and difficult process. There is seldom an international fisheries forum that does not call for increased determination to implement these instruments to halt and eventually reverse the present trend of resource depletion. This call was renewed recently in Johannesburg at the World Summit on Sustainable Development. However, because the factors contributing to fisheries overexploitation and unsustainability are still not widely understood, effective implementation of the instruments is commensurately difficult.

The first workshop, *The Workshop on Factors Contributing to Unsustainability and Overexploitation in Fisheries*, was held in Bangkok, 4–8 February 2002 (“the Bangkok Workshop”). It was attended by 24 experts, in their personal capacity, from a wide range of countries, disciplines and experience.

The Bangkok Workshop focused on identifying main factors of unsustainability (and to some extent, how they interact) and possible paths to solutions. The main factors identified and used by the present workshop as a sound basis for analysis, were: inappropriate incentives; high demand for limited resources; poverty and lack of alternatives; complexity and lack of knowledge; lack of governance; interactions of the fishery sector with other sectors; and the environment. The workshop also reviewed the adequacy of major existing international fisheries instruments.

The second workshop, *The International Workshop on the Implementation of International Fisheries Instruments and Factors of Unsustainability and Overexploitation in Fisheries* was held in Mauritius, 3–7 February 2003. It was attended by 31 experts from 23 countries, in their personal capacity, representing diverse expertise, backgrounds and nationalities.

The workshop was based on a review of nine case studies, each relating to one of the following categories of fishery: large volume small pelagics; tuna and tuna-like species; large volume demersals; and coastal fisheries. The aim was to identify issues and obstacles for fishery management, lessons to be learned and paths to solutions. This was achieved in the context of four dimensions of sustainability: bio-ecological; social; economic; and institutional. Special attention was given to policy considerations related to priorities for fishery management and conservation. A summary of the analytical framework developed in Bangkok and used as a basis for the case studies appears in Annex 3 of the report of the Mauritius Workshop.
Four working groups were formed; one for each of category of fishery, to review and further consider the issues raised in the discussion papers containing the case studies. Each working group presented a general report and conclusions to plenary and plenary arrived at general conclusions applicable to all categories of fishery.

In general, this workshop concluded that poor governance is a major cause for the inability to achieve sustainable fisheries. Other issues addressed in the conclusions are: the need to grant secure rights to resource users; a widespread need for capacity building, training and other specified forms of information dissemination and sharing; the need to extend the usual focus of fishery management beyond the biological component so that economic and social components (the latter considered to be insufficiently covered by fisheries management instruments) are also considered; a need for better progress at national and regional levels in implementing international instruments; and how a lack of will often impedes the achievement of sustainability.

The third workshop, The International Workshop on the Implementation of International Fisheries Instruments and Factors of Unsustainability and Overexploitation was held in Siem Reap, Cambodia 13–16 September 2004. It was attended by 25 experts in their personal capacity, representing diverse expertise, backgrounds and nationalities.

This workshop, building on conclusions of the previous two workshops, aimed at addressing management challenges through the presentation and discussion of a range of papers addressing the following themes: (1) Governance and fisheries management: causes or solutions for unsustainability; (2) Access and fishing rights; (3) Fishery management and sustainability dimensions; and (4) Small-scale issues and developing country perspective. A total of eighteen discussion papers were presented and considered.

This document contains the report of the Siem Reap Workshop and discussion papers submitted by the participants. The report includes a summary of each paper and syntheses of views expressed during the discussion are contained in this report, followed by the overall conclusions and recommendations of the workshop. The report was prepared by the Technical Secretariat of the Workshop.
PART I: REPORT OF THE INTERNATIONAL WORKSHOP ON THE IMPLEMENTATION OF INTERNATIONAL FISHERIES INSTRUMENTS AND FACTORS OF UNSUSTAINABILITY AND OVEREXPLOITATION

1. INTRODUCTION

The International Workshop on the Implementation of International Fisheries Instruments and Factors of Unsustainability and Overexploitation in Fisheries was held in Siem Reap, Cambodia 13–16 September 2004. The workshop was organized in the context of an FAO trust fund project (Project GCP/INT/788/JPN: Factors of Overexploitation and Unsustainability in Fisheries). It was hosted by the Royal Government of Cambodia.

The workshop was attended by 25 experts, in their personal capacity, representing a wide range of disciplines and experience. A list of participants appears in Annex 1.

The Technical Secretary of the workshop, Mr. Dominique Gréboval, welcomed participants in the name of the Assistant Director General of FAO for fisheries, Mr. Ichiro Nomura, and thanked the Royal Government of Cambodia for hosting the workshop. He recalled the aims and outcomes of the two previous workshops, and noted that the present workshop was organized in a different manner. Based on previous findings, it aimed at addressing management challenges through the presentation and discussion of a range of papers. These papers related to four main themes: Governance; Access and fishing rights; some dimensions of sustainability; Small-scale fisheries and the perspective of developing countries. He stated that discussion of the papers would be expected to provide some guidance addressing responsible fisheries management.

The workshop was opened by H.E. Por Try, Secretary of States of the Ministry for Agriculture, Forestry and Fisheries, Cambodia. He recalled the importance of fisheries to the economy of Cambodia and the very special significance of the Great Lake of Tonle Sap and its fisheries to the history and life of all Cambodian people. He also stressed that the issues to be debated by the workshop were of relevance to Cambodia as well as to most developing countries struggling to ensure the sustainable development of their fisheries sector.

The agenda adopted by the workshop appears in Annex 2. For each session (main theme) participants who had prepared discussion papers presented them to plenary. Brief discussions followed each presentation. A fuller discussion of the issues raised in the papers took place at the end of each session.

A summary of each discussion paper follows below in section 2. A synthesis of views expressed during discussions is presented in section 3, and conclusions in section 4. Recommendations appear in section 5.

2. SUMMARY OF DISCUSSION PAPERS

Following is a summary of each discussion paper presented in plenary. The full papers appear in Part II of this report.

2.1 Governance and Fisheries Management: Causes or Solutions for Unsustainability

2.1.1 Allocation and conservation of ocean fishery resources: connecting rights and responsibilities

Serge Garcia and Jean Boncœur emphasized that allocation of rights is a first necessary step towards conservation, but it is not a sufficient one. The performance of allocation in terms of conservation depends on: the control variable (allocated factor); the rights attributes; the selection of private versus communal property; the initial allocation; the effectiveness of the rights' administration; the value of the fishing privilege and the destination of the rent. The performance of fisheries in terms of conservation
appears to be dependent on the solution of a number of allocation dilemmas between: (i) consumptive and non-consumptive use; (ii) fishers and other sectors including conservation; (iii) sub-sectors of fisheries; (iv) national and foreign fishers; and (v) present and future generations. The issues become even more complicated in an ecosystem perspective with issues related to: (i) allocation between fishers (and human consumers) and other marine top predators; (ii) allocation in Marine Protected Areas; (iii) the interplay between conservation and social reproduction; (iv) contrasting evolution of the spatial units selected respectively for ecosystem management and fisheries resources allocation.

2.1.2 Is the failure of conventional fisheries management making the conservationist approach more appealing, offering a way out of making tough decisions?

Jake Rice systematically compared the conventional and ecosystem (or conservationist’s) approaches. While an ecosystem approach is enjoying increasing popularity, it will not make tough conservation decisions easier. The paper stressed the importance of applying the precautionary approach in the face of more acknowledged (not actually increasing it) uncertainty with an ecosystem approach. Interestingly, the elements of the conventional approach (as currently espoused by fishery managers and policy makers) and the ecosystem approach as advocated by conservationist are consistent, although their emphases are different (e.g., the former uses area management as one of many tools, whereas the later essentially makes Marine Protected Areas (MPAs) a requirement). Both approaches stress the importance of inclusive governance, although the conservationist approach actually gives more importance to top-down control of fishing to comply with goals set by broader society whereas conventional fisheries management gives weight to building a sense of stewardship in the industry itself.

2.1.3 Slow fish: creating new metaphors for sustainability

Ratana Chuenpagdee and Daniel Pauly used an analogy to the “slow food” movement as an approach to sustainability. The approach argues for small-scale, traditional methods, and consumer preference, to reduce or constrain fishing mortality.

2.1.4 Is fishery science helping to achieve sustainability in the North Atlantic?

Jean-Jacques Maguire concluded that the failure to take a balanced approach to the four components of sustainability (bio-ecological, social, economic, and institutional) has contributed to the unsustainable state of several important fisheries in a region that should benefit from advanced science and governance. In particular, the paper highlighted problems resulting from a “quasi exclusive” focus on the bio-ecological component.

2.1.5 Recent developments in international fisheries instruments and trends toward sustainability

Michael Lodge highlighted progress in implementing the 1995 United Nations Fish Stock Agreement. While progress has been made, such as adoption of an International Plan of Action on Illegal, Unregulated and Under-reporting and the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, there remain important gaps, such as minimal management of high seas deepwater fisheries. Many of the problems currently facing high seas fisheries are general enough to suggest some sort of global framework management system.

The papers of the session examined how governance interacts with sustainability. The critical elements, such as allocation, lower fishing mortality, the precautionary approach, integration and balance, looking beyond the fisheries sector, participatory and transparent decision making, are well known. So, why do shortcomings in governance still contribute to unsustainability? Stated another way, we know what needs to be done, and we’ve known for some time, so why haven’t we done it? Of course the answer is that it is not easy, and it relates to the “how” rather than the “what”.
2.2 Access and Fishing rights

2.2.1 Establishing Access Regulation and Rights

Ndiaga Guèye presented this paper by J. Catanzano, which provided a detailed road map to the introduction of access regulation and rights, using West Africa as an example.

2.2.2 Capacity Management and Sustainable Fisheries International Experience

Sean Pascoe and Dominique Gréboval concluded that significant progress has been achieved in bringing world wide fishing capacity under control. Overall, the growth of fishing capacity appears to have slowed, and decreases are observed in some areas. Capacity issues are usually addressed as part of fisheries management at large rather than as separate programmes. While quite relevant, this makes it more difficult to monitor and assess progress made towards the implementation of the International Plan for the Management of Fishing Capacity.

2.2.3 Do secure access rights and co-management guarantee sustainability?

Trysh Stone showed that advanced systems of access rights and co-management can still result in overfishing. Such systems can provide an opportunity for stakeholders to use the consultation process to delay decisions. To be successful, co-management bodies must be given clear objectives, boundaries and timelines to operate in. They must also understand that decisions will be made even in the absence of their reaching an agreement.

2.2.4 Sustainable Utilisation Of Fish Stocks – Is This Achievable? A Case Study from Namibia,

David Boyer and Helen Boyer noted that Namibia has developed a fisheries management system that includes many of the recognised “good practices” that should contribute to a sustainable fishery. Despite this, Namibia’s success has been patchy at best. Some stocks have recovered, while others have not, notably sardine and orange roughy. Of the main factors that resulted in unsustainable fishing of these stocks, uncertainties concerning the state and productivity of each stock resulted in management decisions which were insufficiently cautious to address the decline in the stocks. These declines could have been minimised if the precautionary approach had been applied. The overall conclusion of this case study has to question the applicability of conventional management systems, as used in Namibia and elsewhere.

2.3 Fishery management and sustainability dimensions

2.3.1 Will An Ecosystem Approach Mitigate The Factors Of Unsustainability?

Jake Rice observed that the Ecosystem Approach to Fisheries (EAF) directs fishery management to consider the effects of environmental forcing on exploited stocks, the effects of fishing on the ecosystem, and to work within a framework of integrated management and inclusive decision making. These four components interact with all the factors of unsustainability and all the dimensions, and they have effects on both short and long time scales. The greatest potential contributions of the EAF to mitigating the factors of unsustainability are for the first two components to address biological unsustainability due to complexity and lack of knowledge and externalities, and the latter two components to mitigate unsustainability on social and economic dimensions due to lack of effective governance, poverty and lack of alternatives, and possibly inappropriate incentives. For these potential benefits to be realised, however, three pre-conditions must be met: there must be scope to reduce harvesting in the short term, there must be scope to bear transition costs, and there must be scope to pay increased transaction costs.
2.3.2 The Need for a “Bigger Picture” and a Fishery-System Approach

Tony Charles argued for taking a broad ‘big picture’ of the fishery system, to address three of the six Factors of Unsustainability that go beyond the fishery per se, i.e. poverty and lack of alternatives, high demand for limited resources, and interactions of the fishery sector with other sectors. He suggested that “we will never see fishery sustainability if we restrict attention solely to what goes on within the fishery” and that if a condensed set of Factors of Unsustainability is used, an additional one should be “An overly narrow approach to fishery problems”. Charles recommended meeting the challenge by adopting a Fishery-System Approach that broadens from the Ecosystem Approach. He sought to motivate the need for these perspectives through discussion of resilience, livelihoods, community-based management, rights and over-capacity.

2.3.3 A simple framework for proactive management to mitigate unsustainability in fisheries:
Estimating risks of exceeding limit reference points (LRPs) of bio-ecologic, economic and social indicators

Juan Carlos Seijo described a number of challenges in fisheries, such as lack of governance, high exclusion costs, high enforcement and information costs, externalities among fishers, ‘free rider’ behaviour and the ‘social trap’ that leads fishers to act counter to what they know are their long term interests. Table 1 in his paper outlined some strategies to mitigate the high costs. He noted that subsidies – whether to develop the fishery or to alleviate crises – reflect a Factor of Unsustainability, but can also foster sustainability (e.g., by supporting more selective gear, or recruitment enhancing technology). Mr Seijo described work to develop a multidisciplinary set of indicators and reference points, involving a series of steps from the choice of indicators through a risk analysis and other steps.

2.3.4 Three Issues of Sustainability in Fisheries

Alain Bonzon presented this paper by Rögnvaldur Hannesson which observed, based on the history of the Norwegian fisheries over the last half century that: (1) in growing economies, it is seldom possible to maintain incomes of fishermen compared to other groups unless the number of fishermen decreases; (2) environmental variation make it difficult to sustain catches from specific stocks over long periods, although it might be possible to sustain global incomes and value-added through shifting fishing pressure from stocks to stocks; (3) temporary subsidies, particularly for decommissioning vessels, may promote sustainability of income and reduce fishing pressure, if this occurs within a well controlled management regime.

2.4 Small-scale issues and developing country perspective

2.4.1 The Unsustainable Exploitation of Inland Fisheries Resources in Cambodia

Srun Lim Song, Lieng Sopha, Ing Try and Heng Sotharith described the inland fisheries of Cambodia which produces 300 000 – 450 000 tonnes per year with an estimated price at landing sites of US$ 150 225 million. It ranks fourth among the World’s top in terms of total inland fish production, but it ranks first among the world’s top in terms of fish consumption per capita. A household survey carried out in 1995–96 suggests that the average fish consumption rate of 4.2 million people in central Cambodia is 67 kg/capita/year. Small-scale fisheries (family and rice field fisheries) production contributes more than 55 percent of total catch. It is highly significant for food security in the country, especially for the rural poor. The marine catch contributes only about 12–15 percent of the total fish production annually, due to Cambodia’s short coastline of only about 435 km.

The recent increase in fishing effort of the middle scale and family scale fisheries has led to increased fishing pressure on wild fish stock and increased the practice of illegal fishing methods, particularly electro-fishing and small-mesh size net (mosquito net), which lead to serious decline of fisheries resources. The decrease in number of spawning fish has resulted in the decline in fish productivity. The
changes of flow regime in the Mekong River floodplains may change the physical, chemical and ecological quality of river from upstream to down stream. The form and function of the rivers have changed as a result of dam construction and canalization of the river or tributary. The human settlement has also caused changes in land use. This has disrupted the seasonal pattern of fish migration for feeding and reproduction.

2.4.2 Kerala’s Marine Fishery: Evolving Towards Unsustainability: a personal statement spanning three decades

John Kurien offered a personal statement sketching his involvement in the fisheries sector of Kerala State, India over a span of three decades. Initially this involvement was as professional helping small-scale fishers to organize village marketing cooperatives. Later the involvement changed to one of a researcher and policy adviser dealing contemporaneously at the local, national and the international realms. By adopting a schematized diachronic narrative,1 an attempt is made to provide a glimpse into the manner in which the fishery became unsustainable. It also tried to sketch the inter-related hurdles which come in the way of moving (back/forward) to sustainability.

2.4.3 Size matters: scaling management and capacity to achieve sustainability in SIDS [Small Islands Developing States]

Patrick McConney and Robin Mahon focused on issues affecting the management of fisheries when fisheries authorities are small, as is typical in most Small Island Developing States, but also the case in many developing countries regardless of their size. SIDS are often stewards of large ocean spaces relative to land area, population and size of economy. Consequently, even if proportional in size to their populations, fisheries departments of SIDS are small relative to the ocean space they must manage and to the importance of fisheries in the society and economy. This is especially so in the contexts of food security, social structure, culture and environment. Much of the problem in the structure of small fisheries authorities is that they are modelled on large fisheries management agencies in large and/or developed countries, often with large commercial fisheries. Sustainable fisheries will be difficult to achieve unless there is a better fit between the scales of management and management capacities in SIDS. There is a need to research appropriate structures and functions for small fisheries authorities. Ideas are shared on some of the issues and possible answers that will require further dialogue and development at sub-regional, regional and international levels to ensure that real progress is made.

2.4.4 Poverty alleviation, sustainable livelihoods and management in fisheries

Edward Allison and Benoit Horemans sought to reconcile the apparently contradictory agendas of pro-poor fisheries development and the imperative to manage fisheries by limiting access. They first examine the role fisheries are thought to play in poverty alleviation efforts. They distinguish: (i) policy visions that portray fisheries as an ‘engine of economic growth’; (ii) as a means of providing better incomes or reduced vulnerability for ‘traditional fishers’; (iii) as a means to supply consumers, particularly poor consumers with elements of a high-quality diet, and; (iv) as a means to reduce the vulnerability of the poorest in rural society, including ‘non-traditional’ fishers (a broad safety net function). They argue that the compatibility of fishery management and poverty alleviation can be reconciled with each of these visions, but that such reconciliation requires greater compromise in some cases than others. Examples of fisheries that are managed under these four different visions are given. The conclusion is that, providing one understands and can define the main role for fisheries in the economy, one can begin to make policy that recognises the trade-offs between increasing contribution to poverty alleviation and the need to conserve the resource. One reason why fisheries do not get managed sustainably is that society expects them to deliver on too many incompatible functions.

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1 From Greek, meaning "across time". When examining a phenomenon there are two basic ways of looking at it: as it exists at some particular moment (synchronic study) or as it develops and changes across time (diachronic study).
Uli Schmidt emphasized that under conditions of imperfect governance and poverty, which makes top-down approaches to fisheries management vulnerable to elite capture and patronages, bottom-up approaches may be an avenue to explore regarding the potential for compliance and socially acceptable exclusion. Exploration needs to take the historical dimension of Community Based Natural Resource Management (CBNRM) into account and consider the larger social, political and ecological system within which NRM as its major determinant.

3. SYNTHESIS OF VIEWS EXPRESSED DURING THE DISCUSSION

3.1 Governance and fisheries management: causes or solutions for unsustainability

Fisheries are in a poor state under the four components of sustainability (bio-ecological, economic, social and institutional) even where fishery management has been implemented for decades. In particular, the extension of jurisdiction over fisheries has not lead to the expected improvement in fishery management within EEZs. This may be due, in part, to the imbalance given to the four components of sustainability: the bio-ecological component was overtly identified as being of primary importance, but in reality, social and economic considerations may have covertly taken precedence. Whatever the reason, it is clear that institutions have not proven effective at achieving sustainability under any of the four components of sustainability. The Conservationist approach implies a top – down approach to fishery management that has been shown to have little chances of success.

To be effective, fishery management should be explicitly integrated in a wider political framework with the aim of maintaining communities rather than saving fisheries jobs. Maintaining communities is important because reverting social systems to some previous state may be as or more difficult than reverting ecological ones. In order for fishery management to be effective, transition costs have to be explicitly identified and provided for.

Fishery management should be highly case specific. There are no universal solutions to 1) how and to whom allocate rights to fishery resources (or rights to participate in the fishery management process), 2) what the best gear and boat sizes are, 3) how to protect the resource, 4) what the objectives of fishery management should be and what decision making process are best, 5) the best pathway to achieve sustainability.

3.2 Access and fishing rights

As indicated above, fisheries problems should not be viewed in isolation but they should rather be considered part of the larger issue of planning the national economies. This could make it possible to find solutions to the unsustainability of fisheries not just in the fisheries sector, but also in other economic sectors. Particular care should be given to the fact that major institutions and donors as well as some national governments are still aiming at developing fisheries while local authorities do realise that sustainability may require exclusion of some participants. In this context, the development of fishery management plans for developing states should be concerned with finding the best way to contribute to the country’s well-being and economic development, not who is catching the fish – in some cases, perhaps in the short term, it could be more beneficial to have non-nationals catch the fish if they are willing to make a more sizable contribution to the economy of the country.

To be effective, fishery management in general but more particularly so under an Ecosystem Approach to Fisheries Management, needs to be able to make decision and implement them swiftly to deal with emerging threats such as a change in ecological regime. The need for swift action in the face of uncertain information and threats can be incompatible with the move to more consultative, co-management approaches. Co-management systems should therefore emphasise pre-agreed management
actions, to allow for swift decision making and implementation when it is necessary. In the real world however, there are few incentives to make swift decisions, and decisions are often delayed in the hope that the problem will disappear. This is rarely the case and there is a greater probability that in fact the problems of unsustainability will become worse rather than disappear.

Although the *solutions* to fisheries management problems may be case-specific, the *process* to take all the relevant parties to the solution may have some general properties and identifying the properties of such a general process would be of great value. The first step to solving fishery management problems generally involves the allocation of rights. There are two related parts to the problem of allocating rights; regulating access on one side, and dealing with those who are displaced on the other. Confusing the two issues causes problems, but so does dealing with only the first of them in isolation. In some cultures/governance systems, exclusion is either unacceptable or not possible to implement. Perhaps systems of exclusion that are not permanent (e.g. Namibia) could be an option in such places. It should be noted that the social position of fishermen in communities/cultures may affect how alternative approaches work, and needs to be considered in the development of specific management measures. In this context, when groups which can affect success of fisheries management, or participate in its development, are very heterogeneous, it may only be possible to gain consensus on very abstract objectives at first, and it may require a very long time to progress to operational components of management implementation.

“Participatory” processes for developing management plans are not all the same; their dynamics can vary greatly depending on how power is distributed and the personalities and background of individuals involved. When moving to participatory governance, it is important to ensure that the objectives of those participating in management align with the objectives of society in general (“the fox guarding the henhouse”), while ensuring that decision-making is sufficiently efficient to provide responses to challenges early enough to be effective.

It is generally recognised that the allocation of rights and the resolution of disputes is a pre-condition to successful fishery management. However, “rights” are of many types and different challenges and considerations apply to allocating access rights versus allocating rights to be involved in management. In Australia, when rights were allocated in some fisheries, the “race for fish” was replaced by a “race for rights”, which brought its own problems.

Fishery management is currently perceived as having a poor track record. However, the standards for what is “successful management” need to be considered further. Is management a success as long as stock collapses or major social unrests are avoided or is it necessary that stocks be optimally rebuilt and that optimal economic and/or social benefits be produced? As an example, Namibia implemented nearly textbook “conventional fisheries management”, but the results have not met expectations in some cases (hake), and have largely failed in some others because of strong environmental forcing of stock dynamics (sardine) or biological uncertainties were larger than planned for (orange roughy). This suggests that it could be helpful to consider the “inherent manageability of a stock or group of species” (*sensu* Bakun) as a part of the sustainability challenge? Similarly, where capacity (at least fleet size) has levelled off, it would be important to determine if the cause is success of plans to allocate access or just the economics of the fishery?

There is pressure in an increasing number of countries to move fisheries management from Fisheries Ministries to Environment Ministries. This could be expected to necessarily imply pre-eminence be given to the bio-ecological dimension of sustainability, one of the possible reasons for unsustainability. If fishery management were moved to Environment Ministries, it could imply that large-scale commercial fisheries would *de facto* be perceived as not viable with possible large consequences in terms of food supply.
3.3 Fishery management and sustainability dimensions

The Ecosystem Approach to Fisheries is a relatively new concept that is understood to mean different things to different people. Some consider that fishery management has always implemented an ecosystem approach, but a majority believe that the EAF means that extent process would need to be changed. But not everyone agree on what changes mean. Does it imply extending to all species the type of monitoring that is done for commercially harvested species? In this context, a good indicator of ecosystem state is not necessarily a combination of species specific indicators. What is needed is an aggregated indicator that would perform a role similar to that of body temperature in warm blooded animals, i.e. below a threshold the ecosystem would be considered in good health, but above the threshold, it would be considered in need of remedial action. Will the EAF result in decisions that are more conservationists, or will a better understanding of the ecosystem make it possible to tolerate greater ecosystem modifications than would have otherwise been the case under less knowledge. There was a consensus in the workshop that humans should be explicitly included in the EAF, but such a consensus does not exist outside the workshop. If the human dimension were excluded from the EAF, the economic, social and institutional components of sustainability would not be explicitly addressed and the EAF could imply “fancier” biological research rather than the multidisciplinary research that this, and the two previous workshops, have considered to be necessary. Although the knowledge on fish stocks is far from perfect, it is an order of magnitude larger than the existing knowledge about the fishers, the fishing communities, and the fishing fleets. There is general agreement that implementing an EAF will cost more than current initiatives do. Considering that the EAF broadens the scope of factors to be considered in fishery management, it would be normal to expect to broaden the number of sources of revenues to pay for an EAF. In this context, if small-scale fishers hold much local ecological knowledge, allocating communal rights so these fishers can manage the fishery could be an innovative way of implementing an EAF.

Although it is fully recognised that achieving sustainability requires making changes to the status quo that will involve compromises under the four components of sustainability, there is an expectation that the solutions will generally be “win – win”. This implies that the current situations are not “Pareto – optimal”, that is it is possible to improve the situation of several players without making anyone else worse off. Perhaps one way of achieving this is by implementing governance systems that go beyond the fisheries system, as suggested above. Particular attention needs to be paid to implementation challenges considering that fishers are often resisting the idea of involving non – fishers in fishery management processes. In this context, there is substantial room to improve the tools used to support operational decision making. A framework of reference points does exist for the bio – ecological component of sustainability for commercial species, but much remains to be done to explicitly and quantitatively take into account the social and economic components in an ecosystem approach. Obviously, the ecosystem approach also implies that the governance system goes beyond the fisheries context.

Improvements in fisheries technology combined with the desirability to maintain fishing mortality relatively constant and within safe biological limits, imply that the number of fishermen will decrease over time if they are to work full-time. This also argues for governance systems that go beyond the fisheries sector. Given that fishery management is about managing the activities of humans, not those of the fish and that ecosystems do not always respond to management actions in the anticipated way, there is in fact little scope for intervention on the ecosystems themselves. This suggests that aiming for soft bio-ecological sustainability may have a higher probability of achieving overall sustainability than aiming for hard bio – ecological sustainability would.

3.4 Small-scale issues and developing country perspective

Small-scale fishers should not be blamed for all over-exploitation problems. Often, large scale illegal fishing takes place with the tacit or active collusion of government officials whose salaries are inadequate forcing them to earn income using the means at their disposal. In addition, government
departments may lack adequate budgets for enforcement. Dealing with this problem requires a dual approach: civil service reform (cut jobs, increase salaries) and community-empowerment through organisation, capacity building. However, entitling communities to fishing rights is not sufficient if they do not have the means, including government support, to deal with illegal large-scale fishers and outsiders. It would be important to reconcile the conservation and livelihood approaches. Considering that even small-scale fisheries may cover large geographical areas and be transboundary (e.g. Mekong system) multiple scales of governance are necessary and these may require considerable organisational capacity.

The Kerala model for development anticipated one of the central tenets of the livelihoods approach – building on strengths. The project was guided by the philosophy that you start with what you have and build on it. It pioneered community-based development approach in the 1950s. As in several other parts of the world, Kerala’s community development was undermined or reversed by the 1960’s modernisation agenda, but it did get back on track in the 1970s and 1980s. As indicated above, attempts to organise at community level need connecting to higher scales of governance. Historical, political-economy perspectives are important analytical tools that are not sufficiently used. As discussed in previous sessions, economic development of the area or of the country can make a substantial contribution to sustainability of the fishery sector by absorbing labour. In addition, increased demand from urbanising middle-classes can result in increased domestic prices for fish, so that the remaining fishers may be able to benefit from this economic growth and self-regulate through community organisations. However, it is important to take into account the particular context, i.e. know where you are starting from on the social, economic and political dynamics of fishing communities.

Although it is accepted that the ‘solution space’ within which poverty alleviation (livelihoods approach) and resource sustainability can be addressed simultaneously may be restricted, for some fisheries at least, there is some room for manoeuvre in setting harvest rates higher, perhaps temporarily, than would be biologically optimal in order to meet poverty alleviation objectives. In implementing community-based management it should be recognised that not all communities operate as harmonious entities and there are examples of apparently archetypal ‘traditional’ communities in Indonesia that in fact operate as clusters of highly competitive market enterprises (but who nevertheless established rules of cooperation).

4. OVERALL CONCLUSIONS

4.1 Transition and reversibility

Overcoming the transition costs to improve governance is a key barrier to sustainability. The costs are monetary, social, and political. There are always costs, but they may not be known, minimized, or equitably distributed. Thus, it is not enough to espouse a vision; it is necessary to plan and manage the transition. There are many ways to get from the current situation to a governance situation deemed better for sustainability. Although the desired transition path will, to some degree, be dictated by the current situation, the choices that will be made will influence the amount, type (monetary, social or political) and distribution of costs. Exclusion costs, associated with the assignment of access rights, can be particularly problematic. In some communities, fishermen prefer to remain collectively poor together rather than excluding some in order to better protect the resource and/or to allow improving the economic situation of small number of them. In such cases, it is important that any pathway to increased sustainability explicitly incorporate an equitable solution for those that may be left out of the fishery. It is therefore not enough merely to adopt a rights-based management system; plans must be made to take care of those excluded from participation when the rights are allocated.

Win-win management options to improve sustainability remain elusive. It still appears to be the case that pathways which offer potential for major reductions in the effects of a dominant factor of unsustainability on a particular dimension of sustainability usually seem to increase the risk that other factors will be expressed more strongly on other dimensions. For example, reducing participation in a fishery by allocating rights, should improve on the economic and on the bio-ecological components of
sustainability, but, if done without an equitable plan to compensate those left out, would cause a deterioration under the social (and possibly institutional) component of sustainability.

Sustainability does not mean constancy or stability: fish stocks, ecosystems and societies are inherently dynamic and in sustainable systems, stocks and ecosystems will continue to vary. The challenge is that human actions do not cause the stocks and the ecosystem to fluctuate outside natural ranges. Sustainability requires that perturbations to fishery ecosystems (including the human dimensions of the ecosystems) be reversible. Reversibility of a system is linked to its resilience – the ability of a system to absorb and ‘bounce back’ from shocks, whether internal or external. Evaluating resilience is important in fisheries because (a) it requires a system’s approach, i.e. to look at all the components of the fishery system, and (b) it focuses on responding to uncertainty and perturbation, two features that dominate in fisheries.

Resilience and reversibility have different implications for natural and human components of ecosystems. Individual fish stocks may show large natural fluctuations, which may be cyclical or not, due to human intervention or not, without altering the integrity of the ecosystem. Resilient systems will be able to withstand large natural and human interventions and still be able to revert to a previously observed “natural” state. Less resilient system may be able to withstand minimal natural and or human intervention. The human components of ecosystem may be less reversible than the natural components: once a fishing community has lost its fishing people and the knowledge of how to fish it may never be able to regain it. Another fishing community of a different nature may emerge somewhere, but the human component of the ecosystem where the lost community used to belong, has been irreversibly changed. It should be recognised, however, that social changes does occur, unrelated to fishery governance.

Flexible and responsive systems that can absorb fishery resource fluctuations and other shocks and uncertainties are likely to be more robust than fixed systems (e.g. filters rather than barriers to entry; resource tracking rather than fixed carrying capacity; facilitation of exit strategies/diversification) – but it is important that any responsive system should minimise time-lag. Any tracking or flexible system that fails to respond sufficiently rapidly to resource depletion could compromise sustainability – for some systems, this could comprise a high-risk management strategy; ‘systems that delay responses risk collapse’.

4.2 Governance, access rights and trade-offs

The previous two workshops on Factors of Unsustainability recognised that the allocation of rights is necessary in order to address factors of unsustainability. The conclusion that some form of rights allocation is essential for sustainable fisheries management continues to hold. Before rights can be allocated, however, outstanding conflicts must be resolved. In addition to rights to participate in the fishery, good governance could also assign rights to participate in the fishery management process.

The allocation of rights to participate in the fishery need not be allocated to individuals: depending on the specifics of each case, the allocation could be to many society sectors, including communities, individuals, and corporate or social groupings. It is considered essential that the most appropriate form of rights (to fish or to participate in the fishery management process) be given to the most appropriate entity on a case by case basis. The scale of rights would be expected to differ for different types of activities: for example, any member of society could be given the right to participate in the strategic planning of the fishery, while participating in the operational management of the fishery (opening and closure dates, etc.) during the season would be expected to be restricted to those having a direct interest in the fishery. It is therefore necessary to identify the appropriate time scales, processes and responsibilities of the various interested parties for: policy (long term, large scale), development planning (medium-term, national/local scale) and management (short-term, local scale).
The best scales for managing human actions and the scales relevant for the bio-ecological component of sustainability are often different. For management to be successful the multi-scale governance must be integrated effectively, so the nesting of decisions must be streamlined and complementary, so the various scales work together towards a common goal and governance is expressed at the appropriate scale for each factor.

Failing to resolve conflicts before allocating rights or to match the type of rights and mode of implementation to the specific conditions of a fishery can create additional problems without mitigating any existing ones. Even when appropriate forms of rights are implemented in a fishery or a community, successful fisheries management is not guaranteed. Fishery management is an on-going process that requires continuous attention and adjustments. Things can go wrong with how the rights are exercised, or how decisions are reached within the rights-based management systems.

The specificities of fishery management are often considered to involve the area, species, gear types, and cultural characteristics of the people involved. It is also important to take account of the individual personalities, their histories, their power and their power relationships. They may well determine what can be realistically achieved in terms of redistributing rights of access, use and management.

It is important to recognise that good governance systems comprises several interacting and overlapping layers of management at local (micro), national / regional (meso) and global (macro) scales. Fishery management is affected by global processes such as ‘good governance’ agendas, market liberalisation and globalisation. As globalisation continues and affects fishery sustainability positively (Marine Stewardship Council) or negatively (increased demand), fishery manager as well as fishermen should evaluate the possible effects of globalisation on short term, medium term, and long term policies. Global issues, although they may involve all layers of management, would be expected to be the main responsibility, at least for co-ordination purposes, of the central fishery management agency while the daily operational management of the fishery would be expected to be the responsibility of local authorities. It is important that the roles and responsibilities of each party involved in fishery management be clearly identified and unambiguous.

Although the detailed characteristics of governance systems and rights allocation are believed to be highly case – specific, it is expected that the processes followed in identifying and implementing the appropriate governance systems and form of rights for a particular fishery may have broader and more general application. It would therefore be important to document both successful and unsuccessful examples.

There are few areas where all interested parties have the capacity to participate meaningfully in all aspects of fishery management. In addition, the theory and implementation of “best practices” continue to evolve. There is therefore a need for capacity building and continuous education for co-management and other forms of participatory management; to develop decision – making, facilitating and modelling tools in order to design and implement decision-making processes that are legitimate, transparent and representative.

Although rights may have been allocated to many society sectors, including communities, individuals, and corporate or social groupings, the ultimate responsibility to achieve sustainability under its four components rests with the State. It is important that parties involved in fishery management are aware that if they fail to meet the requirements of their duties, someone else will make decisions in their stead.

4.3 Trade-offs

There are many reasons to broaden participation in governance of fisheries, e.g. the objectives of fishery management can be expected to better reflect societal views, the knowledge bases for decision – making would be expected to be greater, and the governance system would be expected to be improved, leading to easier implementation of the fishery management measures. However, experience shows that
participatory decision-making is costly, time consuming, and changes tend to be made incrementally. There are also examples of fishery management failures that could have been prevented by more decisiveness (i.e., for large and rapid changes). This raises the possibility that although benefits are expected from increased participation in most situations, there are instances where the benefits might be offset by the inability to act decisively in the face of a crisis. This argues for well-specified control rules or contingency plans that accelerate decisions when needed.

Changes to fisheries governance systems towards more inclusiveness and decentralisation may be less prone to the inability to act decisively in the face of a crisis. However it is unclear whether this is a consequence of genuinely greater potential for governance changes to improve sustainability or because thorough social science studies are lacking, so the limitations and risks of governance changes are not well documented at present.

In general, it is expected that the implementation of a true ecosystem approach, including the human dimension, will result in improvements under the four components of sustainability. A narrow implementation of an ecosystem approach, however, not taking into account the human dimension, may result in an imbalance in the attention given to the four components of sustainability, with a bias favouring the bio-ecological component. Whether the implantation is broad or narrow, an ecosystem approach will necessarily require trade-offs to be made.

4.4 Ecosystem and livelihood approaches

The Ecosystem Approach (EA) is widely promoted as an avenue to improving fishery sustainability. The analysis presented in the Workshop suggests that, like so many aspects, the potential of the EA is context-sensitive: depending on the fishery, it may improve some components of sustainability, but it may make it more difficult to achieve sustainability under the other components. Implementing an EA will therefore require tradeoffs as indicated above. Humans are part of fishery systems. Therefore, humans should be explicitly included in the EA to fisheries. Conceptually there seems to be consensus that this should be the case, but in practice few implementations of the EA have done it or seem set to do it.

However, a broad implementation of the EA could work in synergy with a sustainable livelihoods approach in achieving sustainability. The two approaches have different entry points, the EA is generally more concerned with the bio-ecological component of sustainability while the sustainable livelihood approach is more concerned with the human component, but they do seek the same objectives and could be interpreted to mean a common approach. The tools and information requirement for each approach are different however, and so are the benefits. From a human development perspective, the livelihood approach would be expected to bring more rapid pay-offs at lesser costs. A narrow implementation of an ecosystem approach, focussing mostly on the bio-ecological component, could imply huge costs of increasing knowledge with few immediate benefits to society, particularly in developing countries. With appropriate institutions and governance system, it should be possible to implement science – based approaches, in the context of a management objective driven process, at minimal incremental costs with respect to increasing knowledge.

In this context, it is important to avoid over-generalisation, either about poverty and lack of alternatives as a root cause of unsustainability in small-scale fisheries, about what function/role small-scale fisheries should play, or about what policy and management strategy could maintain or enhance their role. The role of small-scale fisheries in a sustainable livelihood approach may well vary from case to case. Two main strategies seem to apply – fishing as part of a settled existence incorporating other income-generating activities, such as farming, trading or involvement in tourism, or specialised fishing by geographically mobile people. The management needs of these two groups-settled farmer-fishers and migrant fisherfolk – are very different and determining their relative importance to the fishery sector and the economy is an important component of the information needs for management.
Understanding the role that fishing plays in the economy and society is also important in guiding sectoral policies and setting management objectives. Small-scale fisheries may play the role of 'safety net' for the landless poor, they may provide a component of a subsistence-orientated livelihood, or they may provide economic opportunities and a source of capital for investment in other ventures, depending on the status of the stocks, the availability of other economic opportunities and the nature of access regimes. In all these cases, fisheries are contributing to some aspect of poverty prevention or poverty reduction. Fishery policy objectives need to be linked with poverty reduction strategies and programmes to allow for successful management, including co-management.

It should be possible to alleviate poverty through fisheries without necessarily increasing fishing effort: improving governance, providing social services and building human and social capital all serve to reduce vulnerability and livelihood insecurity. Reducing vulnerability through empowerment of fishing communities means that more solutions are available to achieve the four components of sustainability than pessimistic assessments of Malthusian crisis in the small-scale sector might suggest. Reduced vulnerability also helps to build a sense of resource stewardship. With increasing security comes increasing concern for the long-term future, including intergenerational concerns.

Poverty alleviation and prevention can be achieved through pro-poor access regimes favouring those with few other opportunities or assets. Some exclusion may be necessary, however: pro-poor policies do not imply that everyone can get in the fishery. Re-allocating resources to favour the poor will not be easy. Where economic benefits can be extracted from resources, those who have economic and political power will tend to control access and revenue flows. Few governments are willing or able to challenge the power and authority of local-level elites who are currently the main economic beneficiaries from fisheries. Access to the fishery should be seen as a tool to achieve the goals society has set. Allocating access rights through auction may in fact bring more benefits to society than granting access to a large number of participants.

4.5 Special issues

Better understanding of the human system in the fishery is necessary in order to understand how to better achieve sustainability under the four components of sustainability.

There are many approaches for governance to achieve sustainability. Fishery management requires taking action before it is possible to be certain of the consequences and hence involves taking risks. Innovation in fishery management is essential to improve sustainability, so sometimes large risks must be taken. Both fisheries and fishery dependent communities differ in their capacity to withstand harm, and this should be an important consideration when deciding how experimental to be in changing fishery management actions.

There is a need to better coordinate the government intervention in fisheries. There are increasing calls for jurisdiction over fisheries to be transferred from fisheries ministries to environmental ministries. This could further subordinate the economic, social, and institutional dimensions of sustainability to the ecological one, and dismiss the potential contribution of industrial fisheries to food security.

Solutions to fisheries problems usually cannot be found solely within the fishery itself. Finding solutions to unsustainability usually requires an integrated view of the social, economic, and ecological systems, each interpreted broadly.

4.6 High seas governance

While progress has been made in legal instruments, there is a fundamental issue about the compatibility of freedom of the high seas with sustainability because of the difficulty to deal with allocations. This is highlighted by the current difficulty that some regional fisheries management organizations are having with the need to provide security to present stakeholders in order to promote stewardship and allocate
shares to new entrants. Another dilemma is that nations are generally unwilling to delegate enough power to RFMOs as shown in the lack of enforcement and weak dispute resolution mechanisms, as this is seen as interfering with their sovereign rights. Yet the lack of effective decision making leads to unsustainability.

5. RECOMMENDATIONS

Management options which improve sustainability appear to be highly case specific, so care should be taken before generalising one success to other circumstances. That being acknowledged, the process followed in finding options which improve sustainability may be more general. It would be worthwhile expending effort studying the processes of seeking sustainable options, rather than just studying the options themselves.

Fishery management systems should assess and monitor costs, including transition costs, of information gathering, monitoring, control and surveillance (including the cost of keeping out those who do not have access rights).

Economies based on resources that fluctuate, or whose market fluctuate, may need that participants move from one sector (of the fishery or of the economy) to another as resources and markets fluctuate.

Experience shows that the job of fishery management is never finished. The solution to today’s problem will eventually evolve to raise its own problems.

Systematic approaches to analysing fishery management are important, including the development of indicator systems with suitable reference points for each indicator. It is also important that management advice quantify the risks of exceeding limit reference points. There have been many efforts to develop reference points for biological aspects, but apparently little similar work on social, economic or institutional indicators, although some progress has been made e.g. in the Mediterranean, in the United States, and in Australia.

There exist considerable insight in small-scale fisheries and ways to reduce poverty. Better use should be made of those existing insights, from a variety of perspectives and disciplines (organisation & change management, policy analysis, social psychology, history, geography, demography) that are currently underused. Economics, Sociology, Anthropology and Development Studies are better known but still need a means to better integrate their insights into informing policy and management. Mechanism to set priorities for research and information gathering for small-scale fisheries are also needed.
ANNEXE 1

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ANNEX 2

WORKSHOP AGENDA

Tuesday, 13 September 2005

Morning: Opening
[Plenary] Introduction
Governance and Fisheries Management
Allocation and Fisheries Management (S. Garcia)
Conservation and Fisheries Management (J. Rice)

Afternoon: Creating Metaphors for Sustainability (R. Cheunpagdee/Pauly)
Is Fisheries Science helping achieve Sustainability? (J-J Maguire)
Regional and global governance on the high seas (M.Lodge/VanHoutte)

Wednesday, 14 September 2005

Morning: Access and Fishing rights
[Plenary] Establishing Access Regulation and Rights (J. Catanzano)
Addressing hurdles for Capacity management (S. Pascoe/Gréboval)
Secure rights, co-management and sustainability (T. Stone)
Lessons learned from the Namibian experience (D. Boyer)

Thursday, 15 September 2005

Afternoon: Fishery Management and Sustainability Dimensions
[Plenary] Ecosystem Approach and Management (J. Rice)
Sustainability, integrated management and coastal systems (T. Charles)
Early warning, reference point and risk (J. Seijo)
Economics, environmental aspects, and risk (R. Hannesson)

Friday, 16 September 2005

Morning: Small scale issues and developing country perspective
[Plenary] Inland Fisheries of Cambodia (Srum Lim Song – et al.)
Hurdles to Sustainable Fisheries (J. Kurien)
Scaling management to achieve sustainability (P. McConney/Mahon)
SSF and Poverty & Livelihood (E. Allison/Horemans)
SSF and Decentralisation (U. Schmidt)

Afternoon: Conclusions and Recommendations
[Plenary] Closing
PART II: DISCUSSION PAPERS

I. GOVERNANCE AND FISHERIES MANAGEMENT: CAUSES OR SOLUTIONS FOR UNSUSTAINABILITY

1. ALLOCATION AND CONSERVATION OF OCEAN FISHERY RESOURCES: CONNECTING RIGHTS AND RESPONSIBILITIES
Serge M. Garcia and Jean Boncœur

2. IS THE FAILURE OF CONVENTIONAL FISHERIES MANAGEMENT MAKING THE CONSERVATIONIST APPROACH MORE APPEALING, OFFERING A WAY OUT OF MAKING TOUGH DECISIONS?
Jake Rice

3. SLOW FISH: CREATING NEW METAPHORS FOR SUSTAINABILITY
Ratana Chuenpagdee and Daniel Pauly

4. IS FISHERY SCIENCE HELPING TO ACHIEVE SUSTAINABILITY IN THE NORTH ATLANTIC?
Jean-Jacques Maguire

5. RECENT DEVELOPMENTS IN INTERNATIONAL FISHERIES INSTRUMENTS AND TRENDS TOWARDS SUSTAINABILITY
Michael Lodge

II. ACCESS AND FISHING RIGHTS

6. ESTABLISHING ACCESS REGULATION AND RIGHTS
Joseph Catanzano

7. CAPACITY MANAGEMENT AND SUSTAINABLE FISHERIES: INTERNATIONAL EXPERIENCES
Sean Pascoe and Dominique Gréboval

8. DO SECURE ACCESS RIGHTS AND CO-MANAGEMENT GUARANTEE SUSTAINABILITY? A CASE STUDY OF AUSTRALIA’S NORTHERN FISHERIES
Trysh Stone

9. SUSTAINABLE UTILISATION OF FISH STOCKS – IS THIS ACHIEVABLE? A CASE STUDY FROM NAMIBIA,
David C. Boyer and Helen J. Boyer

III. FISHERY MANAGEMENT AND SUSTAINABILITY DIMENSIONS

10. WILL AN ECOSYSTEM APPROACH MITIGATE THE FACTORS OF UNSUSTAINABILITY?
Jake Rice

11. TOWARD SUSTAINABLE AND RESILIENT FISHERIES: A FISHERY-SYSTEM APPROACH TO OVERCOMING THE FACTORS OF UNSUSTAINABILITY
Tony Charles
12. A SIMPLE FRAMEWORK FOR PROACTIVE MANAGEMENT TO MITIGATE UNSUSTAINABILITY IN FISHERIES: ESTIMATING RISKS OF EXCEEDING LIMIT REFERENCE POINTS (LRPS) OF BIO-ECOLOGIC, ECONOMIC AND SOCIAL INDICATORS
Juan Carlos Seijo

13. THREE ISSUES OF SUSTAINABILITY IN FISHERIES
Rögnvaldur Hannesson

IV. SMALL-SCALE ISSUES AND DEVELOPING COUNTRY PERSPECTIVE

14. THE UNSUSTAINABLE EXPLOITATION OF INLAND FISHERIES RESOURCES IN CAMBODIA
Srun Lim Song, Lieng Sopha, Ing Try and Heng Sotharith

15. KERALA’S MARINE FISHERY: EVOLVING TOWARDS UNSUSTAINABILITY – A PERSONAL STATEMENT SPANNING THREE DECADES
John Kurien

16. SIZE MATTERS: SCALING MANAGEMENT AND CAPACITY TO ACHIEVE SUSTAINABILITY IN SIDS [SMALL ISLANDS DEVELOPING STATES]
Patrick McConney and Robin Mahon

17. POVERTY ALLEVIATION, SUSTAINABLE LIVELIHOODS AND MANAGEMENT IN SMALL-SCALE FISHERIES
Edward H. Allison and Benoît Horemans

18. DECENTRALIZATION, GOVERNANCE AND POVERTY: DETERMINANTS OF UNSUSTAINABILITY. LESSONS LEARNED FROM THE VISAYAN SEA, PHILIPPINES, AND THE TONLE SAP GREAT LAKE, CAMBODIA
Ulrich W. Schmidt
DISCUSSION PAPER 1

ALLOCATION AND CONSERVATION OF OCEAN FISHERY RESOURCES
CONNECTING RIGHTS AND RESPONSIBILITIES

by

Serge M. Garcia and Jean Boncœur

“Resources, their scarcity, their depletion, and their conservation are concepts of the social sciences, par excellence”… Property rights in resources are a primary economic institution of paramount importance in the economics of conservation.” (Ciriacy-Wantrup, 1968).

Summary

It is generally agreed that overcapacity, overfishing, habitat destruction and wastes relate closely to the “tragedy of the commons”, i.e. to the fact that access to the resources is relatively cheap (if not free) and easy (if not open). The implication is that the establishment of a system of clear use rights will eliminate the incentive to “race for fish” and increase the user’s sense of responsibility, leading to conservation. This paradigm has significant conceptual and operational implications. The concepts of conservation and allocation are well defined, and the factors of success and failure are generally well known. The performance of allocation in terms of conservation depends on: the control variable (allocated factor); the rights attributes; the selection of private versus communal property; the initial allocation; the effectiveness of the rights’ administration; the value of the fishing privilege and the destination of the rent.

The interplay between allocation and conservation is iconized in the “Tragedy of unmanaged commons”, and the solutions to the tragedy involve the use of either Pigovian taxes or Coasean use rights. The interplay has a number of institutional underpinnings related to the 1982 Convention of the Law of the Sea, the Convention on Biological Diversity, the UN Fish Stock Agreement, and the regional fishery bodies and arrangements. There is a close connection between the systems of rights and the social structures using them and the two have co-evolved in time. One of the main challenges faced by Governments today appears to be the choice between communal and private property.

The performance of fisheries in terms of conservation appears to be dependent on the solution of a number of allocation dilemmas between: (i) consumptive and non-consumptive use; (ii) fishers and other sectors including conservation; (iii) sub-sectors of fisheries; (iv) national and foreign fishers; and (v) present and future generations.

The issues become even more complicated in an ecosystem perspective with issues related to: (i) allocation between fishers (and human consumers) and other marine top predators; (ii) allocation in Marine Protected Areas; (iii) the interplay between conservation and social reproduction; (iv) contrastive evolution of the spatial units selected respectively for ecosystem management and fisheries resources allocation....

2 Paper originally presented at the 4th World Fisheries Congress, Vancouver, Canada, May 2004, as an opening to the session on Allocation and Conservation.
3 The views expressed in this paper are solely those of the authors, Serge Garcia FAO Fisheries Department, Fisheries Resources Division, Viale delle Terme di Caracalla, 00100 Rome, serge.garcia@fao.org, and Jean Boncour, CEDEM, University of Western Brittany, 12 rue de Kergoat, CS 93837, 29238 Brest Cedex 3, France (Jean.Boncour@univ-brest.fr).
1. INTRODUCTION

The interplay between allocation and conservation is probably as old as life on Earth. Its origin and implications have been brilliantly addressed by numerous eminent scholars and part of standard university text books. In the early 1980s, considering the issue, the Late John Gulland said that it was like “telling grand-mother how to suck an egg”. However, looking at the appalling state of ocean resources more than 20 years after Gulland’s remark, it would seem our “grandmothers” still need to be told again.

The interplay between allocation and conservation has probably affected the life of our ancestors for millennia, conditioning their survival. It has excited the intellect of scores of eminent philosophers, economists, sociologists and ecologists for centuries. It has been central to fisheries management for decades and is, today, as modern and relevant as ever as society moves towards an ecosystem approach to fisheries. The growing societal awareness of the fishery resources’ distress and of the inexorable human population growth, the question of indigenous populations’ rights (a sequel of colonisation); and the institutional quakes of the 1982 UN Convention on the Law of the Sea (hereafter, the 1982 Convention) and the 1992 Convention on Biological Diversity (CBD) have dramatically focused the international limelight on this old but most modern issue. The old debates among economists regarding the respective efficiency and roles of individual and communal rights, of the State and of the Market, are still a source of hot ideological debate, exacerbated by the ongoing process of globalisation. Indeed, the problem may not reside so much in the concepts as in their practical implementation and not so much in deciding about a theoretical long-term equilibrium “Graal” but in the process of transition and co-adaptation of ecosystems, human communities and the institutions connecting them.

Conscious to be treading on an old battered track, the paper aims at providing a background to the WFC4 session on allocation and conservation, with the aim of reminding this audience of some fundamentals and ongoing controversies. This review paper focuses on the interplay between allocation and conservation, rights and responsibilities, recognising that it depends significantly on many factors, internal or external to fisheries that may not all be covered here. In order to call back to mind what the issue has always been, how it was formulated, and what was proposed to resolve it, the first section of the paper recalls the concepts and definitions related to conservation and allocation (with the support of a glossary). The interplay between the two is addressed in the second part of the paper in which conceptual aspects are described together with a series of practical examples.

2. DEFINITIONS AND CONCEPTS

It may be useful, for the purpose of this review paper, to clarify a multidisciplinary terminology which remains sometimes confusing (Hardin, 1998). In this section, we will therefore recall the definitions and concepts of conservation seen as a central objective of management and of allocation seen as a means to achieve it. The following additional concepts and terms often used in the paper are defined in the Appendix: common pool; public resources; res communis; res nullius; discount rate; equity; efficiency; property rights; and sovereign rights.

2.1 Conservation

Conservation has ecological, economic, social, ethical, metaphysical and emotional connotations. It tends to have two main meanings. Firstly, it is the preservation and protection of something from change, loss, or damage, including through the prevention of exploitation. It is the maintenance of the status quo. This seems to be the meaning most generally accepted by francophones for this word, taking conservation and preservation as synonyms. Secondly, it is the planned management and care of (used) natural and cultural resources to prevent their destruction or neglect. It reflects wise use or sustainable use (Ciriacy-Wantrup, 1968: p. 19). It is the long term maintenance of the flow of natural goods and services (Charles, 1992). In the 1980 World Conservation Strategy, it is “the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while
maintaining its potential to meet the needs and aspirations of future generations. Conservation is positive, embracing preservation, maintenance, sustainable utilization, restoration and enhancement of the natural environment” (IUCN et al., 1980: Para. 4). This seems to be the meaning most generally accepted by the Anglophone and the economists in general. It corresponds to the concept of “strong sustainability” and is the only one making sense in this paper.

Conservation failure results in overfishing and depletion. Overfishing has been recognised and described centuries ago (Tiphaigne de la Roche, 1760; Pauly and Chua, 1988) and since Warming (1911), Graham, (1935), and the London Conference on Overfishing (1946), it has been clear that fishery resources could be depleted. During the last 50 years, conventional management strategies aimed formally at conservation through regulation of boats’ and gears’ characteristics (to limit fishing power and improve selectivity), operational constraints (e.g. closed areas and seasons, biological rest) and harvest limitations (e.g. total allowable catches, minimum landing size). The fishery management instruments, such as the 1982 Convention, have institutionalized the conservation objective, specifying that the stock size corresponding to the Maximum Sustainable Yield (MSY) is the limit below which, by convention, conservation has failed and biological overfishing occurs. This is confirmed, by necessity, in the 1995 UN Fish Stock Agreement (FSA) and the 1995 FAO Code of Conduct (the Code). More recently, the framework has been reinforced by the recent societal demand for more attention to associated and dependent species, critical habitats and, in general, the exploited ecosystem requirements (FAO, 2003; Garcia et al., 2003; WWF, 2003).

Constrained by the need to maintain social peace and not addressing the root causes of the phenomenon (see below), these measures attempted and failed, to mitigate the consequences of growing overcapacity. Economically inefficient, they were unable to resolve long-term use conflicts and to ensure conservation. The global consequences have been obvious for the last decades: overfishing, shortened fishing seasons, lower catch rates, decreasing harvest of lower quality, uncertain resource availability, excess harvesting and processing capacity, economic inefficiency and social stress. The resulting high long-term costs have often been shouldered by society through direct or indirect subsidies intended to mitigate the social costs of management, compounding the problem.

It is now common knowledge that this poor sustainability is characterised by and results from the interaction of many interrelated factors, including: (i) the absence of guaranteed rights; (ii) the supremacy of short-term socio-economic considerations over long-term ones; (iii) a perverse incentive structure reinforcing (i) and allowing externalisation of private costs; (iv) rising demand from a growing human population and consequent rising prices; (iv) poverty and lack of alternatives in many areas; (v) ineffective governance and weak enforcement; (vi) disturbances such as pollution, climate oscillations, wars; (vii) scientific and administrative uncertainty and (viii) competition between users, within and between sectors.

It is usually agreed that, in line with the general theory of sustainable development, the corrective action required includes: (i) the granting of more effective rights of use; (ii) improved transparency; (iii) more participation in decision-making; (iv) better understanding of the resources and the communities depending on them; (v) a more precautionary approach to management; (vi) more active consideration of the ecosystem interrelationships; (vii) better monitoring and enforcement; (viii) more equitable distribution of benefits; (ix) integrated development and management policies; and (x) a stronger role of consumers.

The conservation issue has taken a new and stronger development with the adoption of the Convention on Biological Diversity, signalling a change in the foundation of the conservation concept, from ethics (the need to preserve species for future generations; to consider biodiversity as a patrimony; the respect for life forms) to sustainable use. One important consequence has been the general adoption of the Ecosystem Approach to Fisheries (FAO, 2003; Garcia et al., 2003), the significant consequences of which for the meaning and approach to conservation are still to be fully apprehended.

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4 Despite and accepting all its scientific and operational shortcomings.
2.2 Allocation

Allocation is both an object and an act. As an object, it is a share of something set aside for a specific purpose. Synonyms with this meaning include: portion, share, proportion, quota. As an act, it is the distribution of something among selected recipients such as splitting a total allowable catch among fishing nations or assigning coastal areas to different uses. Synonyms are: apportionment, allotment, appropriation, distribution, division, and repartition. The beneficiaries could be contemporary (intragenerational allocation) or belong to successive generations (inter-generational allocation). Both aspects are central to conservation.

Allocation involves the granting of rights (appropriation). It may affect and be conditioned by pre-existing ones. Allocation implies also the assignment of the responsibility of controlling the way in which these rights are exerted (provision). The solution of one set of problems must be congruent with the solution of the second. The structure of the problems, and their solution, depends on the particular configuration of variables (resources, climate and habitat) the rules in use, and the attributes of the individual involved (Ostrom, 1990: 46–50).

The outcome of an allocation process, e.g. in terms of economic efficiency, conservation and equity (see Glossary, Appendix) depends on a number of aspects briefly examined below.

2.2.1 The objective of the allocation

Granting access and allocating rights (and many of the characteristics of the allocation process) may be aimed at various interrelated objectives such as promoting development of an otherwise under-used resource or protecting an endangered one, reaching maximum economic efficiency, maintaining self-sufficient and healthy social groups in remote rural areas, reducing use conflicts and, obviously, improving conservation. While the objective of conservation (or ecosystem reproduction) is usually clearly stated, that of social reproduction is not yet as commonly referred to and taken into account as ecosystem reproduction is, particularly in the conservation arena. There seems to be little resistance to the concept of strong sustainability in relation to the environment (implied in the definition of “conservation”) but the intrinsic value of “social reproduction” may not be yet as fully understood as its environmental equivalent. It is sometimes by environmentalists, with the argument that human constructions are, by essence, evolving structures (an argument that applies indeed also to ecosystems), the possible disruptions introduced by a new system of rights on the social structure should not be a problem. The societal costs of a brutal degradation of social relationships produced by a radical shift in rights allocation (e.g. in terms of exclusion) may not yet be as well perceived as the societal costs of environmental collapse (e.g. following the cod collapse in Canada).

2.2.2 Allocated factor

The first level of allocation among potential users is achieved through granting of access, usually controlled through a more or less comprehensive system of permits, ranging from simple and quasi-free administrative registration to more elaborated licensing and limited entry systems. Limited entry has been used since the early 1960s, and its main problem seems to be the difficulty to reduce the initial

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5 According to Ostrom (1990: 46-50), appropriation is the way in which the flow of resource units (e.g. catch) can be allocated in a fixed or time-independent manner so as to avoid rent dissipation and reduce uncertainty and conflict over the assignment of rights. It relates also to the allocation of spatial and temporal access to the resource, accounting for space-time heterogeneity and related uncertainties. Issues of relevance are commitment, equity, compliance, credibility and deterrence.
over-capacity fast enough to mitigate the effect of technological progress despite difficult and costly buy-back schemes.

In most cases, because of their fugitivity, the resources themselves cannot be allocated between those having been granted access rights. As a consequence, the factor that is allocated (i.e. the control variable) is the best possible albeit necessarily imperfect proxy to the resources. This proxy could be:

Space, e.g. through territorial use rights, with potential problems with mobile resources;
Effort, e.g. through effort quotas, with potential problems with fishing capacity; time sharing, etc.
Catches, e.g. through catch quotas, individual or not, transferable or not, with problems of declarations, highgrading, discards, etc.

2.2.3 Rights’ attributes

The attributes of a right determine its effectiveness in a particular situation. These attributes should relate to the characteristics of the resource or resource system such as its location, geographical structure, distribution and mobility, variability, abundance, resilience and value. They should also relate to the characteristics of the fishers community, including its history and culture, and be compatible with fishing operations.

The main attributes include: exclusivity, duration, security, transferability. Other attributes such as flexibility and divisibility are also sometimes mentioned (Ciriacy-Wantrup, 1968; Scott, 2000; Stokes, 2000). Exclusivity gives protection from legal interference and provides the facility to exclude others. Duration encourages the sense of ownership of the user, provides conservation incentives and facilitates the use of the right as collateral. Security facilitates the defence of the right, increasing the assurance of the holder that it will keep it, contributing to conservation incentive. Transferability of allocations to buyers, renters or descendants is usually considered necessary to provide the flexibility needed for future evolution of the fishery and population of right holders, as well as to protect the family in case of death of the right holder. It provides a mechanism to deal with potential new entrants, increases economic efficiency but may lead to undesirable concentration if provisions are not made to avoid it. Mechanisms exist to permit State intervention on the market to re-establish equity as needed. However, full transferability is often opposed, e.g. to ensure that the original allocation (e.g. to nationals or disadvantaged groups) is not modified. In France, transferability is formally illegal (Boncœur and Troadec, 2004) but in practice fishing rights are transferred with the vessel, the price of which includes the implicit right to fish. Flexibility will allow the system to adapt to changing conditions of the resource or the sector. Transferability and divisibility add to flexibility. For highly variable resources, allocating proportions of the resource flow (e.g. % of the TAC) instead of fixed quantities will permit the adjustment of withdrawal to natural conditions. Divisibility allows a right to be split into components (species, seasons, sub-areas) that may be allocated to different right holders. The possibility to market some elements of the bundle of rights without affecting the property allows a significant reduction of transaction costs (Weber, 2002). Enforceability is self-explanatory and could be considered as part of security.

2.2.4 The right holder: Private versus communal property

The right holder could be a country (as per the 1982 Convention), a community, a fishing company, a vessel or an individual. Selecting individual rights (private property\(^6\)) or communal rights (common property) is probably the hottest policy issue of the allocation process and the relative advantages or drawbacks of the two options in terms of efficiency, equity and sustainability have been debated for centuries (Ostrom, 2000). While some scholars consider contemporary examples of common property as remnants of an irrelevant past bound to disappear, recent research challenges that presumption, and there is a substantial evidence that, in the past, in resilient rural communities, communal property has been able to solve a wide diversity of problems at low interaction costs (Ostrom, 2000: 333). Under the

\(^6\) See definition in the Appendix.
modern conditions of market globalisation, however, it is not obvious that the conditions for this performance still exist or can be re-established.\textsuperscript{7}

The choice is rich in long-term consequences, politically delicate and conditioned by the objectives. The neo-classical economists advocating private property (e.g. individual transferable quotas) tend to stress maximum long-term economic efficiency and benefits (including conservation), with a risk on equity. The socio-economists stress that communal property rights may be more indicated when controls are difficult, and one of the aims is to maintain human settlements in remote rural areas where livelihood alternatives are scarce. In this case the exclusion often implied in individual rights may be unacceptable (Ostrom, 1990: 22), even though this solution may not be economically optimal. The proponents of communal rights argue for other sets of values including equity, ethics\textsuperscript{8} and social reproduction.\textsuperscript{9}

The proponents of private forms of property argue also that: (i) by setting everyone’s share they eliminate the “race for fish” and reduce the incentive for “stuffing in” technology, reducing costs and overcapacity; (ii) they allow each individual to fix the timing of his harvest, choosing times where the weather is better (reducing life risk), the species is of higher quality, the by-catch or concentration of juveniles is lower, etc.; (iii) they turn the right to fish into a transferable asset of fairly well established value; and (iv) to the extent that they allow stock rebuilding, they reduce the uncertainty of the fisher as to what fish he will find where and facilitate contractual arrangements with buyers.

For their detractors, these forms of property presents drawbacks such as: (i) unintended social effects such as non-fishermen owners and concentration of ownership, a phenomenon largely observed and apparently accepted, however, in all other industries;\textsuperscript{10} (ii) difficulty to accurately adjust the quotas to inter-annual changes in reproductive success, abundance or availability because of uncertainty, reducing therefore the accuracy of the management response (even when quotas are defined as percentages of a variable allowable annual catch);\textsuperscript{11} (iii) political risk for elected officers in lowering the total allowable catch, reducing management response effectiveness;\textsuperscript{12} (iv) increased incentives for under-reporting and black market of unreported catches; (v) increased incentive to discard (highgrading; discards of species when its quota has already been reached); (vi) difficulty to reduce capacity fast enough in highly overcapitalised fisheries; and (vii) inadequacy for an ecosystem approach to fisheries.

The two sets of proponents differ also in the way they treat exclusion. On the one hand, limiting access to establishing individual rights is likely to result in the exclusion of the least efficient actors (perhaps the poorer), either initially or during the process of economic “optimization”. The market is the mechanism used for exclusion and compensation. Equity is generally not considered explicitly. On the other hand, granting exclusive access to a whole “community” reduces the initial exclusion problem and allows explicit consideration of equity. However, exclusion of non-community members, often violently, is also a characteristic of kinship-based traditional fishery management systems. Whether market-based exclusion is less ethical than exclusion based on racial or ethnic criteria is debatable.

\textsuperscript{7}At the beginning of the 20th century, traditional rights have been voluntarily weakened by national and colonial powers, generalizing a situation of quasi open access and common property (Ostrom, 2000; Weber, 2002).

\textsuperscript{8}In the long-term, equity, a concept rarely specified, may not be in contradiction with economic efficiency and is implied in the concept of long-term optimal social welfare.

\textsuperscript{9}Collet (2002) stresses that in traditional societies cooperation, solidarity, participation and democracy, morality (ethics), dignity, stewardship and respect are instruments and processes which are operational in community property rights.

\textsuperscript{10}Concentration of rights in a few hands is often perceived as a threat to artisanal enterprises, although it has already started, even in the present conditions of ownership, for reasons of economies of scale (Lequesne, 2003).

\textsuperscript{11}Even when relative quotas are used, quota holders may still exert pressure to ensure the highest allowable catch possible. Such pressure may be attenuated, however, by: (1) transferability, because the market value of the property right (if complete) depends on the state of the resource; and (2) associating the quota holders to the determination of conservation measures in a transparent manner.

\textsuperscript{12}The argument is weak as this risk is, of course, just as high in a conventional management system.
While ITQs are systematically used in countries like Australia, New Zealand, Canada, Iceland and Netherlands, they seem to be considered as unacceptable in principle by a large part of the EU fishers in Italy, Spain, and Greece. In France, a recent law provides that fishing authorizations cannot be transferred, and fisheries are considered as a “common heritage” (patrimoine collectif)\textsuperscript{13}. This last terminology may relate to the “Common Heritage of Mankind”\textsuperscript{14}, an asset defined in the UN in the 1960s and which, by definition, goes beyond a res communis (see glossary) and cannot be appropriated. In Iceland, however, where a similar terminology was used in the law, the Supreme Court decided that it should not impede the free allocation of ITQs based on fishing history. In countries were ITQs have been adopted some time ago, the debate is still raging (Collet, 2002).

The common property challenge needs to be faced by governments if small-scale fisheries are to survive globalisation. The conditions for successful common property include (Ostrom, 1990: 90): (i) clearly defined right holders (and hence exclusions) and resource boundaries; congruence between allocation/conservation rules\textsuperscript{15} and local conditions; (ii) collective choice arrangements in participative framework, allowing fine tuning of the institutions to local conditions and improved enforcement; (iii) reliable monitoring, in which those in charge of monitoring are accountable to the right holders; (iv) graduated sanctions, possibly inflicted by the right holders themselves or their institutions, and social recognition of good behaviour; (v) effective (rapid-access, low-cost, equitable) conflict-resolution mechanisms; (vi) recognition by higher authorities of the right to organise, implying an effective transfer of the management right; and (vii) institution nesting to effectively address cross-jurisdictional problems or problems at different scales.

Conversely, factors influencing success or failure in developing appropriate institutions include: (i) the number of decision-makers (the less the better); (ii) the number of participants (a minimum is needed to achieve collective benefits but large numbers may be a problem); (iii) the diversity of participants (similar profiles, perceptions, interests and discount rates help achieving the necessary consensus); (iv) presence of local leadership. Communal right holders in common pool resources systems have shown capacity to develop sustainable institutions and achieve conservation but they have not always done so. A number of inexplicable failures or successes indicate that the present understanding is not sufficient to elaborate unambiguous policy advice. It is advisable therefore to proceed with incremental action, starting at small-scale, building on existing institutions and their self-transforming nature (Ostrom, 1990:188–191).

2.2.5 The initial allocation

The initial allocation requires identifying the future right-holders. A lottery would randomise the selection and reduce corruption without ensuring equity. A sale (e.g. an auction) would probably be economically efficient, but equity would also not be addressed, as wealthier elements of the community or rich foreigners would be favoured\textsuperscript{16}. Alternatively, a regulatory or political process could be used with criteria related to historical antecedents, existence of alternative livelihoods, vulnerability, maintenance of rural communities, ethnic origin, etc.

Pre-existing allocation patterns must be actively looked for as the new allocation of rights is likely to interfere with existing ones, potentially leading to accidental exclusion, social unrest, etc. The process should be fast enough to avoid massive entry before the law is operational. The so-called Coase Theorem (Coase, 1995) holds that, if transaction costs are negligible, the economic outcome will be optimal, regardless of the initial allocation. It also stresses, however, that the outcome might not ensure equity. By symmetry, if there are significant transaction costs, the efficiency of the outcome should depend on the


\textsuperscript{14}The term was created in November 1967 when Ambassador Arvis Pardo, Permanent Representative of Malta to the United Nations, urged delegates to consider the resources of the oceans beyond national jurisdiction as “the common heritage of mankind”.

\textsuperscript{15}Ostrom refers to appropriation and provision.

\textsuperscript{16}In many countries, the allocation would probably be done with some expression of a national preference.
initial arrangement and the solution is to minimise transaction costs (Edmundson, 1995). In other words, according to Coase, it is the law that should define property in such a way as to minimise the costs of interaction between incompatible uses.

The initial allocation to new entrants is a general and recurrent problem in international and many domestic fisheries. Open-ended rights, which for existing right holders is a sword of Damocles, seriously reduce the security (and value) of the right and the incentive to conserve. The “real interest” of the fishing State applying for entry into an existing international sharing arrangement needs to be assessed but the basis for such an assessment is uncertain (Munro, 2003).

The physical size of the share allocated to each right holder, if not left to the market through which each holder acquires what can be afforded, can also be negotiated using arguments such as historical antecedents (e.g. catch records), local knowledge, the position of spawning, nursery and feeding areas, concentrations of juvenile, biomass distribution and migration (defining the zonal attachment in the case of straddling stocks). The agreement, e.g. on shared stocks, may include compensations and side payments as negotiation facilitators. Highly participative systems seem to be preferable and most likely to reach acceptable agreements (Munro, 2003).

2.2.6 Administration of the rights

Rights need to be protected in order to maintain their conservation and socio-economic efficiency through time, ensuring the existence and enforcement of rules, defining who has the right to do what and how the returns of that activity should be allocated (Ostrom, 2000: 334). This requires the establishment of institutions, e.g. for monitoring the evolution of the fishery and the resource, verify conservation and economic performance as well as equity, forecast natural oscillations, ensure compliance, etc. The less effective the enforcement is, the higher the uncertainty about the future returns from the right and the lower the incentive to conserve for the future. An important element of any allocation system is the availability of dispute resolution mechanisms. With quasi property rights, ordinary tribunals may be able to resolve any dispute. In the case of international fisheries (global commons) the International Tribunal for the Law of the Sea (ITLOS) is competent and it has recently intervened in the dispute related to the management of the Pacific Southern bluefin tuna. Local institutional capacity-building is essential for a decentralised administration.

2.2.7 Value of the privilege

Obtaining an exclusive share of a resource belonging to the Nation as a whole is obviously a privilege. This privilege has a value and indeed often leads to a request for explicit or implicit “compensation” when the privilege is lost. If those fishers who may have to be excluded from the allocation need to be compensated for a loss, those obtaining the privilege might obviously be requested to pay for it. This is of course a hot issue, as fishers usually ask for compensation if forced to leave a fishery but are reluctant to pay for the privilege to continue fishing, particularly when the stocks are low and profitability is marginal. This question, too complex to be treated here, relates to the difficult one of the allocation of the rent (see below).

2.2.8 Destination of the rent

The destination of the rent is a hot issue. If well managed, renewable natural resources generate a rent as a super-profit above the normal return on labour and capital. In overfished fisheries, the rent is dissipated through over-use of capital and labour. Through resource rebuilding, the rent can be re-established progressively as profitability goes up with stock size. It could be recuperated by the State through some form of taxing or fishing-right fee under the user pays principle and used for the benefit of society. If the rent is left to the right holder, it is capitalised at the first sale of the right by its first holder (as a windfall

\[17\text{i.e. the degree of connection between a stock and a particular EEZ.}\]
Allocation and conservation are functionally inter-dependent. While conservation (or sustainable use) is the fundamental objective, allocation is one of the means to achieve it. If conservation fails, and resources are depleted, there will be no stable flow of resource units to allocate. Conversely, without adequate allocation of rights and responsibilities, there is no incentive for conservation and resources are depleted.

In fishery management literature, conservation is usually not a conspicuous part of the argument that tends to focus essentially on economic efficiency and marginally on equity. One of the reasons may be that rent maximisation, the objective of reference of most economic studies, is supposed to maximise the long-term flow of wealth to society (Hannesson, 1993; Boncœur and Troadec, 2004), an outcome that cannot be obtained –under strong sustainability constraints – without conservation of the resource flows. However, the transitional costs related to marginalisation and exclusion, in certain forms of allocation may result in social stress, civil unrest, non-compliance (piracy, illegal fishing), destructive practices (dynamite, poison), etc., that may not be properly accounted for in performance assessments and may seriously compromise the conservation outcome of the allocation process.

The evolution of the environmental capital (towards conservation or depletion and failure of ecosystem reproduction) is convoluted with that of the socio-cultural capital (towards development or poverty and failure of social reproduction) and both can be at the same time cause and consequence of the other. Despite the recognition of this strong functional link, most international agreements appear reluctant to link explicitly allocation and conservation. For instance, allocation is mentioned only once in the Code (Art. 10.2.2) and once in FSA. By comparison, access to resources is mentioned six times in the Code and eight times in the UN Agreement. The term is also used in the CBD. Rights are mentioned ten times in the Code, referring to Sovereign rights of States (eight times) or people (twice) and five times in the FSA (in reference to Sovereign rights of States’ rights). By contrast, conservation is mentioned 61 times in the Code and 26 times in FSA and is a keyword throughout the CBD. In conclusion, while States refer easily to conservation as an agreed universal objective or type of use, they seem to be more reluctant to explicitly relate it to allocation or rights. A similar remark can be made regarding poverty eradication (easily agreed as a universal objective) and equity (a much more sensitive concept to agree with).

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**Allocation institutions have a consequence on social structures** and vice-versa (Collet, 2002). This points to the need to study existing social structures and rights before introducing modifications (Ostrom, 2000). We have stressed above that existing traditional rights had often been suppressed in the early 20th century in developed countries and their colonies. During the colonial era, many developing countries’ borders were arbitrarily established and these were maintained at independence. The establishment of nationhood has often been obtained at the expense of traditional (tribal) rights, replacing or super-imposing traditional rights with the new State ones, weakening traditional institutions to strengthen modern ones. In some of these countries, the concept of re-allocation of property and use rights to indigenous or traditional communities raises for policy-makers the spectra of renewed ethnic conflicts, and solutions will be needed to achieve the benefits of re-allocation without endangering the nations’ unity. The issue is not theoretical, as demonstrated by the relation between the outbursts of civil (ethnic) wars and the discovery of rich resources (oil, diamonds). This may not always be a violent evolution, however, as shown in New Zealand, where the modern recognition of Maori rights (contained in the 1840 Treaty of Waitangi) is said to have led to the development of “tribal capitalism” institutionalizing ethnic differences in that country (Rata, 2003).

**Allocation and conservation are connected with equity and poverty.** The growing identification of conservation with sustainable use or sustainable development connects allocation and conservation directly to poverty and equity (Weber, 2002). Lack of equity may lead disadvantaged actors (excluded
from allocation) to poverty, high discount rates, non-compliance and predatory behaviour. As a consequence, achieving conservation requires reduction or eradication of poverty and extreme forms of inequity (WCED, 1987). This, in turn, requires allocations of rights. “The way out of poverty starts from the formal recognition of secured rights of access to land, resources and public goods” (Barbault et al., 2002). The progressive destruction of agricultural soils and forests, despite apparently complete forms of property, may indicate that property is a necessary but not sufficient condition for sustainable use. The outcome of an allocation scheme will depend both on the quality of the right and the social and institutional conditions within which it is exerted, particularly the mechanisms of redistribution of the benefits.

3.1 The tragedy of unmanaged commons

The failure of many international instruments to explicitly connect the desired conservation and the necessary allocation may be consequential. The 1946 London Conference on Overfishing failed to lay the basis of the sustainable development of fisheries in the Northern hemisphere because States could not agree on effort/capacity allocation. The present poor state of fisheries in that region can be directly connected to that failure. It would be candid, however, to assume that this happened out of ignorance.

According to the literature, the fact that local natural renewable resources could be depleted through wasteful competition because of lack of ownership has been known for centuries, since Aristotle, the Greek philosopher, and Justinian, the Roman emperor. This understanding has been recurrently rediscovered, reformulated, completed, e.g. by Lloyd (1833); Warming (1911); Graham (1935); Whitehead (1948), Gordon (1954) and Hardin (1968). By the end of the 1960s, the “tragedy of the commons”, an expression attributed by Hardin to Whitehead, was already common knowledge (Ciriacy-Wantrup, 1968:142–145). This signalled that, contrary to what was conveniently assumed, the freedom of the sea was a source of problems and the ocean resources were exhaustible.

The emerging axiom, central to sustainable development, could be expressed in many popular ways: no stewardship without ownership; no responsibilities without rights; no environment well-being without human well-being; no conservation without allocation. In more technical terms, the economic theory indicates that, as the fisheries resources most often have the characteristics of a common good, undivided and subject to subtractive use, their fishing generates a set of criss-crossed negative externalities between fishermen. In a competitive context with no or weak regulations, this leads to divergence between individual and collective rationality, the individually optimal effort level being systematically higher than the collectively optimal one. The divergence grows with increasing pressure on stocks, leading to a “race for fish”, chronic overcapacity, overfishing and social conflicts.

As Ostrom (1990) strongly argued, the Tragedy of the Unmanaged Commons (Hardin, 1998) does not imply that all resources owned in common are bound to be wasted. In small rivers, lakes, estuaries, very coastal waters, and around small islands, the evidence of resources exhaustibility, the effects of the resulting scarcity and an easier defence than in the open sea, may explain the early adoption of forms of common property regimes (res communis) by traditional communities. Often area-based, combined with technical regulations and taboos aiming at conservation, some of these systems persisted for centuries but many disappeared in the processes of modernisation, colonisation, independence, construction of

18 The Tragedy of the Commons (Hardin, 1968) has been recast as the Tragedy of Unmanaged Commons (Hardin, 1998).
19 The freedom of the sea instituting free and open access in the oceans, conveniently elaborated by Hugo Grotius (1609) on the assumption that ocean resources were inexhaustible (there was no scarcity) and ocean property would be too difficult to defend anyway.
20 The inexhaustibility of the sea was assumed by Grotius (1609) and supported by T.H. Huxley. Doubts about this opinion were expressed however by Alfred Marshall who, at the end of the 19th century recognized the productivity of the seas but expressed concern about the impact of the steam trawlers development forecasting that “the future population of the world will be appreciably affected ... by the available supply of fish” (Marshall, 1920).
21 On the African continent the laws expropriating traditional communities were adopted around 1929-1930 (Weber, 2002).
the Nation State, and globalisation of the market economy (Christy, 1982; Johannes, 1981; Ostrom, 2000; Feeny et al., 1990; Berkes, 1985; Collet, 2002; Kurien, 2000; Mathew, 2003; Weber, 2002).

3.2 The Tragedy’s solution: Pigou’s taxes or Coase’s property rights

The conventional economic treatment of externalities originates in the theory of social costs of Arthur Cecil Pigou in his “Wealth and welfare” in 1912 and “The economics of welfare” in 1920 which brought social welfare into the scope of economic analysis. According to his analysis, an individual using a (scarce) common-pool resource creates negative externalities for other users, i.e. additional costs that are not borne by himself, but by society. This, in turn, generates a societal inefficiency in that the responsible activity will be developed beyond what would be optimal. In a Pigovian perspective, externalities are seen as a market failure in that competition fails to lead to efficiency. The public administration needs to correct the failure, forcing the producer to “internalise” the societal cost of its activity, taking it into account together with his more private costs of production. The Pigovian instrument of choice is a tax equal to the cost of the externality to society (or a subsidy in the case of a positive externality).

In environment management, the polluter-pays principle is a direct application of the theory. In fisheries, the theory would lead to taxig effort or catches, increasing the real cost of fishing (of already economically weak industries) to bring it back the level of withdrawal compatible with the socially optimal resource level, modulating the tax on the various fisheries to redirect efforts to less pressurized resources. Once instated, a tax would need to be increased as the resource improves to maintain its efficiency. However, taxes are not often used to regulate access to fisheries resources, and present practices to use subsidies reflect instead an opposite principle of negative taxation.

In stark contrast with Pigou’s theory, Coase (1960) considers that externalities do not reflect market failures but result from an incomplete definition of rights without which a market cannot effectively operate, generating high interaction costs. According to him, the solution is not in State interference with the market through taxes but in freeing the market forces through definition of rights and establishment of institutions and mechanisms to exchange the rights (market) and reduce interaction costs (e.g. regulations and tribunals). For Coase, numerous externality issues could be solved through decentralised negotiation between actors. In environmental management, this is reflected by the establishment of transferable “pollution rights”. In fisheries, it may lead to individual transferable quotas (ITQs) or other kinds of transferable individual fishing rights. According to the so-called “Coase theorem”, the initial allocation of rights has no bearing on the final economic efficiency, since in any case the most efficient economic agents will appropriate the rights through the market. Of course, this has nothing to do with equity, which means that the process does not guarantee a societally acceptable (ethical or equitable) outcome. Moreover, as it was long ago demonstrated by Coase, property rights may be an inefficient framework of organisation of production when transaction costs are high (Coase, 1937).

3.3 Allocation dilemmas

The explicit allocation of resources among individuals or groups of the present generation is one of the most complex and delicate of the tasks faced by a government because of the high potential financial and political costs incurred. Not surprisingly, these decisions are among those that governments often do not like to take or publicize.

Consumptive and non-consumptive uses compete for resources. As the impact of unsustainable forms of use becomes more conspicuous, a movement in favour of non-consumptive uses develops. This materialises through requests for allocation of resources to forms of eco-tourism (e.g. on coral reefs), whale watching, etc., at the expense of fisheries and other forms of exploitation, even though some forms of eco-tourism are sometimes criticized by environmentalists for their impact on the environment. Such allocation may take place in the framework of Integrated Coastal Areas Management (ICAM) or Marine Protected Areas. When the objective is to exclude fisheries (e.g. in no-take zones), opposition and non-compliance is to be expected, unless decided within a participatory approach in which transitional
difficulties are taken into account and mitigated. This issue is getting more emphasis in the context of the Ecosystem Approach to Fisheries.

A second level of allocation is among consumptive uses, i.e.: (1) between the fishery and other sectors in a coastal zone or ecosystem; (2) within the fishery sector itself, between concurrent sub-sectors or fisheries segments.

Allocation between fishery and other sectors needs to take place within a spatially integrated management framework such as the coastal zone in which economic activities compete for scarce space and resources within the EEZ, and this highly competitive behaviour leads to resources degradation, particularly in the coastal area. Management integration requires a framework within which choices are made and policies are implemented. The main issues relate to: (i) the selection of compatible activities and exclusion of others; (ii) the allocation of space to activities or groups of compatible activities within a comprehensive coastal space-use planning; (iii) the allocation of resources other than space among competing activities. The FAO Code of Conduct contains specific guidance for the integration of fisheries into coastal area management (Fallon Scura, 1994; Chua and Fallon Scura, 1992; FAO, 1995). The allocation to conservation may be best decided in that framework. It might take the form of an allocation of quotas of preys to predators and the establishment of sanctuaries or marine protected areas. It may often involve a re-allocation of resources. With some exceptions, the Integrated coastal area management frameworks have not been very successful yet, perhaps because they represent one of the most complex area of application of the Coase theorem in which: (i) resources are numerous and of different types, often mobile and impossible to delimit precisely; (ii) users are numerous and with different objectives competing for space and resources; (iii) severe externalities are imposed by land-based activities and (iv) uncertainty and interactions costs are very high and cannot easily be reduced. Applying the Coase theorem a contrario would imply that: (i) property rights may not be a workable solution unless transaction costs are reduced (e.g. through zoning); and (ii) the initial allocation (and some agreement about it) is fundamental to the outcome.

Competition within the fishery sector is one of the most serious issues for the future of fisheries. Conflicts exist between fisheries of similar scale, for space (e.g. gear competition), resources (biological interactions, by-catch) or both (e.g. between aquaculture and capture fisheries). Space can be allocated through zoning to reduce interactions. Resources can be allocated within multispecies fisheries management, taking into account gear and species interactions, but success in that direction has been very limited. Major conflicts exist between: (i) small – and large-scale fisheries; (ii) subsistence and export fisheries; (iii) recreational and professional fisheries; and (iv) capture fisheries and aquaculture (e.g. extensive aquaculture; ranching). In countries where aquaculture is rapidly developing, that industry is looking for more and more complete and secure rights (Harte and Bess, 2000). As these rights crystallise and harden, flexibility and reversibility are reduced, and the potential for conflicts increases as conditions change.

In countries with important and dominant non-indigenous population (UNITED STATES, Canada, Australia, New Zealand), the issue of allocation between sub-sectors is compounded by ethnic considerations. In this highly sensitive context, the question of traditional rights and respect of colonial treaties plays a key role.

The EU “common pond” offers a particularly interesting case. The European Commission struggles with the issue of widespread overfishing and rampant overcapacity. The management process is in two stages: (i) a conservation-based scientific analysis and negotiation leading to advice on TACs (including precautionary TACs when appropriate) at ICES level, followed by (ii) a strictly political negotiation in which the maintenance of the socio-economic status quo (e.g. preservation of traditional fishing), social peace and the equilibrium allocation between countries (under the “Principle of relative stability”) overrides the question of conservation (Boncœur and Mesnil, 1999; Lequesne, 2003). It is an example in which allocation of access and outputs does not lead to conservation despite a complex system of allocation and sub-allocation, officially within States and unofficially through quota hopping. It is interesting in that respect to see the development of a debate on “nationalization” of
resources opposed by those with more mobile fleets (in Spain, France and Netherlands) and favoured by those where local fleets dominate (in Portugal, Ireland, Scotland).

Allocation between nationals and foreigners is another thorny issue, particularly in developing and developed coastal countries, endowed with more resources they could harvest themselves. Applying the concept of “surplus”, these countries gave access and quantitative harvest rights22 to fleets belonging to Distant Water Fishing Nations (DWFNs). Following the extension of their jurisdiction, these coastal countries have rapidly developed their own harvesting and processing capacity, often without cutting down on the previous agreements, precious sources of foreign exchange. The consequence has been a huge duplication of highly subsidised investments and development of a large overcapacity that the world fishery sector is still in the process of “digesting”. In the process, conservation “took a plunge” while the majority of the world stocks were intensively exploited or overfished.

Allocation of shared resources (resources totally or partially outside EEZs) remains a serious issue and stumbling stone. The spectacular damage of the resources of the Loophole, Donut hole, Peanut hole, Nose and Tail of the Grand Banks, etc., and more recently of sea-mounts, illustrate the problem. The use and management of transboundary stocks must be negotiated with neighbouring EEZ owners. While scientific collaboration usually exists, often under the aegis of FAO, the main difficulty remains the negotiation for the allocation of shares to the various countries concerned. The straddling, highly-migratory and purely high-sea resources remain global commons with decreasing preferential rights allocated to the coastal State. They need to be exploited and managed in collaboration through regional fishery management bodies and arrangements and management measures inside the EEZ and outside it shall be compatible (Article 7.2).

Inter-generational allocation is a key to conservation. Sustainable development and responsible fisheries management require maintenance of the resources and the ecosystem productive capacity for future generations. This is a case of inter-temporal allocation of resources. While it has been proposed in the past by economists that some resources might be foregone in exchange for man-made capital offering equivalent or higher opportunities to future generations (soft sustainability), the present international consensus as illustrated by the 1982 Convention and its aliases (including the FAO Code of Conduct) is that resources should be passed unchanged to future generations (strong sustainability). Impact on these resources by present generations should be reversible within an acceptable timeframe. Considering the general disapproval of overfishing, the implication is that present generations are allowed to use the productivity of the stocks (the “interest”) while the natural capital should be preserved for future generations. From a stock perspective, this has been attempted for the last 50 years at least, albeit with generally poor results. From a general ecosystem perspective, habitat destruction, persistent pollution, deforestation and global warming do not indicate a better performance.

3.4 Allocation and conservation in ecosystems

The allocation and conservation question becomes a lot more complex in the context of ecosystems, and a number of new issues are emerging. Ill defined and poorly understood, ecosystems represent a complex, variable and changing pool of interrelated resources. Critical elements of the ecosystem (e.g. critical habitats) may be “fully” allocated to conservation. Animals attached to the bottom (e.g. oysters, clams, coral reefs) may be firmly allocated on a territorial basis together with a thin layer of water above it. The problem increases with the fluidity of the resources and the number of interacting sectors. The fact that ecosystem management objectives, parameters, indicators and reference values are not yet clear is reflected in the fuzziness of the allocation issue in ecosystem-based management. The “reflex” of environmentalists may be to ask for exclusion of any (consumptive) use, e.g. establishing a network of reserves as a precautionary device. This can, however, be a solution only in a small part of the biosphere such as no-take zones in the middle of managed MPAs. Obviously, more work is urgently needed in ecology and social sciences to resolve the issue. In an ecosystem perspective, allocating a resource leads to allocating a productivity chain, with its preys and predators. A network of causal links appears

22 Expressed in vessel or catch tonnage.
between rights holders fishing in the same area at different trophic levels or in different areas. The ecosystem approach to rights-based fisheries requires therefore an allocation matrix including shares for fishermen, predators, conservation and insurance purposes, as well as for other uses. The difficulty of managing shared ecosystems is one order of magnitude more complex and was already raised by Gulland (1984) 20 years ago, when he wrote that “there are no international arrangements to facilitate the necessary trade offs ...to manage ...according to an ecosystem approach”.

**Allocation between fisheries and other predators** is progressively gaining importance as resource-rebuilding strategies are being studied to comply with the requirements of the World Summit on Sustainable Development (WSSD). Fishermen are human predators operating on behalf of fish consumers. As such, they compete with other natural predators for space and resources. In Australia, of about 1 000 000 tonnes of fishery resources being extracted from the sea 20 percent are taken by fishermen, 78 percent are taken by marine mammals and birds, the rest being taken (allocated) to other uses, including conservation (Kearney, 2003). The implication is that other predators consume more fish than humans, a fact that society might not have “registered” and formally analysed yet. The argument has been used to suggest that reducing the abundance of predators would free resources for humans (Tamura, 2003), a proposal raising serious concern and opposition in various parts of society. At the same time, the present depletion of natural predators has affected the quality and level of fisheries harvest (Garcia and Newton, 1997), as well as the ecosystem structure and functioning, with important consequences for fishers themselves (Pauly *et al.*, 1998; Jackson, *et al.*, 2001).

Competition between fishers and fish also occurs for instance when nets set for other purposes interfere with the passage of large cetaceans, entangling them. This interaction leads to damage to the fishing gear and can be fatal to the animals. The response sought by conservation has been the establishment of sanctuaries as well as the banning of drift nets. In both case, the economic activity is simply obliterated. Competition for food resources occurs when the fishermen and an animal predator look for the same prey. The competing predator may be targeted by fisheries (e.g. cetaceans, tunas, sharks and groupers) or not (e.g. seabirds). In both cases, an allocation of preys to some predators to ensure their conservation has been proposed and implemented, e.g. in the North Atlantic.

**Marine Protected Areas (MPAs)** may be seen as a test bed of the ecosystem approach to fisheries and of the interplay between the CBD and the 1982 Convention. They imply in most cases a non-explicit total or partial re-allocation of existing of fishing communities, often without compensation. While their impact on local biodiversity is evident, their systemic impact on the resource systems and on fisheries and communities is improving but remains poorly documented. There is still some way to go before full consensus is developed between fishery scientists and ecologists (Hilborn *et al.*, 2004) and a fortiori between fishers and conservationists, and more testing is needed. As MPAs grow in size and include more uses, their use becomes as problematic as in Coastal Area Management, requiring, for instance the development of alternative source of livelihood for displacement of existing activities to other areas.

Spatial boundaries are central to both allocation and conservation. Garcia and Hayashi (2000) have stressed that, during the last 50 years, the allocation of world resources has progressed through progressive splitting of the resource pool into successively smaller bundles23, from global commons to ITQs. During the same period, however, the requirements of conservation, particularly the Ecosystem Approach to Fisheries, demand integrated management by larger and larger areas and a change of the management scale from single species to multispecies stocks, from assemblages to whole ecosystems, from MPAs to coastal areas and Large Marine Ecosystems.

The contrast between the two evolutions is striking. The first leads to more and more specific and complete rights at the smaller possible scale (individual or communal). The second, on the contrary, leads to the definition of objects the growing complexity and uncertainty of which do not easily lead to manageable rights, except through total exclusion. The first is required for decision-making to establish

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23 e.g. (1) between high seas and the 200 miles zone; (2) into EEZs; (3) into fisheries; (4) into individual quotas resources.
security and liability and generate responsibility. The second is required for scientific understanding and awareness-raising. If the two processes of allocation and conservation are to be integrated towards sustainable development governance, it will be necessary to develop institutional bridges between the two processes at the appropriate scale.

3.5 Institutional underpinnings

The interplay between allocation and conservation in fisheries is governed by international instruments, regional mechanisms, and national legislation. Some of the related issues are briefly addressed below.

The UN Convention on the Law of the Sea is the legal foundation of sustainable development in the ocean. In 1945, the unilateral extension of UNITED STATES’s jurisdiction to its entire shelf (Truman Proclamation), followed in 1952 by Chile, Peru and Ecuador claiming over a 200 – miles jurisdiction, allegedly to protect their coastal resources from depletion by DWFNs, ignited a progressive but revolutionary process of re-allocation of ocean resources between Nations. The process took about half a century, culminating with the adoption, in 1982, of a legally binding Convention which entered into force in 1994. The convention is the legal foundation of sustainable ocean development and it provides that: “In the exclusive economic zone, the coastal State has… sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil…(Article 56.1)”. Sovereign rights include the rights to legislate, manage, exploit, control access and to determine property regimes applicable to the resources. The right of alienation (or right to sell, grant, lease), which together with the others constitutes complete property, is granted in Article 72 while Article 62.4.1 stipulates that the State can fix quotas.

The Convention establishes therefore the conditions for States to re-allocate these resources within their jurisdiction and negotiate allocations for shared resources (whether highly migratory, transboundary or straddling). It does not provide any explicit guidance about allocation except in relation to the surplus. In addition, the coastal State has an obligation of conservation, a duty of stewardship, under a concept of strong sustainability.

The rights resulting from the harshly negotiated convention are complex and reflect a gradient in property depending on the resources types. They appear to be exclusive and close to full ownership when the resource is either fixed to the shelf or entirely circumscribed in the exclusive economic zone (EEZ). If eggs and larvae are dispersed beyond the EEZ, the ownership cannot be complete as the coastal State loses control of one or more life stages of its resource. Ownership of the coastal State is also ensured for anadromous resources that originate in the coastal State’s inland waters such as salmon and sturgeon.

The Convention explicitly provides for joint ownership when the resources form a common pool extending through two or more EEZs (transboundary stocks) extend into the adjacent high seas (straddling stocks) or migrate on large distances (highly migratory species). As the high seas portion of the stock is accessible to all, the Convention established in fact a regime of more or less regulated global common. For these shared resources, the Convention requires instead that divergences be solved through international cooperation. The respective shares must be negotiated and the resources should be managed in a bilateral agreement or a regional fishery body or arrangement. Ideally, they should be managed as a

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24 See Glossary in the Appendix, for a definition.
25 The concept of surplus qualified the sovereign rights. They are not completely exclusive as the coastal State shall give to other States access to any surplus it does not have the capacity to harvest itself, i.e. the difference between the national catch and MSY. This provided a mechanism to facilitate access of DWFNs to EEZs and ensure that all stocks are exploited at Maximum Sustainable Yield and it has been used in the past by some fishing nations during fishing agreements negotiations. The problems raised by this provision have been discussed by Garcia et al. (1986). Following the 1995 FSA, however, MSY should be considered as a limit (not to reach) and not as a target, and the concept has lost any practical relevance.
26 The State does not have the right to exhaust (extinguish) the natural renewable resource put under its jurisdiction by the Convention.
common resource to ensure conservation and equity. Disagreements should be resolved through statutory
dispute resolution mechanisms, or through the Tribunal on the Law of the Sea (ITLOS). The purely high
seas resources (e.g. on sea mounts) are not explicitly addressed, leaving them in a basic regime of free
and open access. Despite this, thousands of transboundary stocks are still not jointly managed.

During the 1990s, a number of international agreements and arrangements27 have progressively specified
and strengthened this regime, increasing the coastal states prerogative for high-sea resources adjacent to
EEZs or strongly connected to it (i.e. the FSA) or entirely circumscribed between EEZs (e.g. in the
Barentz Sea Loophole, Bering Sea Donut hole and Okhotsk Sea Peanut hole). The process may not be
stabilised yet and some countries contemplate a substantial extension of their jurisdiction beyond
200 miles such as in the Chilean concept of Presential Sea28.

The Convention on Biological Diversity, adopted ten years later (in 1992) does not seem to modify
the institutional context of the allocation/conservation interplay in any way. Focusing on intellectual
property rights and patents of genetically modified organisms, it does not really deal with the natural
resources, leaving them under the sovereign rights of the countries, the implications of which have
already been discussed above. Considering, however, that it is extremely difficult to detect, control or
impede bioprospecting, the implication is that in the CBD framework natural resources are de facto
under open access, unless already appropriated by the country to specific holders (Weber, 2002).

Regional fishery bodies and arrangements (RFBAs) are the institution of choice for the
management of shared resources (both straddling and transboundary) but, with few exceptions, their
performance in relation to conservation has been poor. These institutions have generally been
established to foster international collaboration as a means to achieve conservation and it must be
concluded that collaboration is necessary but cannot replace allocation29. Many of them do not have
any mechanism of allocation of resources among their members. The most developed do and use
TACs, often subdivided into national quotas, leaving the responsibility of the sub-division of national
quotas (if any) to their members. They nonetheless fail to achieve their conservation objective because
of: (1) lack of power to adjust fishing capacity and effort to quotas; (2) persisting “race to fish”
between and within national fleets when the TACs or national quotas are not sub-allocated;
(3) inaccurate statistics; (4) lack of enforcement capacity leading to low level of compliance (under-
reporting, illegal, unreported and unregulated (IUU) fishing by non-parties; (5) difficulty to allocate
quotas to new entrants, potentially leading to IUU.

In the context of an ecosystem approach to fisheries, regional institutions meet with additional
(perhaps not exclusive) difficulties. For example, they may not have a comprehensive enough
mandate. This is the case of the International Whaling Commission, the mandate of which does not
include small cetaceans. It is also the case of the Indian Ocean Tuna Commission, the mandate of
which does not cover by-catch species.

The UN Fish Stocks Agreement (FSA) is the institution of reference to manage shared resources in
the high seas and it intends to strengthen the arm of the coastal state and regional fishery management
bodies and arrangements. It deals with the strategic confrontation between coastal states and distant-
water fishing nations (DWFNs), both roles being often played by the same nation. Effective regional
cooperative management is complex due to the potential number of participants and the differences in:
(i) legal status (States, geographical entities, private firms); (ii) socio-economic status (developed and
developing nations); (iii) objectives and histories. Potential new entrants (and fishing non-parties)

27 e.g. the 1999 Barentz Sea Loophole Agreement; the 1994 Convention on the Conservation and Management of
the Pollock Resources in the central Bering Sea (Donut Hole Agreement) and the 1995 UN Fish Stock Agreements.
28 Mar Presencial, in Spanish, a concept proposed in 1992 by the Chilean Admiral Martinez and confirmed by
President Frei in 1994.
29The first international fisheries congress was held in 1896 and the first international conventions were established
in the late 1800s and early 1900s: North Sea Convention (1882); Spitzbergen Convention 1920); Baltic sea
Convention (1929); Whaling Convention (1931). the first international convention for fisheries was proposed in
represent potentially numerous free riders and a source of IUU fishing weakening management schemes. The FSA intends to overcome the difficulty by allocating, de facto, special use rights to members of the RFBAs, requesting non-members to join such institutions and in any case to apply the measures adopted by it. If such measures include quotas, the absence of an allocation to non-members or new entrants, including through the market, is a major impediment. To counter free-riding and abuse, the thorny question of the real interest of the potential new entrants is being examined. The implementation of the FAO International Plan of Action on Illegal, Unreported and Unregulated Fishing (IPOA-IUU) is fundamental for the performance of RFBAs.

4. DISCUSSION AND CONCLUSIONS

Conservation and allocation are the two main functions of fisheries management. The interplay between allocation and conservation has been known for centuries. Scientists have described the problem and advised the governments recurrently for the last 50 years. Beyond a few miles from shore, however, resources remained practically unallocated and accessible to all until the mid-seventies, when EEZs began to be unilaterally expanded. During that period, governments have experimented technical regulatory measures aiming at conservation, through the regulation of gears, vessels, and operations and constraints on effort, including through limited entry and constraints on removals quantity and quality. In the process they learned, the hard way, that the approach did not really perform as hoped.

It is now quasi-generally agreed (at least by scholars) that forms of high-quality individual or communal rights, as appropriate, are needed, together with adequate institutions for their administration. The movement has tended to connect the allocation (devolution) of rights to that of responsibilities under a principle of subsidiarity. The growingly accepted paradigm is that there will be no stewardship without ownership; no responsibilities without rights; no environment well-being without human well-being and no conservation without allocation. Following the general trend towards rights-based fisheries, a wide movement has started in favour of various forms of partnership management, including co-management, even though the capacity of fishers’ communities to effectively undertake the tasks concerned is limited.

While the lessons of the last 2–3 decades are only becoming familiar to fishery managers, the need to add ecosystem considerations seriously complicates the adjustment task. While the sector is still struggling with the implementation of the 1982 Convention, a number of new international instruments and initiatives have precipitated the shift to an ecosystem approach to fisheries adding many dimensions to the allocation and conservation problem.

Various degrees of conservation are possible, depending on the balance of objectives between social and ecosystem reproduction, with significantly different cost implications for rights holders and society. Various forms of allocation are also possible, the outcome of which, in conservation terms, depends to a large extent on the nature of the rights granted (e.g. their security and transferability); the asset allocated (e.g. time, space, catch, effort, etc.) and the method used to regulate the access (e.g. through regulatory, command-and-control, measures or through economic incentives such as taxes or rights.

Experience has shown that taxes are not favoured in fisheries, and negative taxes (i.e. subsidies) are generally considered as having substantially contributed to overcapacity, overfishing and failure of conservation in general.

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30 Even though they remained formally un-allocated until the 1982 Convention came into force in 1994.
31 i.e. allocating rights and responsibilities at the lowest level possible.
32 The heralded decentralisation, expected to reduce management costs has, itself, costs that are often “forgotten” by its champions.
33 The 1992 UNCED Agenda 21 and CBD, the 1995 FAO Code of Conduct for Responsible Fisheries, the 1995 CBD Jakarta Mandate, the 2002 Reykjavik Declaration and the 2002 World Summit on Sustainable Development (WSSD).
The rights-based fisheries concept is getting growing attention in fisheries. It is much less developed in relation to ecosystem management but the ecosystem approach to fisheries may accelerate its general application in the present context of globalization. One of the main challenges is in choosing between individual and communal rights and in finding the right balance between conservation, economic efficiency and equity. Globally, the process will need to pay attention to two global objectives: food security and poverty alleviation.

The interplay between allocation and conservation is very relevant for the interplay between ecosystem management and fisheries management. As the two types of management aim at sustainable use, there is a significant potential for synergy and the Code of Conduct articulates indeed both types of requirements. However, each type of management is underpinned by different instruments, implemented by different national, regional or global institutions with partially overlapping objectives and constituencies. The reality is that the apparent agreement on the concept of sustainable use hides significant differences in the understanding of the concept, the means to achieve its ends and above all, perhaps, in the resources allocation it implies. This situation sets the scene for misunderstanding, wasteful competition for power and significant interaction costs.

The adoption of systems of rights is not, in itself, a sufficient guarantee of long-term rent maximisation, social welfare and conservation (Boncourt, 2003). The interplay between allocation and conservation, affected by climatic vagaries, is also influenced by the time horizon of the actors and their vision of the future. Their weighing of short-term versus long-term benefits is conditioned by their personal discount rate, depending, inter alia, on the economic and financial context in which they operate. A discount rate higher than the intrinsic growth rate of the resource will normally induce non-sustainable extraction rates.

A practical conclusion might be that that if society attaches an existence value or an option value to resource conservation per se, it may be necessary to impose to right holders and to enforce a specific constraint of sustainability. This constraint is enshrined in the sovereign rights provided by the 1982 Convention and must be passed on during the successive process of sub-allocation and enforced by the coastal State under its original obligation.

In terms of policy changes, most governments face two main options: (i) to maintain social structure as a priority, through the historical fishery model, assuming that this model is still functional, at the expense of economic efficiency, injecting public resources through rehabilitation and re-distributive programmes; or (ii) support the outright liberalisation, concentration and competition for the sake of economic efficiency, injecting public resources to finance the social costs of transition, including that of exclusion. These two options might not be mutually exclusive in a transition period (Ostrom, 2000) and might be used simultaneously either in a layered system of coastal and offshore rights as in Japan (Asada and Hirasawa, 1983), radically transferring to coastal communities complete property rights together in a concerted effort to develop their capacity to effectively use and defend them. Political shifts towards large-scale attribution or simply recognition of “hard” property rights to coastal communities might have very significant consequences for the sector, particularly in highly populated countries. There are, however, very few analyses of that option yet and the ongoing globalisation will not facilitate that outcome.

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34Where appropriate, of course, and after having verified that the local conditions exist for the success of the institutional change.
APPENDIX

GLOSSARY

Common pool resources

Ostrom (1990) defines common pool resources “as natural or man-made resources systems which are sufficiently large to make it costly – but not impossible – to exclude potential beneficiaries from obtaining benefits from its use. Berkes et al. (1989) give a perhaps clearer definition of “a class of resources for which exclusion is difficult and joint use involves substractability”. In Ostrom terminology, fishing grounds or stocks may be common pool resource systems while catches taken from them are resource units. Withdrawal of resource units from a resource system is act of appropriation and who does it is an appropriator. While a common pool resource system (a fishing ground) can be jointly appropriated, the resource units withdrawn from it (e.g. the catch) are private. It may be costly to exclude any appropriator from benefits deriving from improvements of a common pool resources system, even if he does not contribute to its management (free rider) and undermines the capacity for others to do so (subtractive or competitive use).

Ostrom (1990) stresses the need to avoid confusing the characteristics of a resource (as discussed above) with that of the system of use. A common property (or common) is a system of joint use underpinned by jointly agreed rules, including access rules, and regulations.

Discount rates

When they invest or act, individuals usually attribute less value to future benefits than to present ones, and the farther away the future benefits are, the lower its present value. They tend to “discount” the future. The discount rate depends inter alia on the information available, the perceived probability to reap future benefits and on present alternatives for investment or action. Because vulnerable and insecure people usually have particularly high discount rates, poverty leads to the degradation of the only resources they have access to. Uncertainty about rights may also lead, for the same reason, to degradation of private resources. Property rights, as well as social norms of behaviour (religion, ethics), may help reducing uncertainty about the future and related discount rates (Ostrom, 1990: 35).

Efficiency

Economists view equity as part of the equity-efficiency axis along which the performance of policies is assessed. From that angle, one needs to distinguish: (i) Private from collective efficiency: accounting for the externalities of the first; and (ii) Short-term from long-term efficiency: accounting for conservation in the second. When facing multiple objectives or conflictual interests, a relatively frequent situation, a programme is considered “efficient”, or “Pareto-optimal” when no alternative exist that could improve the degree of fulfilment of an objective or the satisfaction of an interest without compromising the others. Efficiency is a condition of optimality but it should not be confused with it.

Equity

In fisheries and environmental management contexts, “equity” relates to fairness, justice, e.g. in the allocation of rights or determination of claims. It may also relate to impartiality, freedom from bias of favouritism. It requires that similar options be available to all parties. Equity is a principle of stewardship by governments and the community. A number of sub-concepts have been referred to but may not meet with consensus. Inter-generational equity, for instance, is widely referred to and requires that future generations be given the same opportunity as the present ones to decide on how to use the
resources\textsuperscript{35}. It can be sought through avoidance of actions that are not potentially reversible on some agreed time scale (e.g. a human generation), consideration of long-term consequences in decision-making and rehabilitation of degraded physical and biological environments. Lack of intragenerational equity (i.e. equity among segments of the present generation) is recognized as one major source of conflict and source of non-compliance. Intersectoral equity would require, for instance, that the fishery sector be fairly treated when its interests conflict with those of other sectors. Cross-boundary equity may be a condition to successful shared stocks agreements between countries. Intercultural equity is relevant when allocating resources to different cultures or defining rights of minorities (e.g. between indigenous and other populations). Lack of equity leads to dissatisfaction or poverty or both and may lead to poor compliance.

\textbf{Property rights}

Resource allocation is about property rights, the legal rights to control resources. Property is generally defined as a right on a thing such as an object, a good or a service\textsuperscript{36}. Ronald Coase (1960) views property, instead, as a right to take a specific action such as the right to dump pollutants in the atmosphere or to produce agricultural products in a particular area\textsuperscript{37}.

For lawyers, property is the right to dispose of a thing in every legal way, to possess it, to use it and to exclude everyone else from interfering with it. For economists, property refers to a “bundle” of rights including: (i) access: the right to enter and enjoy non subtractive benefits; (ii) withdrawal: the right to harvest, substract; (iii) management: the right to regulate); (iv) exclusion: the right to defend the property and (v) alienation: the right to transfer, lease, sell all or part of this bundle of rights (Ostrom, 1990; 2000). Some of these rights may be further sub-divided\textsuperscript{38}. The granting or acquisition of all four main rights characterises full property or ownership.

In the Roman Law, property rights compound the right to use a tangible or intangible asset (\textit{usus}), the right to harvest and appropriate the returns from the asset (\textit{fructus})\textsuperscript{39}, the right to give, sell and destroy the asset or its returns (\textit{abusus}). This latter right is the foundation of complete ownership. Since these rights are valid vis-à-vis anybody, they are also called absolute property rights. From both perspectives, although only one or more of the first three rights (access, management, and exclusion or \textit{usus}, \textit{fructus} and \textit{abusus}) may be transferred for some time, establishing relative property rights (the right to sell remaining with the initial owner), full ownership will only be transferred if all the mentioned four absolute rights together are transferred (Kerrest, 2002).

The theory indicates that the structure of property rights influences the allocation and utilization of resources in specific and predictable ways. The transfer of incompletely specified rights and the resulting attenuation of property – whether intended or not – generates uncertainty about the asset and does not provide the incentives for its optimal use. It reduces the owner’s expectations about the uses of the asset (shrinkage of economic options) and therefore decreases its economic value (Furubotn and Richter, 1991).

\textsuperscript{35}This, in turn, raises \textit{inter alia}, the difficult question of the socially optimal discount rate.

\textsuperscript{36}A particular problem is that marine resources are difficult to “own” because of their invisibility, mobility and fugitiveness.

\textsuperscript{37}Curiously, this approach that has an obvious interest for fisheries is the theory defended by Johann Gottlieb Fichte, at the beginning of the 19th century when defending the concept of a “commercially closed State” in a violent advocacy against economic liberalism and apology of integrated planning (Fichte, 1800).

\textsuperscript{38}For instance, the right of access might be subdivided by seasons. The right of withdrawal might be subdivided by type of gear or species.

\textsuperscript{39}The concept of usufruct (\textit{usufructus}), defined as the right of using the returns of someone else’s asset is also potentially useful in fisheries.
Public resources

Resources that can be simultaneously utilised by many users without reduction of the respective availability (non-subtractive or non-competitive use) are considered public resources or public goods (e.g. a maritime landscape, Internet). A public good cannot, in principle, be appropriated although its use could lead to saturation. Attempts to appropriate it (e.g. by coastal developments or aquaculture) often lead to conflict. Whether a resource is public or common depends, however, on the type of use. A coastal area may be considered a public resource system for a set of “non-consumptive” uses (e.g. conservation, diving, bathing, scientific observations) while it would be a common resource for other uses (e.g. fisheries and aquaculture). The concept of sustainable development, for instance, implies that natural renewable resources be treated simultaneously as:

- Public resources when considered across time and generations, inasmuch as their use by some generations does not reduce the possibility of use by others, at least under a strong sustainability concept. They need to be enhanced and preserved; and
- Common resources, when considered at a given time, inasmuch as the use by some members of the present generation affects the use by other members. They need to be managed.

Res nullius/res communis

The concept of common property corresponds to the legal concept of res communis as a “thing which belongs to a group of persons, may be used by every member of the group, but cannot be appropriated by anyone” (Kerrest, 2002). The high seas are a good example of modern res communis. It should not be confused with a system of non-property (or res nullius) in which resources have no owner until they have been captured. “A res nullius is a thing which does not belong to anybody and may be appropriated by anybody” (Kerrest, 2002). However, for the property so generated to be legal, capture must be done in conformity with the relevant regulations. As such regulations could indeed restrict access, res nullius should not be automatically confused with open access. The confusion between res nullius and res communis in the Tragedy of the Commons (Hardin, 1968) has been abundantly clarified, including by Hardin himself (1998), as the Tragedy of unmanaged commons, recognising that the problem was not so much the common pool nature of the resources but the lack of regulation of its access and use.

Sovereign rights

The 1982 Convention and the CBD recognize the sovereign rights of States over the natural resources placed under their jurisdiction but sovereign rights (a legal institution) and property rights (an economic institution) are apparently not considered synonymous. The following comes mainly from Gerald Moore, pers. com., and Correa, 1995.

Sovereign rights are the rights of independent sovereign States to legislate, manage, exploit and control access to the natural resources under their jurisdiction. They include the right to determine property regimes applicable to those resources. Sovereign rights imply independence and exclusivity. The rights appertain only to the sovereign power concerned even though it may be subject to limitations or restrictions, in particular when States agree to exercise their sovereign rights in a particular way and subject to agreed rules, which then become binding on them. In the 1982 Convention, for instance, the statements recognizing the sovereign rights of States over their natural resources are coupled with affirmations of their responsibilities to manage those resources in such a way as to ensure their conservation. Sovereign rights are not property rights but they imply the right to establish property regimes. In the process of doing so, a State may very well determine that certain natural resources are the property of the State. It may also decide to alienate property, within its system of property law. As a consequence, while the 1982 Convention does not refer to property rights and has not explicitly required their establishment, it has explicitly given to the States the right to do so.

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Formed FAO Legal Counsel.
REFERENCES


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DISCUSSION PAPER 2

IS THE FAILURE OF CONVENTIONAL FISHERIES MANAGEMENT MAKING THE CONSERVATIONIST APPROACH MORE APPEALING, OFFERING A WAY OUT OF MAKING TOUGH DECISIONS?

by

Jake Rice

Summary

This paper contrasts the similarities and differences in the problems fisheries management agencies and conservation groups highlighted as central or serious to the failures in fisheries management and conservation. It then contrasts the goals of each of the two approaches, and finally the strategies, tactics, and tools advocated for use by each approach. The first set of comparative analyses will establish if the two groups are trying to solve the same problems. If so, do the groups differ in either where they wish to go (goals) or how they wish to get there (strategies, tactics, and tools)? From the differences, it may be possible to gain insight into whether the conservationist approach does, indeed, offer “a way out of making tough decisions”.

1. INTRODUCTION

Is the failure of conventional fisheries management making the conservationist approach more appealing, offering a way out of making tough decisions? For this question to be answered in the affirmative, three things have to be established as follows.

- Conventional fisheries management has, indeed failed.
- The conservationist approach is increasing in appeal.
- The conservationist approach offers a way out of making tough decisions.

Looked at superficially, the first two theses are, in fact, true. Judged on results, conventional fisheries management has failed – not always, but often, and sometimes spectacularly badly. A widely-quoted FAO overview has reported that 60 percent of the 200 major fish stocks around the world are currently overfished or fully exploited (FAO 1999). Looking at stocks in the developed world alone, where capacity to invest in fisheries science and management is comparatively large and has long history, the picture is no better. A review by the US National Marine Fisheries Service (2002) found that despite national legislation forbidding overfishing, 30.6 percent of 304 exploited stocks whose status was known were overfished or experiencing overfishing, and the status of another 655 (over 2/3 of the total) exploited stocks was unknown. Focusing even more specifically on groundfish stocks, where fisheries – and fisheries management – have the longest histories, the situation is still discouraging. According to the most recent assessments, spawning biomasses of 29 of the 45 stocks (64.1 percent) of Canadian Atlantic groundfish are at or near historic lows or have been declining steadily for the past decade (2003 & 2004 Stock Status Reports on www.dfo-mpo.gc.ca/csas). In Europe, the Fall 2003 and Spring 2004 assessments of groundfish stocks in the northeast Atlantic found that 35 of 64 (64.4 percent) stocks were outside safe biological limits (2003 terminology) or either experiencing or at risk of experiencing impaired productivity (2004 terminology) (advisory extracts in www.ices.dk/acmf).

There are a number of indicators that the conservationist approach is increasing in appeal. Entire journals are devoted to the emerging discipline of “conservation biology” and many are devoting full issues to marine problems. Mainstream science journals are publishing articles on the failure of fisheries management to adequately protect marine resources. The views expressed in this paper are solely those of the author, Jake Rice, Canadian Science Advisory Secretariat, Department of Fisheries and Oceans, Ottawa, Ontario, Canada ricej@dfo-mpo.gc.ca.
management and the need for new approaches (Myers and Worm 2003, Pikitch et al 2004). International and national species-at-risk groups have accelerated the listing of commercially exploited fish species (see Rice, this meeting, for statistics), supporting arguments that failures in fisheries management have placed a substantial portion of marine biodiversity, including exploited stocks, at risk of extinction (eg. Dulvy et al. 2004).

When evaluating the third thesis, it is necessary to analyse the assertion carefully. It suggests that conventional fisheries management has been ineffective because it has been unable to make tough decisions. That point, in turn, suggests that conventional fisheries management was at least addressing the proper issues, striving for proper goals, and trying to apply reasonable strategies and tools. A major impediment to progress was that the decisions which had to be made on the issues just required more pain – political, social and/or economic – than governments and managers were willing to take.

It is not obvious how to test if the issues and goals being addressed by fisheries management are the “proper” ones and if the tools used are “reasonable”, independent of the consequences of management – which the assertion argues are compromised by the lack of political will to make tough decisions. However, analyses across stocks have found that if status of stocks relative to reference points is used as an indicator of success of management, success is more likely when management follows science advice than when it does not (Rice and Cooper [2003] for a global survey of flatfish stocks; Piet and Rice [2004] for a review of all stocks in the OSPAR North Sea region assessed by ICES). This implies that at least science is addressing relevant issues and pursuing reasonable goals, and managers have some tools which can promote improved stock status. Therefore at least some of the problem is with the decision-making and implementation of decisions, which impede the use of the science information and management tools.

Hence, it is worth examining seriously the suggestion that the choices offered by the conservationists somehow require different decisions that are not as tough. This could be because the conservationists have goals on which multi-user consensus is easier to build, or they propose strategies and tools which either inflict less pain or offer ways to make the pain more enjoyable. If this is the case, then the conservationist approach may indeed offer a way out of the unsustainability maze.

This paper will investigate that situation analytically. It will first contrast the similarities and differences in the problems fisheries management agencies and conservation groups highlighted as central or serious to the failures in fisheries management and conservation. Next it contrasts the goals each of the two approaches, and finally the strategies, tactics, and tools advocated for use by each approach. The first set of comparative analysis will establish if the two groups are trying to solve the same problems. If so, do the groups differ in either where they wish to go (goals) or how they wish to get there (strategies, tactics, and tools)? From the differences, it may be possible to gain insight into whether the conservationist approach does, indeed, offer “a way out of making tough decisions”.

2. METHODS

2.1 Sources

I contrasted the problems, goals, and strategies and tools from major policy documents by five national and international government agencies with core mandates for fisheries management (directly or indirectly), with those from the policy documents of five major international conservationist groups or expert groups formed and espousing a strongly conservationist philosophy. For the management agencies I chose the following.

- Magnuson-Stevens Act (as amended in 1996 as the Sustainable Fisheries Act – Feder version [US 1996]) as the conceptual basis for fisheries management in the United States.

- Atlantic Fishery Policy Review (Government of Canada 2004) as the most current expression of the management philosophy and strategies in Canada.
• Green Paper for the EU Common Fisheries Policy (European Communities 2001) as a representation of what fisheries managers in the European Union would like to undertake and achieve (before the complex political processes in the EU altered the objectives and tools for reasons which might not benefit sustainability and conservation).

• Looking to the Future – A review of Commonwealth Fisheries Policy (2003a) and New Directions for Commonwealth Fisheries Management in the 1990s (1989 – the fisheries policy being reviewed) as the basis for Fisheries Management in Australia.

• FAO Code of Conduct for Responsible Fishing (FAO 1995) as the most complete compendium of thought on sustainable fisheries management by an international agency with concerns for the developing as well as the developed world.

For the environmental groups, I chose groups which were widely credible, and staffed by well credentialed professionals. More extreme conservationist groups and publications do exist, but I judged that if a “conservationist approach” is to be adopted by governments, it is more likely to arise from the documents of widely credible and generally constructive groups than from confrontational groups espousing comparatively strident views and approaches.

I used:

• policy statements by two major international conservation groups with wide support and track records of working constructively with government agencies:
  o *Creating a Sea Change* (1996) cosponsored by the International Union for Conservation of Nature (IUCN) and the World Wildlife Fund (WWF);
  o *Ocean Rescue/Endangered Seas*, a more recent (2003) policy by the WWF,

• the fisheries and marine philosophy and strategies of Greenpeace, a group with more confrontational interactions with some governments, in their initiatives;
  o *Fishing in Troubled Waters*;
  o *Save our Seas* (2004);

• reports of two expert groups:
  o *America’s Living Oceans* by the Pew Ocean Commission (2003);
  o the Marine Systems chapter (spring 2004 draft) of the *Millennium Ecosystem Assessment*.

3. APPROACH

From each source, I tabulated three classes of items: the main problems each identified relative to fisheries management, the main goals each espoused as the key features of a better future, and the main strategies, tactics, and tools each promoted as promising ways to move forward. In the tabulation I assigned one of four scores as follows, taking advantage of the fact that each document uses bulleted points, top level headings, or key recommendations to highlight the issues that they consider most important.

1. A feature (problem, goal, tool) featured prominently in a highlighted format;

2. a feature not placed in a highlighted format, but discussed explicitly in the narrative below a highlighted point;
3. a feature not mentioned explicitly, or at best in passing, but clearly underlying other material given prominence in the document (so they have to believe in it);

4. a feature where statements are made explicitly downgrading the factor as important or relevant.

(In a few cases the same feature can receive a 2 or 3 and a 4 in different parts of long document, suggesting some internal contradiction in the document).

From the three sets of paired tabulations, I first examined what problems (and goals, and strategies) were consistently given priority by governments and by conservationist groups. I then focused on the differences in priority the two approaches give to common entries, and, importantly, entries which were usually on the list of one approach, and absent or infrequently included on the list of the other. This analysis provides a factual basis for determining exactly what differs between the “conventional” fisheries management approach and the conservationist approach. The comparative analysis is augmented by a few selected proposals from the conservationist documents, which do not fit in the analytical framework developed, but which are potentially important components of the differences between the approaches. I then consider if those differences really do offer a way out of making tough decisions.

This analysis is imperfect in several ways. Except for the FAO document, each conventional fisheries management document has a geographic focus (national for US, Canada, and Australia; group of nations for the EU), and FAO has advisory but not direct management authority. On the other hand aside from the Pew Commission report, all the conservationist documents take a global perspective. Hence there are likely to some differences, particularly in problems and goals, just because of the geographic scale being addressed and the different accountabilities of the two types of groups.

The assignment of scores was done as objectively as possible, but still reflects one person’s judgments. Moreover, in the cases of Greenpeace and the WWF there was no single document which could be taken as laying out the entire conceptual and policy basis for fisheries management, and I may have missed documents which those groups would argue are core parts of their framework. These shortcomings in the analytical approach can be improved in dialogue with the groups themselves, if this approach is pursued further.

The row entries in the tables are also somewhat heterogeneous, containing some “big issues” and some specific points which, it could be argued might be just a special case of some other row. Also, different documents rarely phrased the same consideration with identical words, so I often had to make judgment calls of whether two documents were making the same point or different ones. Particularly for items receiving a 1, I was fairly strict in not lumping considerations which to me seemed subsidiary with more inclusive items in the same table; if a group really features an item strongly in its document, it considers it important in its own right, even if it is also a part of other issues. I had to be more opportunistic in deciding when documents were actually making the same point with different words; again, a strategy which could be improved through further dialogue.

Notwithstanding the shortcomings, the analysis does bring out key similarities and differences among the two approaches. In turn it allows a more informed discussion of what new options are provided by taking a conservationist approach, and what choices lie down that path.

4. RESULTS

4.1 Perceptions of urgency

Interestingly, each source document includes statements that, at the time the document was written, fisheries management and marine conservation faced a crisis. The words used are even similar, despite
nearly a decade of time elapsing between the first and most recent document, and the different roles and perspectives of the agency or group producing the document. To illustrate:

**Government Perspectives:**

“As far as conservation is concerned, many stocks are at present outside safe biological limits. They are too heavily exploited, or have low quantities of mature fish, or both. If current trends continue many stocks will collapse. … The fisheries sector is characterized by economic fragility resulting from over-investments, rapidly rising costs, and a shrinking resource base.” EU Common Fisheries Policy Green Paper, page 5.

“Certain stocks of fish have declined to the point where their survival is threatened, and other stocks of fish have been so substantially reduced in number that they could become similarly threatened as a consequence of (A) increased fishing pressure, (B) the inadequacy of fishery resource conservation and management practices and controls, or (C) direct and indirect habitat losses which have resulted in a diminished capacity to support existing fishing levels.” Magnuson – Stevens Act Section 104–297.

“Despite advances in the development of sustainable fishing over the last decade, certain problems may prevent improved management of the fisheries and threaten to undermine [species list]… landings. There are continued threats to conservation and stock rebuilding in some fisheries…Many fleets are still simply too large given the availability of resources”. Atlantic Fisheries Policy Review, page 3.

**Environmental Group Perspectives:**

“The loss of critical coastal ecosystems combined with overfishing has precipitated a collapse in commercial and artisanal fisheries. …Species with a long life and low reproductive rate are particularly at risk. … For many species, populations are being affected as their age, size, and genetic diversity are reduced through selective fishing. … Not only does this fundamentally alter the diversity of marine ecosystems, but scientists fear that soon we may have little left to catch other than invertebrates.” Creating a Sea Change, page 20.

“The combined stresses of overfishing, wildlife trade, pollution and climate change are imperilling our seas and the plant and animal species they sustain. …many of the world’s major fisheries are overfished or on the edge of collapse. Almost inconceivably, staples such as [species list] will soon be threatened and the industries they support, crippled.” WWF Ocean Rescue, cover page.

“World Fish stocks and catches are in decline and the coastal habitats on which many of the world’s fish stocks rely on at some stage in their lifecycles are being degraded. The combination of overfishing and degradation or conversion of habitats, which contributes to the loss of biodiversity and food provisioning occurs in both developed and developing countries, where export-driven fisheries are overfished, which diverts food away from the domestic market and the fishing sector declines as a source of employment in many developed countries.” Millennium Assessment, Chapter 25, page 14.

“Thirty percent of the fish populations that have been assessed are overfished or being fished unsustainably. An increasing number of these species are being driven towards extinction. … Destructive fishing practices are damaging vital habitat on which fish and other living resources depend. Combined, these aspects of fishing are changing relationships among the species in food webs and altering functioning of marine ecosystems.” America’s Living Ocean, page iv.

All groups clearly start from the perspective that there have been failures in past fisheries management, and the situation cannot be allowed to worsen. Improvements are needed, and the major differences are in the tone used to convey the urgency, not the need for urgent action.
4.2 Key problems which must be addressed (Table 1)

There are great similarities in the problems identified by those associated with the conventional fisheries management approach and with the conservationist approach. Both see overfishing as a core concern. Both acknowledge the associated problems of the ineffectiveness of fisheries management to control fishing in the past, and the poor compliance and lack of stewardship of many fishers. Both also see loss of traditional livelihoods in fisheries communities as a central problem to be addressed.

The differences between the lists of central problems are revealing, however. Whereas conventional fisheries management expresses concern over commercial loss of exploited stocks, conservationist approaches express pre-eminent concern over loss of biodiversity and extinction of exploited species. The difference in perspective between the two approaches is important; illustrating that economic accountability carries little weight in the conservationist view. Conventional fisheries management also lists the generic issue of ecosystem effects of fishing as a major concern, in a few cases accompanied specifically by habitat damage by fishing gear. In the conservationist approach, on the other hand, a number of individual impacts are listed separately, varying slightly from group to group depending on their individual historical foci. The specification of effects again reflects much more priority to these effects in the conservationist approach. It is also possible that whereas conventional fisheries managers have been made aware that fishing can have detrimental “ecosystem effects”, they have yet to educate themselves about these effects fully enough to offer more than generalities.

In the harvesting side, conventional fisheries management views the high priority problem of overcapacity of fishing fleets as being driven by excessive participation, with a subsidiary problem of excessive dependence of the industry on government. The conservationist approach also consistently gives priority to overcapacity, but links it directly to government subsidies, and to some extent to expanding technology. There is an important nuance in this distinction, as conventional fisheries management sees the overcapacity problem inflicted on it by industry and community dependence, whereas the conservationist approach sees the problem created by governments’ willingness to provide subsidies.

In various combinations, groups associated with a conservationist approach also include several problems that receive at best passing mention from conventional fisheries management approaches. Pressure from international trade and globalization was one such factor, where most conservationist groups identified it as an important impediment to achieving sustainability but the only conventional fisheries management group to identify it as a key problem was the EU. In that case globalisation was seen as a threat to its opportunities to fish, rather than as a threat to healthy ecosystems. Also the conservationist approach consistently includes pollution and coastal development as concerns for fisheries management, whereas the management agencies apparently see them as “someone else’s problem” and do not include them in fisheries policy. Finally, lack of attention to science advice is a major concern to most coming from a conservationist approach, whereas it rarely received mention as a problem in the policy documents of conventional fisheries management. All three of these differences are consistent with the hypothesis that conservationists tend to look at even local fisheries management problems from a holistic perspective, whereas conventional fisheries managers do not give priority to issues outside their immediate jurisdiction. The implications of this difference in perspective were addressed in section 5 of this paper, Discussion.

4.3 Key goals to be achieved (Table 2)

Interestingly, whereas the conservationist perspective produced a longer list of problems which needed to be addressed urgently, it also produces a shorter list of goals to be achieved. This is consistent with conventional fisheries management viewing the responsibilities of managers and governments as more complex and diverse than conservationist approaches do, with many social, economic, and political demands to balance with the ecological needs. Sustainability of uses is at the top of both lists, and protection of habitats is uniformly present in Tables 2a and 2b, although conventional fisheries
management is often more focused on fish habitat rather than habitat quality generally, and overall gives it slightly less importance than in the conservationist approach.

Many of the other goals are common to both approaches, but their priority and sometimes directions often differ. The conservationist approach gives high priority to ensuring healthy ecosystems and protecting biodiversity, including restoring populations and ecosystems where necessary. Rebuilding depleted stocks is more often implicit rather than explicit in their goals. The conventional fisheries management approach, on the other hand, focuses more on rebuilding depleted populations of exploited species and reducing the ecosystem effects of fishing. The difference is consistent with the conservationist approach viewing impacts from the ecosystem towards the causes of harm, where the conventional fisheries management perspective looks outward from the fishery.

All groups want improved management effectiveness, and particularly improved effectiveness of international fisheries management agencies and instruments. The conventional fisheries management approach seems to expect to achieve effective management more indirectly through improved stewardship, accompanied by better fisheries practices and more and better science. Management effectiveness is a goal itself to most conservationist approaches and not a consequence of achieving other goals, such that for example the role of science in supporting effective management does not translate into specific goals for increased science.

The conventional fisheries management approach, on the other hand, has a number of interrelated goals about the management process, including making governance more inclusive, transparent, and equitable. It is often implied however, that inclusiveness related to resource users more than other groups, and equity is among existing participants, and transparency is more about sharing knowledge than sharing power. The conservationist approach wants decentralised management, improved policy frameworks, and view equity in a wider social context. Power is definitely something that governments must at least share, if not yield, to communities. None actually list inclusiveness as top-level priority, although all it is implicit throughout all the documents from that perspective.

Conservationist make reduced by-catch and reduced fishing capacity as explicit goals. They uniformly want to see capacity reduction achieved through removing government subsidies and greater compliance through stronger government action. Reduction of by-catch and capacity is also usually a goal in conventional fisheries management. However, usually the hope is to achieve reduced by-catch and effort while maintaining fisheries employment and achieving yield-based goals. Rather than express a goal as removal of government support, conventional fisheries management usually phrases their goal as achieving self-reliant industries. Again, the differences are subtle but important.

**4.4 Strategies, tactics and tools**

Both the conservationist approach and the conventional fisheries management approach recommend use of many of the same tools, but again almost always with important nuances that differ. Both approaches also feel that an ecosystem approach and the application of precaution are important to improving the sustainability of fisheries, as is the adoption of integrated management processes. Both approaches also believe in a stronger role for science in management, with substantial importance given to greater support for data collection, research, and assessments. Education and training of those in the industry also receives substantial support from both approaches.

Beyond those commonalities, differences begin to be found. Both approaches argue that it is important that management become more decentralized and decision-making become more transparent and inclusive. However, conventional fisheries management expect greater inclusiveness will result in a greater sense of stewardship from harvesters whereas the conservationist approach expects more responsible governmental decisions from including more parties in policy formation and management planning.
Both approaches also acknowledge the importance of objectives-based management and comprehensive management plans for fisheries, with objectives being set for components of ecosystems other than just the target species of the fishery. However the conservationist approach has much lower expectations than does the conventional fisheries management approach, with regard to the effectiveness of objectives and reference points as management tools. The differences are particularly strong with regard to recovery planning for depleted fish stocks, which are consistently a high priority for conventional fisheries management but considered a secondary factor from the conservationist approach. Management objectives, reference points, and recovery plans are all tools already embraced by conventional fisheries management, and largely developed in that framework. Their greater expectations of effectiveness could be a consequence of either managers having faith in their ability to use their tools effectively, or conservationists having a fundamental distrust of fisheries managers to use tools decisively for conservation objectives.

Both approaches also believe that there is a role for economic instruments in addressing the problems with fisheries, but in different ways. Interestingly, certification of ecological sustainability is attractive to some adherents of both approaches, and also viewed with scepticism by some following both approaches, particularly those in a conservationist approach. That scepticism seems to be based on concerns that certification may disadvantage fisheries with primarily social objectives relative to ones with primarily economic ones. This interpretation corresponds to the very strong priority that the conservationist approach gives to subsistence users, accompanied by efforts to diversity coastal economies, which is important in both approaches. However, the main economic instruments viewed by the conservationist approach are deterrents – simply termination of financial support to large-scale commercial fisheries.

Conventional fisheries management still believes that technical measures are of substantial value in making fisheries more responsible, as are specific surveillance and enforcement tools such as observers. The conservationist approach simply promotes regulating or even banning gears which impact habitats or have high by-catch rates. They also want to see more stringent enforcement, but believe this will come more from increased will to enforce and commitment to international instruments than just wider use of observers and surveillance technologies. The same directness characterizes the strategies and tools advocated by the conservationist approach for reducing capacity and effort. In that approach it is a strategy as well as a goal to simply reduce effort, eliminate subsidies, and restrict any further expansion of fisheries, often linked simply to increased will to make conservation decisions. In conventional fisheries management approaches, the application of sanctions, penalties and cost recovery programs are featured as ways to achieve the desired reductions, with elimination of subsidies important, but viewed as a complex process to achieve.

By far the single greatest difference, though, is that conventional fisheries management looks to additional management objectives, technical measures, and greater stewardship as the strategies and tactics to reduce ecosystem effects of fishing, supported in the case of a few agencies by marine protected areas. The conservationist approach, on the other hand, has endorsed large and numerous marine protected areas as the single most important tool in achieving the goals of sustainable fisheries and ecosystem management, and addressing the problems in fisheries. This view was promoted by every conservation group’s documentation, usually as one of the most central messages.

5. DISCUSSION

Based on this analysis what really are the main differences between the conventional approach to fisheries management and the conservationist approach? With regard to problems to be addressed, the conservationist approach sees a broader range of problems as priorities, compared to the conventional fisheries management approach. Whereas the conventional fisheries management approach is focused in the first instance on depleted stocks, with ecosystem considerations second, the conservationist approach focuses first on biodiversity and risk of extinction of stocks and species, with depleted stocks just one component of the problem warranting little special status.
The other key difference is that whereas both approaches see overcapitalization and excessive fishing as core problems, their view of cause and effect is substantially different. In conventional fisheries management overcapacity rises from changes in stock status or fishing efficiency, degrading the economics of the fishery and creating the need for government support to continue viable industries and communities – subsidies respond to a need. In the conservationist approach the overcapacity and excessive fishing is a consequence of government subsidies – governments create the problem through their own policies and actions.

Consistent with points throughout the analysis, the conservationist approach applies a different standard to small-scale fisheries than large ones. From that perspective small-scale and artisanal fisheries are often the victims of expansion of large-scale fisheries. To the extent that government subsidies contributed to the expansion of large-scale fisheries, they are a part of the problem. To the extent that they contribute to keeping communities and small-scale fisheries alive when threatened with being out-competed by large-scale fisheries, they can be doing good.

With regard to goals, the core differences are associated with the conservationist approach having a broader ecosystem focus than that of conventional fisheries management. Conventional fisheries management emphasizes in the first instance rebuilding depleted stocks, whereas the conservationist approach is focused on restoring ecosystems and habitats more comprehensively. The conventional fisheries management approach seeks to achieve more effective management through improved stewardship, believing that increasing participation builds a greater sense of responsibility in the industry and more willingness to comply with management goals than existed in the past. The conservationist approach also seeks better management and believes it starts with decentralization and greater participation in management. However this is achieved by obtaining better decisions from local and regional groups with a greater diversity of participants at the table, less dominated by those with a financial interest in fishing, and then having those decisions enforced on commercial harvesters by governments with greater will to act. Removal of subsidies is also a goal, to further weaken the position of the large-scale commercial industries.

At the scale of strategies, tactics, and tools, conventional fisheries management places more faith in objectives-based management plans to guide fisheries, and technical measures to reduce unwanted impacts of non-target species and habitats. The conservationist approach believes more in community based management of small-scale fisheries, where formal plans may not be central to management, and to strict top-down regulation of fishing practices, including banning use of gears which damage habitats or which cannot have their by-catch problems largely eliminated through technical measures.

As noted earlier, the approach believes above all in creating networks of large no-take zones, in which fisheries operations simply are not allowed to occur, or occur only on subsistence levels.

Many of these differences are consistent with the generalisation, noted above, that conservationists tend to look at even local fisheries management problems from a holistic perspective, whereas conventional fisheries managers do not give priority to issues outside their immediate jurisdiction. For example, it seems that both groups compartmentalise their views of economic drivers of fisheries, but in different ways. One such driver is pressure from international trade and globalization. Most conservationist groups identified it as an important impediment to achieving sustainability, yet conventional fisheries managers may have acknowledged it as an issue in their policy documents but gave it little attention in goals and strategies. This contrasts markedly with the high value that conventional managers give to economic tools when applied to management of domestic fisheries; tools that conservationists view with scepticism when used on domestic scales. Another example is pollution and coastal development, which conservationists view as a concern of fisheries management, yet fisheries management agencies leave to other jurisdictions. The implications of this difference in defining the scope of fisheries management are important, as both perspectives present potential problems for making progress towards sustainability. The conservationist approach invites the grafting of diverse social and integrated planning issues onto even local fisheries issues, distracting effort from fixing a problem to “fixing the world”. The conven-
tional approach invites myopia, allowing substantial effort to be expended fine-tuning details which are tractable and ignoring fundamental problems because the managers feel that they do not have authority to tackle them.

In summary, there are numerous differences between the conventional fisheries management approach and the conservationist approach. Some may appear to be just nuances, but even most of the nuances are important. Moreover, some of the differences are major. The important consideration is: “Do these differences offer a way out of making tough choices?”

The choices which have to be made are certainly not easier. The choices may actually be ones which make more sense; for example it may not be possible to rebuild individual stocks (European Communities 2003) without rebuilding the size composition of the community in which it occurs (Pope et al. 2003). However, the scientific challenges of knowing what to do to restore ecosystems include all the scientific challenges of restoring individual species as just special cases of a task which is much larger, and can only be more complex that a single small part of the task. Likewise, the number of human activities which have to be reduced, modified, or curtailed to restore an entire ecosystem, or even the fish community portion of it, can only be larger than the number of activities impacted in restoring a single stock. This, in turn, requires cooperation from, and often sacrifices by, a much wider range of users, including fishers on stocks which are still healthy. Moreover not all of those who feel that they are making the sacrifices can expect to ever receive benefits from their perceived sacrifices – at least they cannot expect benefits to accrue in proportion to the sacrifices make by the different users. This makes the challenge much harder, and much less likely to succeed. Essentially every document reviewed from the conventional fisheries management approach, and some from the conservationist approach, stress that cooperation from fisheries in management activities is most likely when they expect that those who make the short-term sacrifices will be the ones to receive any subsequent benefits.

The options offered as choices are not necessarily more attractive, at least to the harvesters being asked to reduce and change their activities. In the conservationist approach they are being asked to accept less help from government, reduce effort by as much more than in conventional fisheries management, often invest more in more environmentally friendly gear, and above all, to cease fishing altogether in large parts of all marine areas. In a recent social science investigation of attitude of fishermen from the UK, Norway, Denmark, and the Netherlands towards closed areas, there was wide consensus in the industry that they would only consider closed areas as part of a comprehensive management plan. Moreover, their support would be for small areas, closed for specific purposes related to the target species of the fishery, and closed only for the periods of the year when the target species is engaged in the activity justifying the closure (EFEP 2004). These small and temporary closed areas for spawning, nursery areas, etc are very different from the networks of 20–40 percent of marine areas of the world that are a cornerstone of the conservationist approach. Adherents of the conservationist approach stress the long-term benefits to fisheries of such benefits (reviewed documents, Roberts at al 2002). However, a number of additional conditions usually have to be met for those benefits to accrue (Hilborn et al. 2004), and the trade-off of short term catch reductions for long term higher yields has been offered by conventional fisheries management for decades without being accepted by the industry in almost all cases (review in Rice, this volume).

Finally, the way that the choices will be made cannot be simpler in the conservationist approach than in conventional fisheries management. Both approaches have more inclusive, transparent, and decentralized governance as keys to their way forward. Central to the difference in their approaches to this issue, though, is that within the conservationist approach there will be a greater diversity of perspectives in the inclusive governance processes, the processes will be biased towards participants from small and artisanal fisheries over the interests from large-scale commercial fisheries, and the governance system will address policy issues more than implementation issues. It is hard to see how this will lead to easier decision-making. It certainly does not accord with the Canadian experience with inclusiveness in providing science support to management (Rice this volume) and development management strategies (the AFPR 2003, which took over three years and is not complete), nor with the developing EU approach to greater inclusiveness in assessment and management planning (ICES 2004). Decisions take longer to
reach. Moreover, the conservationist approach argues that the greatest reductions should be by the large-scale industrial harvesters, who will lack incentives to remain part of a process that they feel is biased against them. The reports from the conventional fisheries management approach document well that the necessary compliance and stewardship needed from industry is only likely when they have high confidence in the fairness of the processes leading to the management decisions – and even then compliance is not assured.

So we find that the conservationist approach does not present easier choices (at least to those causing the overfishing and ecosystem impacts), does not offer more attractive options, and does not offer easier processes to reach decisions where there is reason to expect compliance. Why does it expect to succeed? In various ways, each of the documents from the conservationist perspective expected more decisive action from governments, national and international. For example, the Pew Report (page 47) recommends that all quota and conservation decisions be made unilaterally by a government fisheries service, solely on the basis of recommendations from teams of scientists from federal and state agencies and academia. The Millennium Assessment is strident in its criticisms of governments as “not willing to act for the good of the global commons … The refusal of governments to set sustainable harvest levels or to take a precautionary approach to the Common Fisheries Policy is the most blatant example of this (page 47)”. It ends the paragraph with a call for “a political commitment to use them [international instruments] to effect change.” The source of the greater will is unspecified, but is inferred to come from greater citizen pressure, expressed through the more inclusive consultation and decision processes.

Hence, at the end of the analyses, the key component in both approaches still seems to be a need for governments to be willing to act decisively. Both approaches acknowledge a track record of frequent failures in the past, which has led to the current crises which they all recognise. Conventional fisheries management is trying to address the failures by reducing the pressures on government to be the main actor, and building stewardship by the resource users. The conservationist approach is trying to address the failures by changing the politics of decision-making, so the short-term interests of the fishing industry come to lose most of the time, rather than win. It is not offering easier choices, more attractive choices, or easier ways to choose. It is making choices tougher in all three ways. However, it is expecting more toughness in dealing with the choices as well. Given the past, this may be the right thing to do.

REFERENCES


European Fisheries Ecosystem Project. 2004. European Fisheries Ecosystem Plan (draft) http://www.efep.org


Table 1a. List of Issues which Government and Intergovernmental Agencies highlighted as serious concerns about current fisheries.

<table>
<thead>
<tr>
<th>Issue</th>
<th>United States</th>
<th>Canada(^{43})</th>
<th>European Union(^{44})</th>
<th>Australia(^{45})</th>
<th>FAO(^{46})</th>
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<td>Stock declines</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Risk of loss of stock</td>
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<td>4</td>
<td>1</td>
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<td>Habitat damage and loss</td>
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<td>Loss of coastal employment</td>
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<tr>
<td>Ineffective management/ conflict of international fisheries</td>
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<td>4</td>
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<td>Poor stewardship; Lack of compliance</td>
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<td>3</td>
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<td>Overcapacity – excessive participation</td>
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<td>Reliance on government help</td>
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<tr>
<td>Lack of attention to Science advice</td>
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<td>Globalisation</td>
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<tr>
<td>By-catch</td>
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<td>Ecosystem Effects of Fishing</td>
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<td>Loss of traditional livelihoods</td>
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<td>Lack of an ecosystem approach</td>
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\(^{42}\) Magnusson-Stevens Act (1996) – Table 1 & 2; Section 2; http://www.nmfs.noaa.gov/sfa/magact/mag1.html#s2.

\(^{43}\) Atlantic Fisheries Policy Review (2004) – Table, Section 1.1-1.3; Table 2 – Section 2.

\(^{44}\) Green Paper on the Common Fisheries PolicyTable 1-Chapter 1; Chapter 1.

\(^{45}\) Australia – Looking to the Future: A Review of Commonwealth Fisheries Policy; Chapters 1-4.

\(^{46}\) Code of Conduct and Checklist; Table 1 – pp. 1-6.

* Globalisation of harvesting and marketing was discussed in several parts of the Australian review, but as a fact of life and not a problem in need of corrective action.
Table 1b. Issues considered serious by Environmental Groups

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>WWF$^{47}$</th>
<th>IUCN$^{48}$</th>
<th>Greenpeace$^{49}$</th>
<th>Pew$^{50}$</th>
<th>M.A$^{51}$</th>
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<td>Pollution &amp; nutrient enrichment</td>
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<tr>
<td>Stock declines</td>
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<td>Coastal Development</td>
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<td>Invasive Species</td>
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<td>Aquaculture (pollution &amp; escapees)</td>
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<td>Inappropriate concepts</td>
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<td>Overfishing</td>
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<td>Expanding technology &amp; capacity</td>
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<td>Serial overfishing / down the web</td>
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<td>Ignoring Science</td>
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<td>Genetic changes to exploited populations</td>
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<td>Food security at risk</td>
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<td>Expansion of fisheries to deep water</td>
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<td>Subsidies / excessive effort</td>
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- Dealt with in another chapter of the Millennium Assessment, where it is a high priority.

$^{47}$ WWF Ocean Rescue and Endangered Seas Programs.
$^{48}$ IUCN Sea Change (with WWF Co-sponsor).
$^{49}$ Greenpeace – Fishing in Troubled Waters & Principles for Ecologically Responsible Fisheries.
$^{50}$ Pew Ocean Commission – America’s Living Ocean.
$^{51}$ Millennium Assessment – Chapter 25 – Marine Systems.
<table>
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<th>Canada</th>
<th>European Union</th>
<th>Australia</th>
<th>FAO</th>
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<td>Prevent Overfishing / Achieve sustainable use</td>
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<td>Rebuild Depleted stocks</td>
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<td>Obtain optimum yield</td>
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<td>Use best science available</td>
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<tr>
<td>Increase science knowledge</td>
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<tr>
<td>Collect reliable data</td>
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<td>2</td>
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</tr>
<tr>
<td>Equity &amp; transparency</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Expand underutilized fisheries</td>
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<tr>
<td>Reduce By-catch</td>
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<tr>
<td>Reduce Capacity</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Support Sovereignty</td>
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<td>Achieve Self-reliant Fisheries</td>
<td>4</td>
<td>1</td>
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<td>1 (Cost recovery)</td>
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<td>Maintaining Fisheries Employment</td>
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<tr>
<td>Improve fishing practices &amp; enforcement</td>
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<tr>
<td>Protect &amp; Enhance Biodiversity</td>
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<tr>
<td>Improve Food Security</td>
<td></td>
<td></td>
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<tr>
<td>Reduce ecosystem effects of fishing</td>
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<td>2</td>
<td>1</td>
<td>1**</td>
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</tr>
</tbody>
</table>

* Goal was specifically to attract young people into fishing as a career.
** Goal was to take a more ecosystem approach to management, of which ecosystem effects of fishing was a part.
Table 2b. Goals of Environmental Groups

<table>
<thead>
<tr>
<th>Goal</th>
<th>WWF</th>
<th>IUCN</th>
<th>Greenpeace</th>
<th>Pew</th>
<th>M.A</th>
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<td>Ensure uses are sustainable</td>
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<tr>
<td>Improved stewardship</td>
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<td>Improved management effectiveness</td>
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<td>Integrated policy framework</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Strengthened international agencies / instruments</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>Decentralised management</td>
<td>3</td>
<td>1</td>
<td>3</td>
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<td>2</td>
</tr>
<tr>
<td>More inclusive decision-making</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Protect habitats and coastlines</td>
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<td>3</td>
</tr>
<tr>
<td>Improved depleted fish stocks</td>
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<tr>
<td>Restoring populations and ecosystems</td>
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<tr>
<td>Reduced fishing capacity</td>
<td>2</td>
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<td>1</td>
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<td>3</td>
</tr>
<tr>
<td>Reduce by-catch</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Improved food security</td>
<td></td>
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<td>Remove government financial support to commercial fisheries</td>
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<tr>
<td>Equity of access / protecting subsistence uses and small-scale fisheries</td>
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<td>1</td>
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<tr>
<td>Eliminate whaling</td>
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</table>
Table 3a. Strategies, Tactics and Tools advocated by Government and Intergovernmental Agencies

<table>
<thead>
<tr>
<th>Strategies, Tactics and Tools</th>
<th>United States</th>
<th>Canada</th>
<th>European Union</th>
<th>Australia</th>
<th>FAO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulate foreign fishing</td>
<td>1</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implement / Expand Observer Programs</td>
<td>1/2*</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Strengthen International Agreements</td>
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<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Apply Ecosystem approach</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Apply Precautionary Approach</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Use Technical Measures for By-catch/habitat impact reduction</td>
<td>1/2*</td>
<td>2</td>
<td>1</td>
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<td></td>
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<tr>
<td>Use best science available (including user knowledge)</td>
<td>1</td>
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<tr>
<td>Mgmt Plan must prevent overfishing / achieve sustainability</td>
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<tr>
<td>Allow for resource variations</td>
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<tr>
<td>Reduce / Minimise by-catch</td>
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<tr>
<td>Decentralised Management / consultations</td>
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<tr>
<td>Transparent Inclusive Decision-making</td>
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<tr>
<td>Promote Stewardship</td>
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<tr>
<td>Identify &amp; protect fish habitat</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Limited access</td>
<td>1 &amp; 4 ***</td>
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<tr>
<td>Implement Recovery Plans for overfished stocks</td>
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<tr>
<td>Reduce or Manage Capacity</td>
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<tr>
<td>Disaster relief</td>
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<tr>
<td>Increase research / assessment</td>
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<tr>
<td>Apply Integrated Management</td>
<td>2</td>
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<tr>
<td>Increase monitoring and enforcement / reliable data</td>
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<tr>
<td>Promote development of underutilised species</td>
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<tr>
<td>Use trade agreements</td>
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<tr>
<td>Provide Education, Training &amp; Communication</td>
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<tr>
<td>Support subsistence fishing / equity</td>
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<tr>
<td>Maintain allocation shares</td>
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<td>1**</td>
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<tr>
<td>Control new fisheries so they grow slowly</td>
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<tr>
<td>Apply Sanctions and penalties</td>
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<tr>
<td>Conduct Risk assessments</td>
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<tr>
<td>Apply Cost recovery</td>
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<tr>
<td>Apply Economic instruments / ITQs, certification</td>
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<tr>
<td>Address ecosystem effects of fishing</td>
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<td>Deal with pollution</td>
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<tr>
<td>Strategies, Tactics and Tools</td>
<td>United States</td>
<td>Canada</td>
<td>European Union</td>
<td>Australia</td>
<td>FAO</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
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<tr>
<td>Reduce / eliminate subsidies</td>
<td>2</td>
<td>1</td>
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<tr>
<td>More determined decision-making</td>
<td>2</td>
<td>1</td>
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</tr>
<tr>
<td>Adopt explicit objectives, indicators &amp; reference points</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Use Marine Protected Areas</td>
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<td>2</td>
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<tr>
<td>Apply Code of Conduct</td>
<td>3</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Diversify coastal employment</td>
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<td>Implement conflict resolution mechanisms</td>
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<td>Formalise allocation processes</td>
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</table>

* Mandatory on foreign vessels, considered for domestic vessels
** For countries, not fleets
*** Limit new entrants, no removals of existing participants
<table>
<thead>
<tr>
<th>Strategy / Tactic</th>
<th>WWF</th>
<th>IUCN</th>
<th>Greenpeace</th>
<th>Pew</th>
<th>M.A</th>
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<td>Marine Protected Areas</td>
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<td>I!</td>
<td>1 *</td>
<td>1!!</td>
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<td>Regional Governance</td>
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<tr>
<td>Adopt inclusive, transparent Governance</td>
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<tr>
<td>Apply Ecosystem Approach</td>
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<td>1</td>
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</tr>
<tr>
<td>Apply Precautionary Approach</td>
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<td>1</td>
<td></td>
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<td>2</td>
</tr>
<tr>
<td>Separate quota and allocation decisions</td>
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<tr>
<td>Limit Access</td>
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<td>Set New management objectives for ecosystem health, not yields</td>
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<td>Implement marine zoning</td>
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<td>Implement management plans with conservation goals</td>
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</tr>
<tr>
<td>Increase financial &amp; political support for international agencies / instruments</td>
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<td>Regulate use of gears which cause damage</td>
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<td>Mandatory Monitoring Programs</td>
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<td>Increase gear selectivity</td>
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<td>Increased capacity / funding for management and science</td>
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<td>Use best available science</td>
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<tr>
<td>Control pollution</td>
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<td>Integrated Management</td>
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<td>Eliminate Subsidies</td>
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<tr>
<td>Reduce fishing capacity / effort</td>
<td>1</td>
<td>1</td>
<td>1!!**</td>
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<tr>
<td>More stringent enforcement / Stronger application of agreements</td>
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<tr>
<td>Measures to give priority to subsistence uses (Trade and Policy)</td>
<td>1</td>
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<td>Diversify employment opportunities</td>
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<td>Control technological innovation</td>
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<td>Increase political will for tough decisions</td>
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<td>Restrict expansion of fisheries</td>
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<tr>
<td>Use of objectives, indicators, hard reference points and rules</td>
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<tr>
<td>Use of economic instruments – eco-certification and trade agreements</td>
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<td>2 / 4</td>
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<td>Provide Education, training and communications</td>
<td>2</td>
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<tr>
<td>Use of Species-at-Risk designations</td>
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<tr>
<td>Recovery Plans for depleted species</td>
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<tr>
<td>Implement Code of Conduct</td>
<td></td>
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</tr>
</tbody>
</table>

* Not as part of fisheries program, but key goal
* Especially whale sanctuaries and deep water areas
** Targeted at large vessels
*** Dealt with in other chapters of the documents, where the strategies are developed as priority actions.
SUMMARY

Analogous to the recently emerging ‘slow food’ movement for the protection of the right to taste (see [www.slowfood.com](http://www.slowfood.com)), the concept of ‘slow fish’ may be used to convey important messages for protection of fisheries and the right to fish. The slow food movement talks about striking the right balance of respect and exchange with nature and the environment, while enhancing eating pleasure. Similar notions also occur in fisheries, when fishers talk about their personal attachment to the sea and how they consider fishing a satisfying and fulfilling lifestyle. The rapid development of fishing technology during the past decades has brought about many undesirable changes in the underlying ecosystems, causing many fisheries to fail. Governments, mired in day-to-day tactical decision-making, have been so far unable to contain the industry, leaving the public at large with increasing doubts about the future of fisheries and fish supply.

We propose here a new metaphor for the general public to think about: sustainability, the concept of ‘slow fish’, with three components. First, ‘slow down fishing’ deals with the need to match the rate of fishing with the rates of nature. It involves creating an understanding that long-term benefits of responsible fishing practices outweigh the loss of short-term gains, especially when considering total ecosystem values and future generations. Next, ‘scale down fisheries’, concerning the need for reduction of fishing capacity, using incentives such as differential taxes, geared preferentially to small-scale, owner-operated vessels. Finally, ‘maintain small-scale fishing communities’ considers food security and viable livelihood of local fishing communities. Through education and media programmes, this would create awareness for importance of local knowledge, community pride and high-quality fish that are locally caught and consumed (including visiting tourists), thus linking, here as well, with a key tenet of the slow food movement.

1. INTRODUCTION: A NEED FOR NEW METAPHORS

Since the mid-1990s, FAO and several prominent scientists have warned against the crisis in fisheries worldwide and provided evidence to support an urgent need for global actions to address the problem (Pauly *et al*., 1998; Jackson *et al*., 2001; FAO, 2002; Myers and Worm, 2003). Agenda 21, the Convention for Biological Diversity, the listing of some commercial fish species under CITES, and the FAO Code of Conduct for Responsible Fisheries, are some of the initiatives intended to address this situation. The FAO Code of Conduct, in particular, aims at setting principles such as ecosystem-based management, participatory decision-making, quality and safety of fishery products, integration of fisheries with coastal management, and international cooperation in management and compliance (FAO, 1995). These principles have been used as a basis for policy setting and implementation at the national level for many countries. For example, the US government adopts ecosystem-based principles and implements these through ecosystem management plans (EPAP, 1999), while Canada’s Ocean Strategy considers ecosystem ‘health’ (DFO, 2002). Environmental organizations endorse similar principles, as expressed in the WWF proposals and guidance (Ward *et al*., 2002) and the Pew Ocean Commission Report (POC, 2003).

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52 The views expressed in this paper are solely those of the authors, Ratana Chuenpagdee, Coastal Development Centre, Thailand; International Ocean Institute, Canada, [ratana.chuenpagdee@dal.ca](mailto:ratana.chuenpagdee@dal.ca), and Daniel Pauly, Fisheries Centre, University of British Columbia, Canada, [d.pauly@fisheries.ubc.ca](mailto:d.pauly@fisheries.ubc.ca).
In addition to reporting on the worsening state of the fisheries and marine ecosystem, some studies identify the causes and propose potential solutions. Using historical trends and mapping techniques, Pauly and Maclean (2003) showed that overfishing was the major cause of decline of fish stock and ecosystem degradation in the North Atlantic. Their recommendations to alleviate the problem included reducing fishing effort, transforming the market for fish and transforming the governance of fisheries.

Chuenpagdee et al. (2003) compared and ranked ten fishing gears used in the US, in terms of their impacts on by-catch and habitats. Their report, *Shifting Gears*, provided a comprehensive account of ecosystem impacts caused by each gear, as well as suggested means to lessen these impacts, such as gear modifications and shifting from high to low impact gears. These recommendations and suggestions, while sensible, are not always well received. Policy makers willing to endorse these measures may fear becoming unpopular with the owners of industrial fishing fleets, whose economic interests usually carry more political weight than those of small-scale commercial and subsistence fishers. Thus, more often than not, problems in fisheries emerge from issues of fair access allocation and equitable distribution of costs and benefits between the different segments of the fisheries sector.

International and national environmental organizations dealing with marine and fisheries issues have launched various education and awareness programs about conservation issues. An example of these efforts is the production of a ‘Fish List’ (www.thefishlist.org), assembled by Blue Ocean Institute, Environmental Defence, Monterey Bay Aquarium’s Seafood Watch Program and Seafood Choices Alliance. The list aims to inform consumers as to what seafood to enjoy and what to avoid, based on the state of the underlying fish stock and impacts caused by various fishing methods, and enhances public awareness about fisheries and ocean issues.

Overall, fisheries problems have been well identified by scientists, acknowledged by governments, and generally understood by the public. Various efforts to reverse the trends which have led to the crisis, such as effective subsidies and fleet reduction programs, have been explored, while programs to provide protection to fisheries resources and their ecosystems, such as the designation of marine protected areas, are implemented. Fishers and other stakeholders are increasingly being consulted about fisheries management. Yet, the continuing crisis suggests that more is required, i.e., that it is the very way we think and talk about fisheries and fish that needs to change. It is under this premise that we propose a new metaphor, ‘slow fish’, to promote discussion and awareness about fisheries sustainability among the general public.

‘Slow fish’ follows the key tenet of the ‘slow food’ movement (www.slowfood.com) for the protection of the right to taste and striking the balance of respect and exchange with nature and the environment, while enhancing eating pleasure (Honoré, 2004). For fisheries, this translates into three key areas, i.e., slow down fishing, scale down fisheries, and maintain small-scale fishing communities. ‘Slow down fishing’ concerns the need to match the fast rate of resource exploitation with the slow rate of nature, by slowing down fishing. This would promote an understanding and acknowledgement of long-term societal benefits of responsible fishing practices through an application of valuation methods that account for the total value of fisheries resource and of ecosystems, for the present and future generations.

Next, ‘scale down fisheries’ deals with the need for reduction of fishing capacity through appropriate incentives, including a differential tax system favouring the operation of small-scale, owner-operated vessels. Finally, ‘maintain small-scale fishing communities’ recognizes the importance of local fishing communities in their contributions to food security and viable livelihood. Through education and media programmes, it aims to increase public awareness and appreciation for locally caught and consumed fish and seafood products. The rationale for considering these three aspects and policy recommendations on how to achieve ‘slow fish’ are described in the following sections.

2. SLOW DOWN FISHING

Several studies have shown that the growth of fisheries catches worldwide has slowed down since the 1970s, and indeed reversed since the late 1980s (FAO, 2002; Pauly et al. 2002). The decline is due to several factors, including overfishing, ecosystem changes due to destructive fishing practices, discarding of by-catch, and to a lesser extent, pollution of coastal waters. A natural response to this should be that
we slow down fishing. The reality is, however, quite the opposite. Many nations choose to become competitive in the race for the last fish, through expansion and modernization of fishing fleets that go fishing farther, deeper, and stay longer at sea (Pauly and Maclean, 2003). This is often done despite higher costs, e.g., of fuel (Pauly et al., 2003), and increased environmental damages (Chuenpagdee et al., 2003). This expansion was possible, among other things, because of high levels of subsidies, which contribute to keeping the costs of fishing artificially low.

Swan and Gréboval (2004) identified subsidies and overcapacity as the most important factors for unsustainability. Several examples of government programs promoting fisheries development through subsidies have been reported, e.g., for the trawl fisheries in the Gulf of Thailand (Chuenpagdee and Pauly, 2004a), and the small pelagic fishery in Chile (Zuleta, 2004). It is not surprising, thus, that over-capitalization and over-capacity are currently considered the most pressing problems of the world’s fisheries (Kirkley and Squires, 2003), and that debate continues about the effects of subsidies and ways to remove them (Swan and Gréboval, 2004; Holland et al., 1999; Clark et al., 2004). Although some may argue that subsidies help keep the fisheries economically viable, they usually add to the existing marginalization of small-scale fishers, for example, by raising barriers for members of the small-scale sector to participate in management decisions (Delgado et al., 2003).

Another reason for continued overfishing is the undervaluation of fisheries resources. Policy makers, managers, investors, and environmental organizations alike rely on valuation techniques and economic analyses to assist in their decisions about various resource issues, such as allocation, fisheries development project appraisal, and damage compensation (e.g., in cases of oil spills). Similar to the evolution seen in ecological and biological assessment, social and economic assessment of fisheries resources has been modified to account for the complexity, diversity and dynamics of the resource system. Experts, unsurprisingly, differ in their opinion about the most appropriate techniques to capture resource values. While there is no lack of publications on principles, methods and guidelines, different approaches can lead to dissimilar results, as observed in studies by Costanza et al. (1997) and Lomborg (2001), suggesting that estimating the actual costs of fishing remains a challenge.

For the most part, valuation methods rely on conventional, implicit or constructed markets, such as changes in productivity, travel cost, and contingent valuation (CV), respectively. Several recent research focus on improving the existing conventional methods, in particular CV, which is most often used to value natural and environmental resources (see for example, Mc丹niels et al., 2003). Others focus on exploring alternative techniques and different elicitation process to deal with the difficulties in resource valuation (Farber et al., 2002). One such approach is the ‘damage schedule’ method, which relies on the rankings of perceived relative importance of resources (Chuenpagdee et al., 2003). Not only does this offers an alternative ‘metric’ for valuation, but it also draws upon choices made by individuals, including experts, managers, resource users and general public, to reflect their value system. Interestingly, in its applications to various resource issues (e.g., fisheries, coastal habitats, marine protected areas) and in diverse cultural settings (e.g., Thailand, Mexico, Belize, US, Canada), rankings obtained generally reflect an underlying consensus amongst stakeholders. These findings are encouraging, as they imply that people might be more in agreement with difficult policy decisions than normally assumed. Thus, ‘slow down fishing’ might indeed be possible to implement.

In addition to proper resource valuation, cost-benefit analysis needs to incorporate the real costs of resource extraction, including externalities and subsidies, as well as explicitly considers the interests of future generations (Sumaila, 2001), and accounts for unpredictable future events (Weitzman, 1998), through different uses of discount rates. This new analysis could contribute to efforts to halt overexploitation of fisheries, as it attempts to shift the focus from the present to the future, and illustrates that long-term benefits outweigh the loss of short-term gains.

Why slow down fishing? Given the reality that fisheries exploitation rates do not match the slow rates of nature, i.e., the slow rates of growth, reproduction and biomass accumulation of most species, and the even slower rates of build-up of biogenic structures (coral reefs, deep sea reefs, oyster reefs, etc.), it makes sense to slow fishing down. Considering the irreversibility of change in many natural and
social systems, once they are disrupted by over-exploitative and damaging activities, it is reasonable to consider lessening fishing pressure. Moreover, experiences show that programs such as restoration of habitats, rebuilding of fish stocks and the re-establishment of displaced coastal communities have usually not been successful, despite strong effort and high investment. Efforts to restore oysters in the Chesapeake Bay started more than a decade ago, by attempting to construct a large-scale oyster reefs, and later to build a three-dimensional reef structure. Yet, it remains to be seen whether the Chesapeake Bay Program will achieve its goal of a tenfold increase in oysters by 2010 considering challenges such as habitat degradation and the current low population levels of native oysters (CBP, 2000). Another example is the cod fisheries off the North East coast of Canada. It has been many years since the collapse of cod fisheries that caused about 35 000 fishers to become unemployed. Still, there is no sign of recovery of both underlying fish population and fishing communities (Haedrich and Hamilton, 2000).

Slow down fishing closely corresponds with the precautionary principles and the FAO Code of Conduct for Responsible Fisheries (FAO, 1995). It requires that proactive fisheries policies and social programs be implemented to slow the rate of fishing, and to change how people relate to fisheries resources. Policy changes involving institutional reform are often useful in this regard. As seen in Thailand and Indonesia, new ministries have been established with the mandates to manage fisheries as natural resources for sustainability and conservation, instead of as agricultural products to be simply ‘harvested’. The shift from exploitation to conservation reflects the recent considerations for ecosystem health and future generations.

Changing how people relate to fisheries is, in some way, a formidable task, given the looming threat of a supply shortage. As reported in Delgado et al. (2003), global fish consumption is on the rise, due to the combined effects of growth in population, income and urbanization. It is now being recognized, however, that the problem is not only about the overall amount of food being consumed. Rather, the concerns are related to the distribution of food and consumption pattern. Presently, fish and fisheries products are not evenly and fairly distributed. For example, most of the fisheries resources in the exclusive economic zones (EEZs) of West African countries are extracted through rather one-sided fishery ‘access agreements’ for fishing fleets from the European Union, which supply European markets (Kaczynski and Fluharty, 2002). The United States, Japan and other countries of the North are similarly involved in unbalanced fish trade with developing countries. Overall, consumption patterns in the North may be as responsible for the shortage of fish in countries of the South, even as their populations grow (Curran et al., 2002). Clearly illustrating the importance of these two issues is critical to altering people’s perspective on global fish supply.

The strong interest in promoting aquaculture as a solution for seafood shortage is notable. There is sufficient evidence that this ‘blue revolution’ needs ‘greening’ in order to be sustainable and not adding to current problems of ecosystem degradation (EJF, 2004; Naylor et al., 2000). The development of shrimp farming (particularly, black tiger prawn, *Penaeus monodon*) in Thailand and its environmental impacts is but one of numerous examples (Chuenpagdee and Pauly, 2004a). The intensification of shrimp farming has resulted in loss of mangrove forests, degradation of coastal ecosystem and water pollution. Considerations about growing methods, feeds, processing, distribution and regulations are needed before shrimp farming can becomes sustainable (Lebel et al., 2002). A thorough analysis is required to relate aquaculture with concerns of food security, addressing the issue of competition in the utilization of fisheries products e.g., as fishmeal for feeding carnivorous fishes such as salmon, vs. direct human consumption. For many people, the ill-named ‘trash fish’ are considered ‘food fish’, or in some cases, ‘choice fish’, and they can be used as raw materials for various human food products, such as fish sauce and fish balls (Pauly, 1996). In such case, promoting aquaculture of carnivorous species can result in further reduction in food supply for the local poor. Slowing down fishing thus involves long-term considerations on ecosystem, social, and economic effects, from both capture fisheries and the fish farming sector.
3. SCALE DOWN FISHERIES

Fisheries, in all countries, operate at several scales, and the definition of small-scale and large-scale operations may differ from country to country. The variation in the definitions is greater, however, for medium to large-scale than within the small-scale sector. In other words, for many countries, the lower and upper limit for what constitutes small-scale fisheries is comparable. For example, based on FAO Country Profiles (http://www.fao.org/fi/fcp/fcp.asp), the smallest unit of small-scale fisheries is fishing with no boat, and the average size of a small-scale boat is between 5–8 m. Boat sizes between 12–15 m are still considered small, but not those greater than 21–24 m. Other characteristics used to determine the size of the fisheries are boat type, GRT, engine size, number of crew, and gear type. The latter is perhaps the least robust as many gears, particularly mobile ones, can be made in a range of size. Thus, when gear type is used to characterize small-scale fisheries, it must be accompanied by other descriptive features.

It is acknowledged that all fisheries, large or small, have ecosystem impacts, and can cause overfishing. Nevertheless, social and economic consequences of the current fisheries situation differ greatly between small and large-scale operators. For many small-scale fishing communities, dependency on fisheries resources is high, as fishing is often the only source of income and livelihood. Thus, their food security is greatly threatened with the degradation of fisheries, and is worsened when faced with a competition from the large-scale fishing sector, especially when it relies on large catch-efficient commercial fishing vessels, such as purse seiners and trawlers (FAO, 2000). The latest report by FAO warns of the overfishing situation in the Asia-Pacific region, causing changes in the trophic level of the fisheries ecosystems, and the increase in the amount of ‘trash fish’ in the catches (www.fao.org/newsroom/en/news/2004/49367/index.html). For a region with a large number of small-scale fishing communities, which relies on fisheries for much of its food and for various economic reasons, such diagnosis is worrisome.

Despite the recognition of the important role of the small-scale fisheries sector to local communities, this sector is largely marginalized, geographically, economically and politically (Pauly, 1997). The physical remoteness of most small-scale fishing communities makes it difficult for their members to benefit from government programs, such as port development, roads and infrastructure, processing facilities, and other forms of subsidies, as well as to access fisheries information and to participate in management decisions. Small-scale fisheries are further marginalized in terms of information and research. National fisheries statistics focus largely on the medium and large-scale commercial fishing sectors, and little data is available on the small-scale fishing sector, and even less so for subsistence fisheries. Information about small-scale fisheries is usually descriptive, based on research that emphasizes the anthropological, social and cultural aspects of the fishing communities. While the distinctiveness of each community should be appreciated, failure to provide an overview of the important economic role played by this sector prevents the emergence of cross-country generalization, and limits the possibility of making a comparative assessment of their contributions to their respective societies. As a result, funding and technical supports are not appropriately distributed. For example, more credit loans and subsidies should be given to the small-scale than to large-scale sector, to develop infrastructure and marketing system such that small-scale fishing communities become less dependent on moneylenders, and can obtain good prices for their products. With the new product requirements such as the FAO/Codex Hazard Analysis Critical Control Point (HACCP) system seeking to identify and control hygiene risks of fish and seafood products, the cost of compliance is high and the small-scale fishing sector cannot meet the cost without financial and coordination support from the government.

From an ethical perspective, scaling down fisheries creates fairness. Why do 20 percent of fishers (large-scale) catch 80 percent of the fish (Wilen, 2000)? It is certainly not because they work harder than small-scale fishers or that they are more experienced. The advantage that they have seems to be on the use of modern fishing equipment and technology. Unfortunately, it is the modernization of the fishing industry that is responsible for most of today’s overfishing problems. The introduction of trawlers in the Gulf of Thailand, for example, was an unplanned experiment, causing unanticipated results, including displacement of small-scale fishers (Pauly and Chuenpagdee, 2003). Although we acknowledge that
some small-scale fishing methods can be very destructive, such as dynamite and cyanide fishing practiced illegally in many developing countries, e.g. of Southeast Asia (Saeger 1993) or Africa (Vakily 1993), small-scale fisheries sector has overall been at a disadvantage. The rights-based system favoured by many fishery management bodies has not been effectively implemented to allocate a fair share of resources to small-scale fishers. Often, they bear the ‘burden of proof’ about their traditional and cultural ties to the fisheries resources. An alternative to the individual fishing rights, such as the community right system proposed by Macinko and Bromley (2002), should be considered to create management systems that are fair to small-scale fishers.

For fisheries management that is institutionalized such that decisions are taken at the central level, and are based solely on resource biology and short-term economic gains, small-scale fisheries may not look like a viable option. FAO estimates show, however, that of the 36 million people engaged in fishing and fish farming, roughly 15 million fishers are employed aboard decked or undecked fishing vessels operating in marine capture fisheries, and that more than 90 percent of these fishers are working on vessels that are less than 24 m in length (FAO, 2000). Clearly, the small-scale fishing sector occupies an important niche in the employment structure, and the social fabric of many countries.

Scaling the fisheries down might increase some conflicts between static gears. But at least it will be a fair competition between fishers of the same scale, as opposed to the current situation where the small-scale sector constantly competes against, and usually loses, to large-scale operators. Finally, scaling down fisheries might just happen on its own, given the increasing costs of fishing, particularly with the projected rise in global fuel price (Heinberg, 2003). A different type of intervention is needed, however, to discourage the tendency to resort to increase subsidies and offsetting the costs in further investment in the capital-intensive, large-scale fisheries. A choice has to be made between providing for a small number of large-scale operators or supporting the livelihood of numerous small-scale fishing communities (see below).

4. MAINTAIN SMALL-SCALE FISHING COMMUNITIES

With the current trends in global demand for seafood and the potential in export earnings through global markets, nations are inclined to further develop their fishing industry through modernization of fleet and increase in capital investment, further transforming locally-based fishing activities into globalized, industrial fisheries. Small-scale fishing communities in the North and the South alike are faced with such trends, and with the difficulties in maintaining their cultural identity, practicing traditional ways of living, improving quality of life, and participating in the resource management. In other words, they are further marginalized by globalization.

Maintaining communities is certainly not about keeping them poor, deprived and undeveloped. Rather, it means accepting that they should be making their own decisions. The roles of governments are thus to explore possible options with the communities, including alternative livelihood, and to provide support to facilitate their decisions, within constraints emanating from the resources themselves. Evidently, not all communities are able to participate in such process at the same level. As suggested in numerous studies on community participation in resource management, some key attributes for meaningful engagement are local capacity, level of organization, and leadership (Jentoft and McCay 1995, Sen and Nielsen 1996). This implies that, for some communities, local capacity building and empowerment programs are required. Equally important is the willingness of the government to share authority and partner with the communities in resource management. Often, community-based management and decentralization is successful when political will exists, and when principles such as inclusiveness, transparency, and accountability are practiced (Jentoft, 2004).

Several examples demonstrate the growing value of local knowledge and the increasing roles of small-scale fishing communities in promoting resource conservation and fisheries sustainability. In Oceania (Johannes 1982) and Vietnam (Ruddle 1998), communities participate in conservation and traditional management of fisheries resources. The Philippines is the leading country in community-based marine protected areas (White and Vogt, 2000). Local knowledge is well integrated with natural and social
science research method in the investigation of white hake (*Urophycis tenuis*) predation on juvenile American lobster (*Homarus americanus*) in Southern Gulf of St. Lawrence, Nova Scotia, Canada (Davis *et al.*, 2004). Small-scale fishing communities in southern Thailand have established marketing cooperative whereby community members control the auction of fish and sale of fisheries products. The initiative has resulted in maintaining the livelihood of the communities, as well as in promoting conservation measures, such as the release of egg-bearing female crabs.

Despite the above, changes in the communities are expected to take place, including the pattern of seafood consumption. When adding the changes in attitudes toward fish that occur in other places, meeting the increasing demand for fish becomes a bigger challenge. A survey of about 9,000 women in Norway showed, for example, that increases in fish and seafood consumption was due to factors such as belief in health benefits, change in consumer pattern for healthy diet, increasing household size, and relatively close distance to coastal areas (Trondsen *et al.*, 2004). In general, fish consumption is high in developed countries where preference for fish has increased, and in developing countries where alternative sources of protein are limited or where fish is part of the traditional diet. Japan, for example, is one of the highest per capita consumption levels in the world (about 70 kg/year), while that for several small island states in the Pacific, in the Indian Ocean and in the Caribbean is over 50 kg/year (Westlund, 1995).

Should we eat more or less fish? In developed countries, people eat increasingly more fish, including salmon and shrimp, which become readily available due to globalization of fish trade, and of the fish meal required for farming these organisms, which increasingly originates in developing countries (Delgado *et al.*, 2003). These changes in seafood consumption patterns are among the major threats to maintaining fishing communities and food security in developing countries. The pressure to increase the amount of export to satisfy overseas demand, in exchange for foreign earnings, reduces the quantity of fish available for local consumption. The situation is dire in many locations where fish was a staple food item. Food security is often perceived as the ability to produce for export, with the money thus earned to purchase food on global markets. The alternative suggested here by the ‘slow food’ movement is local reliance on locally produced food.

Slow food ([www.slowfood.com](http://www.slowfood.com)) is an international movement launched by Carlo Petrini in 1986, initially as an objection to the trend toward more and more ‘fast food’ (Honoré, 2004). The movement has since become a promoter of local products and breeds of artisanal producers and of environmental sustainability. The movement has now about 60,000 members, from 100 countries, half of which are in Italy. Members meet and stage events, debates and other initiatives to create awareness about food and culture, as well as promote other ways to ‘slow down’, e.g., slow living, forming also part of the ‘Slow’ movement in general (Honoré, 2004). Applying the ‘slow food’ philosophy to fisheries would work in favour of maintaining small-scale fishing communities, as it allows them to generate revenue from the local sale of their products, as well as income from tourists who would be attracted to visit the communities and taste high quality fish and seafood. More importantly, the movement brings to surface the cultural ties and personal pride that many small-scale fishers have about the sea and their livelihood.

Another important initiative to promote sustainability and to provide the right incentives for producers and consumers is the eco-labelling, certification and quality insurance of the products. One example is the Marine Stewardship Council ([www.msc.org](http://www.msc.org)). Another system is the seafood labelling scheme implemented in the US in the fall of 2004, which is to indicate the origin of products (where they are caught), the processing location and the nature of production (wild or farmed). The public seems to be in favour of the food labelling scheme, partly as a way to support American seafood producers and partly due to health concerns, especially since the report on the high level of toxins in farmed salmon (Hites *et al.*, 2004). Most of the seafood industry, however, considers it onerous, expensive and unnecessary (Kay, 2004). The concern is legitimate, and a plan should be in place to ensure that the capital investment required to meet the scheme is not too high, particularly for small-scale producers. Consumers, on the other hand, can rely on sustainable seafood guides, such as the previously mentioned ‘Fish List’, mainly for fish and seafood products in the US, and a comparable list, the ‘Good Fish Guide’, compiled by the
Marine Conservation Society, based in the UK, covers fish from the European side of the Atlantic (www.fishonline.org).

Why maintain small-scale fishing communities? Based on a study by David. Thompson (cited in Pauly, 1997), the small-scale sector contributes to sustainability in at least three aspects. First, almost all small-scale fisheries catches are used for human consumption, as opposed to about half in the case of industrial fishing. Second, fuel efficiency is higher in small-scale fisheries than in industrial sector, with a production of 10-20 tonnes of fish for each tonne of fuel, i.e., four to five times better than that for industrial fishing. Finally, as much as 4 000 people are employed for each US$1 million investment in fishing vessels, a stark difference from 5–30 people in the case of industrial fisheries. Another important consideration in favour of maintaining small-scale fisheries is the fact that income generated from this sector is likely to stay at the local level, and contribute to local well-being (Sen 1999). Studies also show that women and children in small communities participate in fisheries and contribute to food security within their households, not only in the commonly understood roles in fish marketing and fish processing, but also in the fishing activities. Some of the examples are reef gleaning, widespread in Southeast Asia and the Pacific (Chapman 1987), and gathering of estuarine bivalves and other invertebrates in West and East Africa (Williams 2002) and in El Salvador (Gammage 2004).

The UN definition of food security is not only about ensuring that people have physical and economic access to sufficient, safe, and nutritious food at all time, it is also about the right to food, defined as “the right to have regular, permanent and unobstructed access, either directly or by means of financial purchases, to quantitatively and qualitatively adequate and sufficient food corresponding to the cultural traditions of the people to whom the consumer belongs and which ensures a physical, mental, individual and collective fulfilling and dignified life free from anxiety” (UN, 2001). Thus, maintaining small-scale fishing communities is clearly an important path to realize this ambitious global goal.

5. **TOWARDS ‘SLOW FISH’**

There is no need to be romantic about ‘slow fish’. Pragmatically, it boils down to three basic points, i.e., going slow, staying small and eating less. The fact that it might sound sensible to many people, for their daily activities as much as in their considerations about fisheries, does not make it easy to implement. Innovative schemes and strong political commitment will be required.

On its own, the predictable increases in fuel costs of the coming decades should result in the scaling down of the fishing industry (Pauly et al. 2003). We would add to this an additional scheme to reflect the actual, particularly the environmental costs of fishing. Similar to the ‘polluter–pay’ principle, we propose a differential tax system on fishing, based on the level of impacts (in terms of by-catch and habitat damage), and also on the size of operation. Building from the ranking method developed by Chuenpagdee et al. (2003), we incorporate considerations for ‘scale of fisheries’ to distinguish between ecosystem effects caused by large, medium and small-scale fishing operations. The first five columns in Table 1 are the actual results of the study of ten fishing gears used in US waters, focusing on impacts of these gears on by-catch of five species groups, i.e., shellfish and crabs, finfish, sharks, marine mammals, and seabirds and sea turtles, as well as damages to physical and biological habitats (Chuenpagdee et al. 2003). The rankings were obtained using a workshop consultation process and a paired comparison survey with fishers, managers, and the general public (represented by members of environmental organizations). As the proposed cost scheme aims to provide incentives for scaling down the fisheries, we add the size of fishing operation to the consideration (Column 6). The total impact, incorporating the ecosystem impacts and fisheries scale, is then used to determine the differential tax level (Table 1).

This scheme is flexible and can incorporate different gear types and sizes. The by-catch and habitat damages for each gear can be determined on a relative scale to gears with known impacts. The relative scale also implies the consistency in applying the tax level (e.g., higher tax to fisheries with greater overall impacts). The level of taxes can be initially set low and later adjusted to deter investment that would expand the size of the fisheries, or as incentive to stay small. Other information that can be
added to Table 1 includes net economic surplus (or loss) for each gear. As reported in FAO (2000), various fisheries in each country can result in either positive or negative net surplus. In general, either very large-scale fisheries (e.g., deep-sea bottom trawl) or very small fisheries (e.g., artisanal gillnetters) tend to operate at a loss. The former is due to excess capacity and over-capitalization, while the latter is not as cost effective as other inshore fisheries such as purse-seine (FAO, 2000).

We have suggested earlier that slowing down fishing involves long-term consideration and looking into the future, through improving resource valuation methods and incorporating true costs of fishing in the trade-off analysis. Additionally, we believe that a proactive conservation curriculum is required for secondary and tertiary educational institutions. Several education programs exist to create awareness about environment and conservation among general public and school children. Universities around the world offer course and degree programs in fisheries, but with a focus on technology, development, biology, stock assessment, fisheries management, and, to a lesser extent, on social science issues. While it is acknowledged that principles such as sustainability, precaution, ecosystem-based approaches and equity may be part of such courses, the emphasis is still primarily on resource utilization, not conservation. There is certainly a need to include in the offering of colleges and universities of the maritime countries of the world dedicated courses in ocean conservation, to capitalize on the fact that university students will become responsible consumers and a critical mass in support of the ‘slow fish’ movement. Such courses should be developed and offered through collaboration between universities and academic institutions worldwide.

Education can be informal and fun. A wide range of education tools for sustainability is available, as reported by Milne et al. (2003) of those used in the Philippines and Indonesia. The ‘slow fish’ movement can be promoted at food festival and other sustainability forum, as part of raising awareness about the issues and a media and public communication campaign. Information about the importance of small-scale fisheries and their contributions to ecosystem sustainability, economic viability of small communities, and social well-being needs to be widely disseminated. A database on small-scale fisheries that is currently being developed, as part of the Sea Around Us Project (www.seaaroundus.org), based at the Fisheries Centre, University of British Columbia, is part of an initiative to demystify and de-marginalize the small-scale fisheries sector. The database includes number of fishers, number of boats, small-scale fisheries catches, contributions from women and children, and other characteristics (Chuenpagdee and Pauly, 2004b). It is structurally similar to the global (large-scale) fisheries, ecosystem and biodiversity database also assembled by the Sea Around Us, to allow for comparative assessment of the two fishing scales, in terms of their socio-economic contributions and ecosystem impacts.

We now turn to our final recommendations on governance perspectives, at local, national and international levels. As suggested by Pauly et al. (2003), putting sustainability first implies governments’ ratification of and adherence to international fisheries agreements and conventions. Nationally, government needs to devise governance system that allow a movement from solving current problems of tactical management, to considerations for long-term societal trends and needs (Kooiman, 2003). Such governance systems would be concerned mainly with creating opportunity, building governing institutions, and setting principles, e.g., effectiveness, legitimacy, and ethics or moral responsibility. At the local level, government would focus on providing financial and institutional support to local fishing communities in their initiatives to promote conservation and sustainability, in their desire to maintain traditional lifestyle, and in their interest in bottom-up governance of local resources.

Why would fishers go along with ‘slow fish’? Charles et al. (2003) show that fishers can be in favour of such program, provided that it is carefully developed. The survey indicated that traditional coastal fishers working along the French coast of the English Channel, from Brest to Boulogne, supported the quality enhancement program that aimed to induce improved product marketing. Appropriate incentives that are culturally sensitive are certainly required. In the case of the French fishers, they would agree to fish less simply to obtain a better balance between work and spare time, and thus improve their quality of life.
6. CONCLUSIONS

It has been projected that the future global demand for fish will reach 100–120 million tonnes by 2010 (Westlund, 1995). Given the current situation of the world fisheries, it is doubtful that global marine ecosystems will be able to supply that amount. The risk and uncertainty about aquaculture production is still high, particularly in terms of its overall environmental impacts.

‘Slow fish’ is a new metaphor encouraging us to think and act consciously about slowing down fishing, scaling down fisheries and maintaining small-scale fishing communities. This requires long-term considerations, comprehensive cost analysis, and the explicit considerations of future generations. It involves promoting small-scale fisheries, to match the scale of extraction with the scale of natural regeneration. Tools such as differential tax system, geared preferentially to small-scale, owner-operated vessels, could be used to generate incentives to scale down. Support should be given to endorse local governance of resources, promote local products caught by sustainable fishing methods, conduct research and collect information on small-scale fisheries, and enhance public and education program on conservation and environmental sustainability. ‘Slow fish’, as in ‘slow food’, means protection of fisheries and the right of local, small-scale fishers, of current and future generations, to fish, for a living and for food.

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REFERENCES


DISCUSSION PAPER 4
IS FISHERY SCIENCE HELPING TO ACHIEVE SUSTAINABILITY IN THE NORTH ATLANTIC

by

Jean-Jacques Maguire

Summary

The thesis of this paper is that the imbalance in the importance given to each of the four components of sustainability (bio-ecological, social, economic, and institutional) is a major cause of unsustainability. A review of fishery management success in the north Atlantic indicates that the bio-ecological component of sustainability appears to be reached for several fisheries exploiting invertebrate and pelagic species, it is generally not achieved for high profile groundfish species. In addition, the other components of sustainability, particularly the social and institutional components rarely appear to be achieved. The lack of recovery of groundfish stocks despite no or limited fishing is only one indication that the scope for human intervention on rebuilding fish stocks is limited. This suggests that it would be easier to make progress on the other components of sustainability, which in the end, would most probably also benefit the bio-ecological component. The way to improved fishery management and sustainability is not through better science for top down management, but through better and more effective governance. This should not be seen as an argument to decrease fishery management efforts. On the contrary, the theme of the paper is that fishery management should be re-focused in order to be more effective to increase the socio-economic benefits that can be extracted from the fisheries, while at the same time protecting the resources. It is the neglect of the socio-economic and institutional components of sustainability that have led to fishery management processes being ineffective.

1. INTRODUCTION

The thesis of this paper is that the imbalance in the importance given to each of the four components of sustainability (bio-ecological, social, economic, and institutional) is a major cause of unsustainability. The paper examines the effects of the disproportionate importance given to the bio-ecological component of sustainability in the fishery management processes of the North Atlantic. The quasi-exclusive focus on the bio-ecological component of sustainability places extremely high pressure on the scientific advisory processes both in terms of the quantity of management advice and in terms of its reliability and precision. The state of the art is not up to these demands with the result that there is a loss of credibility in science, thereby undermining the whole management process.

In developing countries, the need to fight poverty and increase short term income and/or food supply and the demands for fish from developed countries, means that the highest priority may be given to the social and economic components of sustainability, often at the detriment of the bio-ecological component. In developing countries, the institutional component is generally embryonic at best, but there are exceptions. The absence of well established institutions for fishery management means that various formal and informal governance systems exist with no guarantee that they will contribute to achieving sustainability.

In developed countries, fishery management processes are highly elaborate, particularly in the North Atlantic where the history of “modern” fishery management is the longest. In most developed countries, the explicit focus of fishery management is first and foremost to pursue the bio-ecological component of sustainability – the logic being that a profitable fishery supporting “vibrant” communities cannot exist without healthy fish stocks. Although the existence of the other components of sustainability is often

53 The views expressed in this paper are solely those of the author, Jean-Jacques Maguire.
recognised they are clearly secondary to the bio-ecological component. With the increased public profile given to fisheries and their problems in the last decade, the rebuilding of fish stocks has become the highest priority for fishery management agencies which have undertaken to rebuild fish stocks at all costs, whether nature will allow it or not. As a result, the magnitude of the negative social, economic and institutional consequences of the various rebuilding strategies that would be possible have not been taken into account, the one with the highest probability of rebuilding is usually chosen, regardless of the consequences on the other components of sustainability.

Fisheries have provided food to humans since the dawn of times and structured fishery management dates at least to 350 BC, in Ptolemaic times, when “the catch was taxed up to one quarter of its value; (and) there was also a tax on the right to fish, particularly in waters owned by the temples” (Cushing 1988, page 4). Cushing (op. cit.) also notes that “fisheries in the dawn of history on rivers and close to the sea shore may not have differed very much from those we know today in the same places”. Fishing, like hunting, was the first means of sustenance for human beings. Although fish were included in the earliest studies of nature, along with plants and other animals, Cushing (1988) identifies the Victorian age as the beginning of structured marine biology and fisheries science. As capture became mechanised, stocks became depleted, and fishermen were forced further from shore, marking the beginning of fisheries exploration that is continuing to this day (Cushing 1988) with the newly developed fisheries for deep water species providing a prime recent example. The need to know more about fish and fisheries also led to the creation of fisheries laboratories and the setting up of fisheries expeditions. At the turn of the twentieth century, European governments recognised the need to co-ordinate their efforts which led to the creation of the International Council for the Exploration of the Sea, the oldest intergovernmental organization in marine science in the world. Fisheries science, and more specifically, structured fisheries science is therefore a relatively new science. Interestingly, Cushing (1988) notes that “much of the pressure for the establishment of ICES came from fishermen who knew that stocks were declining” (page 204) based on their declining catch per unit of effort.

For most of its 100 to 150 years of existence, fishery science has been mostly concerned with identifying new fishing opportunities and improving fishing methods. By the 1950s, the need to regulate fishing became evident. The first measures implemented aimed at increasing the yield that could be obtained from the fish caught by increasing mesh size and the legal minimum fish size. By the 1960s, it became necessary also to control fishing effort, particularly in the Northwest Atlantic where a massive influx of fishing effort had occurred beginning in the late 1950s. New entrants in the fisheries were mostly from the former Eastern Block countries, but also from other European countries whose waters were already considered fully exploited.

Controlling fishing effort proved to be difficult and contentious. It was difficult to find an equitable sharing formula between the distant water fleet of new and large vessels, including factory freezer trawlers, and the older American and Canadian domestic fleet of much older and considerably smaller wetfish trawler. The introduction of Total Allowable Catch (TAC) was seen in the 1970s as a better basis to share access to the resource. In the euphoric 1970s when no technical challenge was considered too great, scientists were confident that they could measure how many fish were in the sea, and what proportion should be caught. By the mid 1970s in the Northwest Atlantic, and by the late 1970s – early 1980s in the Northeast Atlantic, the majority of important fisheries had come under TAC management.

In the Northwest Atlantic, the TACs were rapidly decreased at the time of the extension of fisheries jurisdiction by both the U.S.A. and Canada in 1976 – 1977. The almost complete exclusion of the Distant Water Fleet resulted in a substantial reduction in fishing effort and in fishing mortality. Good year classes, particularly of cod, had been produced in the mid 1970s and the stock size increases that resulted from the reduction in fishing mortality and increases in recruitment were spectacular, particularly for those cod stocks in Canadian waters. This provided a considerable boost to the confidence of Canadian groundfish scientists. In the Northeast Atlantic, no such drastic reduction in fishing effort took place (except in Iceland when British trawlers were excluded as a result of the cod war won by Iceland against the United Kingdom), and large increases in stock size were not observed.
Instead, for the main cod and plaice fisheries, a slow long term decline can be observed, while haddock and sole appear to continue to fluctuate without trend.

However, the growth in the cod stocks between mid 1970s and the mid 1980s is not what has most impressed scientists and the public. What is remembered most vividly is the spectacular collapse of Canadian cod stocks in the early 1990s. Such crises “have raised the question of the culpability of fisheries science. Optimism in science as the best basis for management, a conviction that held sway for nearly a century, has given way to disagreements, sometimes even mutual recriminations among scientists, managers, and fishermen. At the same time, scientists’ growing understanding of climate change has prompted renewed scrutiny of the relative contributions of natural and anthropogenic changes to marine populations.” (Rozwadowski, 2002, page 1).

2. THE CONCEPT OF SUSTAINABILITY

Sustainability of the resource base has been the foundation of fishery science from its inception. However, the modern concept of sustainability is more ambitious, and it explicitly recognise why sustainability is sought – to provide sustainable benefits to humans now and in the future. Most modern discussions on sustainability recognise that the concept is multifaceted. Cunningham and Maguire (2002) summarised the modern concept of sustainability in a fisheries context as one with “multiple objectives” (focussing on both the ecosystem and the human system, and a balance of resource conservation and human concerns). The FAO guidelines on sustainable indicators for fisheries (FAO, 1999) recognize fully the need to ensure both human and ecosystem well-being in a sustainable development context, Charles (2001) stresses that “there is wide recognition of the need to view sustainability broadly, in an ‘integrated’ manner that includes ecological, economic, social and institutional aspects of the full system” (p. 186).

In this paper, the modern concept of sustainability is seen as having four components: a bio-ecological component associated with the preservation of the resources and of the ecosystems that support them; a social component associated with the equitable distribution of the benefits arising from fishing; an economic component where fishing is expected to bring positive economic benefits to society; and an institutional component where the governance system is expected to be itself sustainable. This approach is consistent with the concept of sustainability used in the first two workshops on factors of unsustainability in fisheries. Interestingly, sustainable development theorists note that the overexploitation of human resources is just as despicable as the overexploitation of natural resources (Forget 2004).

3. IS SUSTAINABILITY ACHIEVED IN THE NORTH ATLANTIC

Maguire (2001) describes the fishery management organisations in the North Atlantic and Maguire (2004) evaluates the success of fishery management for large volume demersal fisheries in the North Atlantic under the four components of sustainability. The overarching conclusion was that sustainability was rarely achieved under any of the components of sustainability. For this type of fishery, the situation has not improved. In fact, from the point of view of the bio-ecological component of sustainability, more stocks are now considered to be outside safe biological limits (see the various press releases and reports associated with the publication of the advice of the International Council for the Exploration of the Sea (ICES) at http://www.ices.dk/aboutus/pressroom.asp) while from the point of view of the economic component of sustainability, the viability of major fleets is threatened (Urquhart 2003). It is particularly worrying that cod stocks in Iceland, in Norway and in the Faroe Islands are now considered to be outside safe biological limits (http://www.ices.dk/aboutus/pressrelease/Press%20release%20ACFM%20Report%20may%202004.doc).

In the North West Atlantic, the situation is more complex, at least under the bio-ecological component of sustainability. After the collapse (Canadian waters) or severe declines in biomass (USA waters), drastic reductions in fishing effort, including complete fishery closures, have successfully reduced fishing mortality. Rebuilding of the stocks has been variable by species and areas, however. While haddock and
yellowtail stocks appear to have responded to the decrease in fishing mortality with marked increases in biomass, the biomass of other species have either remained stable or continued to decrease (e.g. cod). With such low biomasses and most of the groundfish fisheries either closed or under very severe restrictions, it is doubtful that the social and economic components of sustainability are achieved.

Alarming reports on the state of North Atlantic fisheries have been presented at the 2002 meeting of the American Association for the Advancement of Science (AAAS) in Boston. The meeting is one of the largest scientific gatherings in North America and it receives wide Media coverage and so did the reports diagnosing the state of the North Atlantic fisheries. In particular, a report by Christensen et al. (2002) (http://fisheries.ubc.ca/projects/SAUP/report/impactmodels.htm ), predicting that the larger predator fishes of the North Atlantic would all but disappear within 50 years if the trend continued. Similarly, Myers and Worm (2003) estimated that the biomass of large predatory species has declined by 90 percent or more over the last 50 years. These predictions and estimates of decline have appeared in high profile scientific journals and they have been highly publicised. They suffer however from serious scientific shortcomings. The evaluation of traditional fisheries in the North Atlantic by Christensen et al. (2002) did not include herring and mackerel, two traditional species whose biomasses are near the highest observed, because they did not meet an arbitrary trophic level threshold. The inclusion of herring and mackerel would have altered the picture significantly. Walters (2003) demonstrates succinctly and clearly why the estimated declines in Worms and Myers are likely grossly overestimating the real changes in stock size.

There is no doubt that groundfish stocks in the North Atlantic are depleted, that fishing mortality is too high, and that there would be considerable socio-economic benefits, in addition to conservation ones, to be achieved by reducing fishing mortality. However, fishing is not the only factor affecting stock productivity (Klyashtorin 2001 and others referenced therein). In particular, it is not obvious that reducing fishing will necessarily result in increased groundfish stocks, as shown by the lack of or meagre recovery of Canadian and United States cod stocks despite substantial reductions in fishing mortality. This may suggest that there are periods favourable for cod and others that are not, a phenomenon also seen off Greenland at the beginning of the twentieth century (Buch, Horsted, and Hovgård, 1994). Swain and Sinclair (2000) note that there is circumstantial evidence to suggest that the large biomass of pelagic fishes (herring and mackerel) in the Southern Gulf of St. Lawrence may impede the recovery of the cod stocks in the area.

Based on available stock assessment information, the biomass of pelagic species in the North Atlantic appears near historic maxima. The bio-ecological component of sustainability therefore appears to have been achieved. There is little information to assess whether the other components of sustainability are achieved. However, from an institutional point of view, fishery management in the North East Atlantic is clearly of the top-down sort with little scope for meaningful implication of interested parties either in the scientific processes or in the decision–making processes.

Crustacean fisheries (lobster, shrimp, snow crab) in the North West Atlantic have been highly profitable over the last decade. From a bio-ecological perspective, there are indications that the collapses of groundfish species have released the predation pressure on shrimp and possibly on snow crab, making it possible for stocks to increase markedly. The bio–ecological component of sustainability therefore appears to have been met. Success on the other components of sustainability varies from areas to areas, with some seeming successful in most components (snow crab in Area 19 Cape Breton), while others fail under the social and institutional components (snow crab in Area 12, the southern Gulf of St. Lawrence). Generally speaking, however, it can be said that there are few flagrant problems of conservation with crustacean fisheries in Atlantic Canada. Nevertheless, the management of those fisheries faces considerable problems. The Canadian government has tried to distribute more widely the wealth generated through the fisheries under various scheme. In some areas, it simply granted access to a large number of unemployed groundfish fishermen by allocating them small individual quotas as an income supplement giving them access to the Canadian income support program (employment insurance). In other cases, the government set up so-called “solidarity funds” through which it collected money from the fishery to re-distribute to those without allocations in the lucrative fisheries. Finally, in some cases,
the government reached an agreement with “traditional” fishermen on the conditions under which the available resource could be shared with a larger number of participants. Crustacean resources in the North Atlantic are faring reasonably well when compared with demersal species, but it does not mean that it is not possible to overexploit crustacean resources: Orensans et al. (1998) describe how crustacean fisheries in the North Pacific have become sequentially depleted while under active fishery management based on scientific advice. Failure of fishery management has therefore occurred on other species groups as well.

The overall picture in the North Atlantic therefore is not as grim when other species groups are considered. The bio-ecological component of sustainability appears to be achieved for invertebrates and pelagic fish resources, but only in a few rare cases for groundfish stocks. Similarly, the economic component of sustainability appears to have been achieved for invertebrate and pelagic fish resources. Achievements are less clear in terms of the social and the institutional components of sustainability. Fishery management institutions continue to exist and to operate, but they are facing increasing invertebrate and pelagic fish resources, it is worth asking if their relatively high stock credibility problems.

Although the bio-ecological component of sustainability appears to have been achieved for several invertebrate and pelagic fish resources, it is worth asking if their relatively high stock sizes of are directly due to intended effects of human fishery management actions or to other causes.

4. THE SCOPE FOR HUMAN INTERVENTION

The current institutional framework in the North Atlantic assumes that fishing is the main cause of changes in stock size. A more or less mechanistic approach is implied: if fishing mortality is too high, the stock will decline and, as the stock decline, recruitment will also decline thereby speeding the rate of decline. If fishing mortality is decreased, the stock will increase, at the beginning slowly and progressively more rapidly as recruitment improves as a result of higher spawning stock biomass. Multispecies and ecosystem considerations are rarely taken into account: the fact that one species may be a predator of another either at the adult or other life history stages is rarely taken into account. Yet, multispecies interactions are potentially very important (Swain and Sinclair 2000).

The theory is simple enough (too simple), but the practice has proven more difficult. In particular, limits on total removals have appeared to be an inadequate tool to modulate fishing mortality. There are several reasons for this, including the difficulty in estimating stock size and predicting future stock size, but poor compliance as a result of ineffective governance systems, because in part of the disproportionate importance given to the bio-ecological component of sustainability, and inadequate monitoring, control and surveillance have also played a major role.

Where management has successfully decreased fishing mortality through fishery closures or similarly drastic measures, the expected increases in stock size have not always materialised (e.g. the lack of recovery of Canadian cod stocks despite closed or substantially reduced fisheries). Whether fishing mortality has been successfully reduced or not, it can be argued that the effects of natural changes and or cycles have interfered with the intentions of management to rebuild fish stocks. There is therefore not an absolute scope for intervention.

There is increasing evidence that hydro-climatic effects, and in some cases, habitat considerations due to industrial or housing developments are affecting fishery resources. The absence of Atlantic salmon in the New England area of North America can be clearly related to construction of numerous dams that are preventing salmon from reaching the head waters where it used to reproduce. The simplistic assumption that reductions in catches and fishing mortality will necessarily result in increased stock sizes does not recognise that resources will fluctuate over time, sometimes outside what would be considered safe biological limits, even without human intervention (i.e. without fishing). Past changes in stock sizes from archaeological records (Baumgartner, Soutar and Ferreira-Bartrina 1992), show that large fluctuations in stock size have occurred before any fishing took place, therefore suggesting that climatic variation was
the primary cause of fluctuations in stock size. Such fluctuations, whether induced by climate variability or due to other causes, have been identified for snow crab in eastern Canada (Sainte-Marie et al. 1996). Several authors (Sharp 2003, etc.) provide credible evidence and argumentation that climate change, unrelated to the green house effect, is cyclical with cycles and patterns embedded at various temporal and spatial changes. Without entering the green house effect debate, nor that of trying to predict the climate of the future, the conclusion that climate shows cycles is convincing. The exact periodicity, whether 50 to 70 years or longer remains to be established, the important point is that cycles exist. Although most species can tolerate a range of conditions, it is axiomatic that the distribution and abundance of fish stocks will change as a result of changes in climate because species have well-defined requirements in terms of temperature, salinity, oxygen content, etc. Bio-ecological sustainability of individual species in specific locales is therefore impossible for all species, in all locations, all the time. Fishery management systems that do not recognise that cyclical factors due to hydro-climatic variability or to other factors have in some cases the potential to be more important than fishing risk unnecessarily penalising the fishing industry in order to rebuild resources that may have to wait the next cycle of favourable hydro-climatic conditions before it even has the potential to rebuild. Sharp (2003) supports this observation (p. 33) when he states that the failure to recognise the dynamical changes in climate and their effect on fisheries has led to the failure of fishery management. Where cycles are recognised to exist, as is the case for snow crab in eastern Canada, fishery management tries to “manage” around the “cycles” rather than try to eliminate them (or ignore them). The scope for human intervention on the traditional aspects of the bio-ecological component of sustainability (i.e. reducing fishing mortality in order to increase biomass and subsequent recruitment), is therefore perhaps considerably smaller than hitherto assumed, although there could be scope for intervention on protecting habitat or providing alternate habitat when development projects do sacrifice existing habitat. If the scope for human intervention is more limited than previously believed on the bio-ecological component of sustainability, there is possibly considerably greater scope for meaningful action on the other components, particularly the social and institutional components. In addition, there is no doubt that improvements on the economic, social and institutional components of sustainability would have immediate, direct and measurable effects on compliance with existing management regulations, one of the main causes for the lack of success of fishery management.

5. DISCUSSION

The title of this paper appears well justified, related mostly to two main themes.

1. The optimism that science was the best basis for management was unwarranted for the type of TAC – based fishery management that has been implemented in the North Atlantic

2. The effect of hydro-climatic conditions should be better taken into account in evaluating fishery management strategies.

Based on these two themes, it can be concluded that fisheries science made a positive contribution to fishery management during its first 50–75 years of existence when its main mode of operation was to work co-operatively with the fishing industry and with fishery managers. More recently, however, fishery science has become more narrowly numerical and mostly concerned with counting fish in the sea in order to set Total Allowable Catches. The much publicised spectacular collapse of high profile cod stocks under active management instead of drawing attention to the uncertainties in stock assessment led to a re-enforcement of the view that greater attention should be paid to the conservation and protection of marine resources. This paper argues that in order to be helpful, fishery science should again try to be helpful to parties interested in fishery management, including the fishing industry, fishery managers and environmental non-governmental organisations (ENGOs). In order to do this, fishery science can no longer be given the “dictatorial” role it has been given in recent years in Canada, in the European Union, and in the United States of America. This implies that fishery science should have a lower profile in the
fishery management processes. The approach suggested by Berkes \textit{et al.} (2001) would seem well indicated to help achieve a better balance between the four components of sustainability.

The fear that a major catastrophe, such as the collapse of the Canadian cod, could occur in their jurisdiction has focused the attention of fisheries management on the conservation of the resource. As collateral damage, fishery management institutions have forgotten the real objective of fishery management: providing food as well as social and economic benefits to society (Cochrane 2002, Cunningham and Maguire 2002, Hilborn \textit{et al.} 2001, Hilborn 2002, Maguire 2002). The basic theme of this paper is consistent with Hilborn (2002) that “the key to successful fisheries management is not better science, better reference points, or more precautionary approaches but rather implementing systems of marine governance that provide incentives for individual fishermen, scientists, and managers to make decisions in their own interest that contribute to societal goals” (page 403).

Common conclusions 1, 2 and 4 of the Second FAO Workshop on Factors of Unsustainability in Fisheries (Swan and Gréboval 2004) are consistent with the above:

1. Poor governance is a major cause for the inability to reach sustainable fisheries. Failure to have good governance, in itself, is sufficient for fishery management to fail.

2. There is a need to grant secure rights to resource users (individually or collectively) for use of a portion of the resource, space, or other relevant aspect of the fishery. Inappropriate incentives and lack of good governance are often predominant issues preventing sustainability and both link to the absence of secure rights.

3. Fishery management has usually focused primarily on the bio-ecological component of sustainability, but has often failed even on this dimension of sustainability, possibly because it did not pay enough explicit attention to the other components of sustainability. Achieving sustainability requires a blend of a conservation perspective and the social and economic perspective of those directly associated with the fisheries. Either alone will not succeed. The social component of sustainability is insufficiently covered by fisheries management instruments in general.

The almost exclusive focus on the bio-ecological component of sustainability in North Atlantic fishery management processes as led to neglecting other aspects of fishery management which may hold considerably more scope for improving/increasing the benefits society derives from its marine resources. It is generally accepted that with a few exceptions, maximising economic yield would imply higher stock biomass and lower fishing mortalities than trying to maximise yield (i.e. MEY occurs at higher biomass and lower fishing mortality than MSY). Therefore, rather than making fishermen feel guilty because they fish harder than F_{MSY}, why not try to convince them to fish at F_{MEY}? This implies that giving a higher profile to the economic component of sustainability rather than detract from the bio-ecological component, could in fact make it easier to achieve it. Similarly, the majority of conflicts in fishery management arise from unresolved allocation issue that have social and economic implications, or because the decision–making process is seen as unfair and lacking transparency. Working on improving the transparency of decision–making process, which is likely to lead to decisions being seen as more fair, is likely to increase compliance with the management measures that have been adopted, another factor likely to make it easier to achieve the bio-ecological component of sustainability.

Pauly \textit{et al.} (2002) comprehensively and coherently make the case that fishery management has failed and that changes must be implemented in the fishery management process if sustainability of fisheries is to be attained. The message is not new however, and the problem has been recognised for a long time in the North Atlantic as can be seen from the advice provided by ICES, Canadian DFO scientists, or USA National Marine Fisheries Service scientists. Although Pauly \textit{et al.}'s diagnostic is reasonably accurate, in the end they prescribe essentially the same medicine that has been tried for several decades: marine protected areas have been used in fishery management for a long time in terms of time and area closures, while decreases in fishing mortality have been advised for at least 20 years. Although the authors do not
define what they mean by sustainability, the paper is suggestive that they are mostly concerned with the bio-ecological component of sustainability. In the end, the paper is yet more preaching by scientists on how fisheries should be managed, and by implication, the paper is calling for more of the top-down fishery management that brought us to the present crisis. The solution they propose has been tried, and it has failed. The way to improved fishery management and sustainability is not through better science and more top down management, but through better and more effective governance.

Fishery management systems in Europe and in North America have elaborate scientific advisory processes, but they also have substantial monitoring, control and surveillance capabilities. Yet, overexploitation is still occurring where scientific advice has been produced AND accepted. Often, however, even though the scientific advice was accepted by the management authority, implementation was frequently far from effective. As a result, actual catches may have been substantially higher than those advised and accepted on paper. The tendency to exceed advised catches is one of the serious perversion of fishery management systems based on total allowable catches (TACs). A further perverse complication is that the underreporting of catches causes the stock assessments to underestimate fishing mortality (and consequently overestimate stock sizes) which results in TACs being set too high, further complicating the problem. TACs are exceeded for a number of reasons, but they are more common in areas where the capacity to catch fish far exceeds the ability of the environment to produce fish. Before active management in the form of Total Allowable Catch on individual stock and species basis, fishermen would direct their effort on the species where the combination of abundance and price on the market was the most favourable. With the introduction of TACs, and even more so with individual quotas, the choice of individual fishermen has been severely limited – it has become more complicated (or costly) to switch from one species to the other depending on price and availability: they are stuck with the species for which they have a quota. Hilborn et al. (2001) suggested that a diversified portfolio of species would be one way to alleviate this problem and would also provide a means to manage risk.

Hilborn (2002) observes that “The Food and Agriculture Organisation of the United Nations (FAO) convened an expert consultation on the precautionary approach in 1995 (FAO, 1996) that identified key aspects that are almost exclusively procedural. To be precautionary, a fishery needed a management system that measured catches and abundance, rules about how catches would be changed in relation to the data collected, and the ability to enforce changes in catch. The vast majority of the world’s fisheries are not precautionary – not because the reference exploitation rates are too high but rather because catch cannot be measured or catch limits enforced, because abundance cannot be estimated, or because rules do not state how catches will change in relation to stock size. The key message is that it is the process that is precautionary, not the reference points” (page 406, para. 3). Richards and Maguire (1998) convey a similar message.

In a system where there is a good balance between the four components of sustainability, the fishermen and other interested parties would not feel alienated and it would benefit them to genuinely contribute to the design and operation of effective fishery management system. In too many existing systems, scientific advice appears to have the ultimate say on management decision. As a result, the fishing industry does not feel ownership of the fishery management plans and associated measures and therefore does not consider itself bound by them. Breaking the rules becomes the norm to survive, and monitoring, control and surveillance would need to be stepped up considerably to have any hope of maintaining reasonable compliance. It is becoming increasingly clear that such systems are not sustainable under any of the four components of sustainability, an indication that reasonably equal effort should be devoted to the pursuit of the four components of sustainability if bio-ecological sustainability is to be achieved.

Rectifying the balance between the four components of sustainability would not necessarily require substantial investments in acquiring knowledge. In fact, it could be argued that one way to rectify the balance would be to allocate less funds to the bio-ecological component of sustainability. However, this would not be “wise”. It would be preferable to re-allocate some of the funds currently allocated to the operation of the fishery science advisory machinery to the acquisition of knowledge regarding the functioning of ecosystems and the influence of climate on fisheries, recognising that there may be little scope for human intervention on the fluctuations of the resources. It may be that the balance between the
four components of sustainability can only be restored by decreasing the importance given to the bio-
ecological component.

6. CONCLUSION

Joseph E. Stiglitz, winner of the 2001 Nobel Prize in Economics has written a lucid evaluation of the
efforts of the World Bank (WB) and of the International Monetary Fund (IMF) (Stiglitz 2002). The WB
and the IMF have been created after the Second World War, and their history is therefore about the same
length as that of structured fisheries science in support of fishery management in the North Atlantic.
Many of the criticisms that Stiglitz directs at the IMF would apply equally well at fishery management
and at fishery science in the North Atlantic: a dogmatic approach (in the IMF’s case, free the market, in
fishery management protect the fish), a one size fits all approach (privatise services and deregulate in
the case of the IMF, decommission and slash the number of days at sea in fishery management), and a
disregard for the local social and economic consequences of the implementation of the plan
(restructuring of the economy, fishery management plan).

Fishery science and management, similar to the WB and the IMF are believed to have been useful early
in their life, but recently, they have drifted from their original intent and their usefulness has been
questioned. Holling (1995) suggests a model for the evolution of ecosystems and institutions which may
help understand the evolution of fishery management in the North Atlantic. He observes that
management of ecological variables leads “to less resilient ecosystems, more rigid management
institutions, and more dependent societies” (page 6, para. 4).[…] Because of the initial success, in each
case the management agencies shifted from their original social and ecological objectives to the
laudable objective of improving operational efficiency of the agency itself – spraying insects, fighting
fires, producing beef and releasing hatchery fish with as much efficiency and as little cost as possible.
Efforts to monitor the ecosystem for surprises rather than only for product therefore withered in
competition with internal organizational needs, and research funds shifted to more operational
purposes.[…] the very success in managing a target variable for sustained production of food or fibre
apparently leads inevitably to an ultimate pathology of less resilient and more vulnerable ecosystems,
more rigid and unresponsive management agencies, and more dependent societies. This seems to define
the conditions for gridlock and irretrievable resource collapse. […] Moreover, those pathologies occur
not only in examples of renewable resource management but also in examples of rigid policies of
regulation of toxic materials or in examples of narrow implementation of protection of endangered
species” (page 8-9, para. 3-5).

In a system where there is less emphasis on the bio-ecological component of sustainability, stock
assessment, although it would have less of a dictatorial role could play a far more meaningful role. In
particular, the development of “alternative, data-based rather than model-based, approaches” (Hilborn
2002, page 403) to agreeing on management measures would provide considerably more scope for
meaningful involvement of interested parties other than stock assessment scientists / modellers. Such an
approach would hold a greater probability of achieving the true meaning of the precautionary approach
which is to produce social and economic benefits to society (Hilborn et al. 2001, Hilborn 2002).
Berkes et al. (2001) provide an alternative view of fishery management that would in fact lead naturally to a better balance in the four component of sustainability (their figure 3.1 is adapted here as Figure 1).

Holling (op.cit.) suggests that the way towards sustainable development is through “the release of human opportunity. It requires flexible, diverse and redundant regulation, monitoring that leads to corrective responses and experimental probing of the continually changing reality of the external world. Those are the features of adaptive environmental and resource management” (page 30, para. 4).

This should not be seen as an argument to decrease fishery management efforts. On the contrary, the theme of the paper is that fishery management should be re-focused in order to be more effective to increase the socio-economic benefits that can be extracted from the fisheries, while at the same time protecting the resources. It is the neglect of the socio-economic and institutional components of sustainability that have led to fishery management processes being ineffective.
REFERENCES


DISCUSSION PAPER 5

RECENT DEVELOPMENTS IN INTERNATIONAL FISHERIES INSTRUMENTS AND TRENDS TOWARDS SUSTAINABILITY

by

Michael Lodge⁵⁴

Summary

Previous workshops in this series had found that, although international fishery instruments address directly or indirectly many of the factors of unsustainability in fisheries, better implementation is required. To avoid unsustainability, institutional arrangements need to involve interested parties in the decision-making process and develop an appropriate incentives structure. Weaknesses in existing governance systems need to be addressed and it is essential to move more rapidly to the situation envisaged by the 1995 Agreement where effective management systems are in place for all international fisheries. Where there are currently-unregulated high seas fisheries, new organizations or arrangements need to be established as a matter of urgency, using the template of the 1995 Agreement as a basis for resolving key issues affecting sustainability such as disagreements over allocations and the question of new entrants and non-compliant States. Currently unregulated high seas fisheries had been identified as an area requiring particular attention. This paper reviews international developments since 2001 and considers how available tools found in existing international fishery instruments may be adapted to provide better governance of high seas fisheries, including new deep ocean fisheries. Many of the problems currently facing high seas fisheries are common to all regions and all fisheries and there are compelling reasons why some sort of global framework management system may become necessary.

1. BACKGROUND AND INTRODUCTION

In a document prepared for the first international workshop on the implementation of international fisheries instruments and factors of unsustainability and overexploitation in fisheries [Bangkok, February 2001], the author considered whether the main factors contributing to unsustainability and overexploitation identified by Cunningham and Maguire (Cunningham and Maguire, 2002) had been addressed in international fisheries instruments.

By way of background, the document provided a general review of international fisheries instruments including the 1982 UN Convention on the Law of the Sea (LOSC), the 1995 UN Fish Stocks Agreement (UNFSA),⁵⁵ the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF), the FAO International Plans of Action (IPOAs) elaborated under the CCRF and various other ‘soft law’ instruments. It was noted that it was difficult to make any precise correlation between the factors of unsustainability identified by Cunningham and Maguire and international fisheries instruments, primarily because many of the factors identified were of an economic nature, driven by external factors not necessarily reflected in international instruments that are frequently developed as a response to political concerns rather than as a scientific response to economic, ecological or social problems. Notwithstanding, the author proposed that international fishery instruments were a critical tool for the establishment of appropriate institutional arrangements, which in turn have a direct effect on the sustainability of the fisheries they are designed to manage. In addition, some preliminary conclusions, as follows, were drawn from a brief analysis of some of the key international fisheries instruments:

⁵⁴ The views expressed in this paper are solely those of the author, Michael Lodge.

1. Considerable progress at the international level had been made in creating mechanisms for addressing the problems of illegal, unreported and unregulated (IUU) fishing, especially through the IPOA – IUU\(^{56}\) and relevant provisions of the UNFSA.

2. Some progress had been made in addressing biological and ecological issues, especially through the emphasis in both the UNFSA and CCRF on the application of the precautionary approach and growing recognition of the need for ecosystem based management.

3. Less progress had been made in addressing the problems of sustainability in small-scale and artisanal fisheries, with the focus at international level mainly on the role of States and national fisheries administrations.

4. Progress had also been made in addressing institutional issues, and in particular in defining more clearly the functions and responsibilities of regional fisheries management organizations (RFMOs).

The emphasis on the role of RFMOs as the key delivery mechanism for conservation and management of transboundary fish stocks was noted as one of the most significant and important recent trends in international fisheries management. At the same time, it was noted that some of the existing RFMOs, particularly those whose mandates had been established prior to the adoption of the UNFSA in 1995, were ineffective, whilst others had not successfully addressed key factors affecting sustainability including those relating to compliance, illegal, unregulated and unreported fishing, as well as effective decision-making. It was suggested that further efforts needed to be made to strengthen RFMOs to ensure that they (a) meet the standards established by the relevant international fishery instruments, and (b) possess the necessary mandates to enable them to address the factors affecting sustainability.

Following discussion of the paper during the first workshop, it was concluded that although international fishery instruments revealed a high level of consensus at global level on the factors to be addressed, failure to implement existing instruments was a major problem. More guidance and capacity-building activities should be directed at the implementation of international instruments at the national, regional and global levels.

At the second international workshop on the implementation of international fisheries instruments and factors of unsustainability and overexploitation in fisheries [Mauritius, February 2003], participants attempted to answer more specifically the following questions.

1. What are the major obstacles to the implementation of major legal instruments?

2. What are the main lessons learned and the possible paths to solutions for improved implementation?

3. What are the possible gaps that may exist in these instruments to guide the international community in improving the management of marine fisheries?

In the light of a number of case studies, the following factors were identified as significant to addressing unsustainability for all fisheries, with the relative importance of the various factors of unsustainability varying according to the type of fishery under consideration (Swan and Gréboval, 2004).

1. Poor governance is a major cause for the inability to reach sustainable fisheries. Failure to have good governance, in itself, is sufficient for fishery management to fail.

2. There is a need to grant secure rights to resource users (individually or collectively) for use of a portion of the resource, space, or other relevant aspect of the fishery. Inappropriate incentives and lack of good governance are often predominant issues preventing sustainability and both link to the absence of secure rights.

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\(^{56}\) 2001 FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing.
3. There is a widespread need for capacity building, training, education, awareness building, and sharing of knowledge relevant to fisheries management for all stakeholders.

4. Fishery management has usually focused primarily on the bio-ecological component of sustainability, but has often failed even on this dimension of sustainability, possibly because it did not pay enough explicit attention to the other components of sustainability. Achieving sustainability requires a blend of a conservation perspective and the social and economic perspective of those directly associated with the fisheries. Either alone will not succeed. The social component of sustainability is insufficiently covered by fisheries management instruments in general.

5. There is a need to make better progress in the implementation of international instruments relating to sustainability at the national and regional levels.

6. Achieving sustainability is often impeded because there is a lack of will to make management decisions or because decisions that have been made are not enacted either due to a lack of will or a lack of capacity to act on them.

It was emphasized that the linkages and interactions between these factors were highly complex and had not been fully addressed. It is often the failure to take into account these interactions that have impaired past management attempts.

In light of the outcomes of the first and second workshops, the present paper is intended to serve as a background for continuing discussion of the prospects of achieving good governance of international fisheries through better implementation of existing instruments. The paper reviews a number of important international developments that have taken place since 2001 (i.e. since the first workshop in this series) and attempts to identify some of the main trends arising out of these developments. Contrary to what has become a common perception, the paper postulates that there is in fact a broad recognition of the need for better implementation of existing instruments, but that this needs to be combined with gap-filling where necessary and a more precise focus on the leverage that can be gained through ‘smarter’ implementation of existing measures. In many cases it is apparent that States and RFMOs do not necessarily need to do more, but they do need to do what they are already doing much more efficiently.

2. INTERNATIONAL DEVELOPMENTS SINCE 2001

The following section briefly reviews and places into context some of the important developments that have occurred in important multilateral fora in recent years, including the United Nations General Assembly, FAO and Organization for Economic Co-operation and Development (OECD) in relation to key instruments.

2.1 UN Fish Stocks Agreement

The UNFSA entered into force on 11 December 2001. As of July 2004, there were 52 Parties to the Agreement, including the European Community and its member States. Although the Parties to the Agreement include some of the major maritime powers, including the United States and Russian Federation, one of the problems has been a lack of commitment to the Agreement by some of the major distant water fishing States, including Japan, Republic of Korea, China and Poland and open registry States, such as Belize, Panama, St Vincent and the Grenadines and Guinea.

The most important international development that has taken place with regard to the UNFSA is the establishment of an annual round of informal consultations between States Parties. The first such meeting took place in July 2002 and has now become an annual event. The meeting has provided a useful forum for States Parties to review the implementation of UNFSA, including through exchange of information on measures taken at the national level to implement the provisions of the Agreement and identification of particular problems associated with its implementation. The discussions at the informal consultations have been much facilitated by the preparation of an annual report by the Secretary-General,
partly compiled on the basis of a questionnaire to States Parties, on the status and implementation of the Agreement and its impact on related or proposed instruments throughout the UN system.

Among the outcomes of the informal consultations have been the adoption in 2003 of a recommendation to the General Assembly on terms of reference for the establishment of an Assistance Fund under Part VII of the Agreement, administered by FAO, to assist developing States parties in the implementation of the Agreement, as one component of the forms of assistance envisaged by Part VII. The recommendation of the informal consultation was formally adopted by the General Assembly in its resolution A/58/240 in December 2003. The Fund is designed to respond, in part, to the need for capacity-building as a precondition to full implementation of the Agreement in developing countries, whilst recognizing the need to consider other options for strengthening national, subregional and regional institutions and policies to better address the special needs of developing countries (IDDRA, 2002).

In addition to providing an opportunity for comment on the format and content of the annual General Assembly resolutions on sustainable fisheries, the informal consultations have also revealed a broad level of agreement on the problems that continue to affect international fisheries for straddling fish stocks and highly migratory fish stocks, especially on the high seas. These include:

(a) the need for strict scrutiny and clarification by the international community of the concept of the ‘genuine link’ between flag States and their vessels in the context of conservation and management of fisheries;

(b) lack of implementation of the basic principles set out in Part II of the Agreement and undermining of the provisions of UNFSA by IUU activities, particularly in high seas areas adjacent to areas under national jurisdiction;

(c) the need to reduce fishing capacity as a matter of urgency, and the link between IUU fishing vessels, operating outside international management schemes, and the problems of excess fishing capacity; and

(d) the need to address the role and competence of existing RFMOs, particularly their deficiencies concerning species coverage, ecosystem-based fisheries management, and reduction of by-catch of associated or dependent species. Participants also identified as a major gap in present high seas fisheries management the absence of a regulatory regime for demersal species. An extension of the UNFSA regulatory regime was considered a possible solution to addressing this gap.

It is envisaged that the informal consultations will also form an important preparatory forum for determining the structure and process for the Review Conference envisaged by Article 36 of the UNFSA, scheduled to take place in the first part of 2006. That Conference will be important, not least because it is likely to bring to a head the potential for polarization between those who wish to see UNFSA strengthened and implemented in good faith, and the realpolitik of those who could well argue that, with only 52 States Parties, the way to achieve universal acceptance of UNFSA is, as with Part XI of the LOSC, to remove those elements that are most objectionable.

2.2 Implementation of the IPOA – IUU and related FAO measures

Considerable effort has been expended by FAO since 2001 on the implementation of its IPOAs on IUU fishing (2001) and on the management of fishing capacity (1999). These efforts have included review of the status of implementation of the IPOAs at COFI (25th session, February 2003) followed by the adoption of a Resolution at the Thirty second Session of the FAO Conference in November 2003 in which FAO members expressed their concern at the growing incidence of IUU fishing and the lack of effective implementation of the IPOA – IUU. In the same Resolution, member States went on to note the lack of commitment by some States to meet their obligations under international law as well as the increasing incidence of vessels flying “flags of convenience” and the inability or lack of will on the part
of some countries to apply any controls over the vessels they flag. Apart from the usual exhortations to States to sign up to the relevant international instruments (exhortations which, in the view of this author at least, have absolutely no impact on the behaviour of States), FAO members also encouraged States and RFMOs to adopt, by 2004, national and regional plans of action to implement the IPOA IUU, to prevent fish caught by vessels identified by relevant RFMOs to have been engaged in IUU fishing being traded or imported into their territories and to ensure compliance with and enforcement of policies and measures having a bearing on IUU fishing which are adopted by any relevant RFMOs.

Following the concerns expressed at COFI and at the FAO Conference, FAO convened in June 2004 a Technical Consultation to Review Progress and Promote the Full Implementation of the IPOA – IUU and the IPOA Capacity. Expert consultations have also been held on the impact on IUU fishing of fishing vessels operating under open registries (September 2003) and on legal issues related to CITES (June 2004). In August 2004, FAO will hold a further technical consultation on the role of port States in deterring IUU fishing. To support these efforts, FAO has issued comprehensive analyses of action taken by FAO members to implement the IPOAs and on the progress of regional fishery bodies and RFMOs in implementing the IPOA – IUU. FAO has also issued Technical Guidelines to support implementation of the IPOA – IUU, containing advice on measures and recommendations on the organization and content of national plans of action.

The analyses undertaken by FAO of the actions taken by States and RFMOs are informative and useful, even if they do not in themselves add anything new to the debate on sustainability of fisheries. They show that the serious concerns expressed by the governing bodies of the FAO have had some impact, with approximately a quarter of FAO members having formulated national plans of action for the implementation of the IPOAs. The analyses indicate (as may be expected) that the dynamic nature of IUU fishing allows illegal activities to flourish where controls are less. Of the measures recommended to deal with IUU fishing, control over nationals, flag State controls and market-related measures emerge as the least effectively implemented, with worrying lapses reported in the exercise of flag State responsibility and enforcement of measures against nationals. The main constraints to full implementation of the IPOAs at national level were reported as lack of financial and human resources (reading this in parallel with the FAO Conference resolution, in which ministers decried the “lack of political will and capacity of some governments” one might well pause here to wonder whether the real problem is a lack of resources per se or a lack of willingness to target available resources in the right direction).

At the regional level, FAO’s analysis indicated that a predominant issue for RFMOs was the need for more effective enforcement measures. It was considered that trade and market-related measures had had a positive impact, where implemented, but that the lack of effective flag State control remained a major impediment to progress. One cannot help but agree with the conclusions proffered by the FAO Secretariat that success in the fight against IUU fishing will only come through “increased regional cooperation, harmonization of legal frameworks and monitoring, control and surveillance (MCS) systems … and the building of networks that will become more and more impenetrable to IUU fishing interests.” The question, of course, is how is all this to come about.

One matter of particular concern is the lack of commitment shown by States to the 1993 FAO Compliance Agreement.57 The Agreement entered into force on 24 April 2003, but to date (August 2004) has been formally accepted by only 28 FAO members. As pointed out by Norway in a paper presented to the June 2004 FAO technical consultation mentioned above, only 10 States and the European Community have ratified both the FAO Compliance Agreement and the UNFSA. This is a somewhat strange phenomenon given the overlap between the two instruments, but at the same time has the serious repercussion of undermining the potential effectiveness of the high seas fishing vessel register maintained by FAO under the Compliance Agreement.

2.3 Deep Sea 2003 and UNICPOLOS V

High seas governance in general became a focus for discussion at a special conference convened by the Governments of Australia and New Zealand in conjunction with FAO at Queenstown, New Zealand in December 2003. Although the conference was convened with a broad mandate to examine issues relating to the management of deep sea fisheries in general, specific concerns emerged with respect to the sustainability of currently unregulated deep sea fisheries on the high seas and the relationship between fisheries management and high seas governance in general. Lodge (Lodge, 2004) discusses the relationship between management regimes for deep sea fisheries and the implementation and enforcement of an effective legal regime to protect biodiversity in the deep ocean.

Reviews of management case studies from New Zealand, Namibia, the South Tasman Rise and within CCAMLR revealed that high levels of precaution are required to manage deep sea fisheries in a sustainable manner. Scientific advice needs to properly reflect known uncertainties in the data and allow for potential unknown uncertainties, including the profound impact of oceanographic and climatic variations. The South Tasman Rise orange roughy fishery management agreement was regarded as particularly instructive in that it contains an innovative decision rule that recognizes alternative hypotheses concerning intermittent aggregation of orange roughy stocks. The default management is based on the worst-case scenario and allows for increases in catch levels should the more optimistic hypothesis appear correct.

On the question of high seas governance, there was widespread agreement that multilateral governance needs improvement, but varying views on how this might be achieved. Some of the issues raised included the urgent need to address allocation of fishing rights and benefits—especially among developing countries in order to secure multilateral cooperation; whether changes to the existing high seas regime should focus on sustainable management of deep sea fisheries or more broadly on deep sea biodiversity and the wide range of possible activities that might affect deep sea biodiversity; and whether any new legal measures should focus on the high seas only, or should extend to fisheries on the continental margins and within exclusive economic zones.

The debate on high seas governance was taken a step further during the fifth meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS) in June 2004, which discussed, inter alia, the theme of ‘New sustainable uses of the oceans, including the conservation and management of the biological diversity of the seabed in areas beyond national jurisdiction’. The meeting noted the increasing levels of concern expressed by many States, scientists and several nongovernmental organizations over ineffective conservation and management of the biodiversity of the seabed beyond national jurisdiction. It was proposed that the General Assembly in 2004 take the following actions:

(a) urge States, either by themselves or through RFMOs, where these are competent to do so, to consider on a case-by-case basis and where justified on a scientific basis, including the application of precaution, the interim prohibition of destructive practices by vessels under their jurisdiction that have an adverse impact on vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold water corals located beyond national jurisdiction;

(b) encourage RFMOs with a mandate to regulate bottom fisheries to urgently address the impact of deep sea bottom trawling on vulnerable marine ecosystems in accordance with international law; and

(c) urge members of RFMOs without the competence to regulate bottom fisheries to expand the mandate, where appropriate, of their RFMOs to cover such activities in accordance with international law, with the progress on action taken in response to these requests to
be reviewed within two years with a view to further recommendations, where necessary.

Several delegations made specific proposals for the conservation and management of marine biodiversity beyond national jurisdiction, including: (1) addressing scientific and legal gaps in the conservation and management of high sea biodiversity; (2) providing direction and substance to the debate on the governance of high seas marine biodiversity; and (3) identifying further options for progress. These suggestions included: (a) the convening of an intergovernmental conference on deep sea fishing on the high seas by the General Assembly to identify gaps in governance and scientific knowledge, and to provide a forum for negotiating and promoting the implementation of long-term measures necessary to protect and preserve rare and fragile ecosystems as well as the habitat of depleted, threatened or endangered species; (b) the initiation of an intergovernmental process by the General Assembly to identify existing gaps regarding governance and scientific knowledge; and (c) the establishment of a task force on high seas biodiversity. Nevertheless, given the wide divergence in views, UNICPOLOS V was not able to recommend the adoption by the General Assembly of any of the specific measures that had been proposed such as a global moratorium on high seas bottom trawling, or the setting up of a group of experts or intergovernmental process to identify and address the gap in existing governance arrangements on the high seas. The most that could be agreed to at this stage was to welcome a decision by the Conference of the Parties to the Convention on Biological Diversity for its ad hoc open-ended working group on protected areas to explore options for cooperation for the establishment of marine protected areas beyond national jurisdiction, consistent with international law, and on the basis of the best available scientific information, and to encourage the participation of oceans experts in the working group.

2.4 OECD

Under its 2003–2005 programme of work, the OECD’s Committee on Fisheries is considering the environmental, economic and social arguments in support of measures in relation to IUU fishing as well as the economic and social impacts of IUU fishing. In April 2004, the OECD hosted a workshop on IUU fishing activities with the objective of gathering information and data on the extent of IUU fishing and identifying the economic and social drivers to IUU fishing (OECD, 2004). Around 120 experts from OECD and non-OECD countries, RFMOs, intergovernmental organizations, non-governmental organizations and academia attended the workshop.

The workshop reached a number of (unsurprising and somewhat self-evident) conclusions, including that IUU fishing is harmful to fish stocks and undermines the efficiency of measures adopted nationally and internationally to secure fish stocks for the future and that IUU activities also have adverse effects on the marine ecosystem, notably on the populations of seabirds, marine mammals, sea turtles and biodiversity as a whole (discards, etc.). More significantly perhaps, the workshop agreed that the IPOA – IUU contains sufficient tools to tackle the IUU issue. The question is to find ways to better implement such tools. In this respect, IUU fishing is a dynamic and multifaceted problem and no single strategy is sufficient to eliminate or reduce IUU fishing – a concerted approach is required nationally, regionally and internationally, and by type of fishery. The full range of players should be involved in helping bring forward solutions to the IUU problem.

As to the information and data needs that would assist in addressing IUU fishing, the workshop considered that in spite of recent improvements in information collection, there remains a lack of systematic and comprehensive information on the extent of IUU operations and impacts. This is compounded by the varying level in quality, accessibility, reliability and usefulness of the available data. It was considered that trade tracking and the resulting accumulation of information by market countries are an enormous task but very important for the creation of effective measures to combat IUU fishing. While there are a number of international instruments addressing the collection of fisheries information and statistics, these need to be integrated and further, there remains a need for improvement in national statistics on trade in fish and fish products, especially in relation to IUU fishing. There is also a need to broaden the scope of the information gathered so it covers activities and situations “upstream” and
“downstream” of the IUU fishing operations themselves. This will help to better define the nature and scope of IUU fishing and to improve knowledge of the economic and social forces which drive IUU fishing in order to help target future actions.

2.5 Ministerially-led Task Force on IUU Fishing on the High Seas

The importance of securing the political will to tackle the problem of IUU fishing on the high seas was one of the aspects underlined by ministers and other participants who attended the Eleventh Meeting of the Round Table on Sustainable Development held at the OECD on 6 June 2003. One key problem is what appears to be a lack of willingness on the part of some States to participate in multilateral arrangements and secondly to participate effectively in them (which begs the questions whether there is any way to ensure that States have a common view of their responsibilities so that agreed actions are implemented and desired outcomes achieved).

As a result of that meeting, on 1 December 2003, the United Kingdom Minister for the Environment, Elliot Morley MP, announced the formation of a ministerially-led task force to address the problem of IUU fishing on the high seas in order to produce an analysis of the IUU fishing problem together with recommended and prioritized actions that can be both implemented by members of the task force and advocated as the best course for others to follow. The Task Force has been established under the auspices of the Round Table on Sustainable Development at the OECD, with a small secretariat hosted at the OECD’s Paris headquarters.

The mission of the Task Force, which is envisaged to take between eighteen to twenty-four months to accomplish, is to spell out a way forward at global, regional and national levels and propose a full menu of prioritized actions that keeps the ‘big picture’ to the fore. A key outcome must be an authoritative, pragmatic and prioritized action plan that is both analytically sound and politically saleable. The intention is that the completed action plan will be placed by ministerial members of the Task Force directly in the hands of other ministers who will then be asked for their views on the main findings and recommendations. Assuming that the analysis is persuasive, ministerial members of the Task Force will be in a strong position to press their colleagues on why, given the consensus on the analysis of the problem, implementation of the recommendations at national, regional and global levels should not be possible. In conjunction with the bilateral ministerial-level approaches, the Task Force’s broad business and NGO membership is expected to help mobilize wider public support for the report’s main findings with a view to generating further momentum for change.

Importantly too, the Task Force will present its report and recommendations to, inter alia, the FAO Committee for Fisheries, as well as relevant bodies of the UN, United Nations Environment Programme (UNEP), OECD, the International Maritime Organization (IMO), the UN Commission for Sustainable Development (CSD) and RFMOs. The purpose of these ministerially-led presentations will be to seek agreement on the analysis and to press for the implementation of the action plan in a coordinated manner through the respective mandates of such bodies.

In July 2004, the High Seas Task Force issued its first consultation paper (HSTF, 2004), being a consolidated list of the legal, science, economics and trade, and enforcement issues arising in relation to IUU. The paper suggests a diagnostic and analytical matrix designed to approach the problem from the perspective of each of the major ‘actors’ (flags, vessels, nationals and fish) in relation to the location where activities take place (at sea, on land, in port) in order to enable identification of how the cross-linkages may be optimized between the various stages of or activities comprising the IUU fishing operation. The paper also examines opportunities for the application of tighter or more effective control points which will address the causes of IUU fishing rather than just the symptoms.
3. IMPORTANT REGIONAL DEVELOPMENTS SINCE 2001

This section reviews a number of the more important regional initiatives that have taken place since 2001. The list is necessarily selective; with attention confined to those initiatives that have most relevance to the overall subject of the workshop.

3.1 Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

The Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, adopted in 2000 after four years of negotiations, entered into force on 19 June 2004. The Convention formally establishes the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, which will have management authority over the world’s largest and last-remaining unregulated tuna stocks in the Central and Western Pacific Ocean. The establishment of the Commission means that all tropical tuna stocks worldwide are now covered by one or more of the following five RFMOs: International Commission for the Conservation of Atlantic Tuna (ICCAT), Indian Ocean Tuna Commission (IOTC), Inter-American Tropical Tuna Commission (IATTC), Western Central Pacific Fisheries Commission (WCPFC) and Commission for the Conservation of Southern Bluefin Tuna (CCSBT).

It is too early to say whether the establishment of the WCPFC will have a positive impact on the sustainability of tuna stocks in the Central and Western Pacific Ocean. At the institutional level, the potential parties to the Convention have made good progress since 2000 in preparing the groundwork for the entry into force of the Convention, but it remains a matter of concern that, as of August 2004, the Parties that have ratified the Convention are mainly small island developing States. No major fishing States have yet ratified the Convention. This raises the question not only of their commitment to the Convention, but also whether the Commission will be able to secure a sound funding base in order to carry out its work. Further, for the first time, real fears have been raised concerning the sustainability of bigeye and yellowfin stocks in the region, as well as a growing problem of overcapacity in both the purse seine and longline fisheries despite the adoption of a number of resolutions aimed at preventing overcapacity by participants to the negotiations leading to the establishment of the Commission. Although the Commission starts with a significant advantage in that it is one of the few RFMOs that contains decision-making mechanisms that result in binding decisions, the real test ahead for the new Commission lies in how it will deal with the question of allocation of limited fishing opportunities between the Parties, including an increasing number of developing country participants that wish to participate in the high seas fishery.

3.2 Inter-American Tropical Tuna Commission

The most significant development that has taken place since 2001 with respect to IATTC is the negotiation of an entirely new convention to replace the rather outdated and unsatisfactory 1949 bilateral agreement that established the IATTC. The resulting Antigua Convention was adopted in June, 2003 (but will not enter into force until there are seven ratifications). Among the objectives of the revised Convention are to incorporate the fisheries management principles established in the LOSC and UNFSA, both of which post-date the existing IATTC Convention. Thus, the Antigua Convention incorporates explicit references to the precautionary approach, the requirement of compatibility of measures between EEZs and high seas and the objective of long-term sustainability of fish stocks. It is not clear that the new Convention will make radical and immediate changes to the way in which IATTC operates, primarily because existing rights of parties to the present Convention are grandfathered in for an indefinite period. Nevertheless, explicit references to new management principles, and steps such as an agreement to confer participatory status on Taiwan, as a fishing entity, mean that the groundwork has been laid for future developments in the IATTC region.
3.3 Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

Since 2000, CCAMLR has adopted two significant initiatives. The first is a catch documentation scheme for Patagonian toothfish. The scheme is intended to establish a framework for tracking landings and trade flows of toothfish in order to verify that catches from the CCAMLR area have been taken in a manner consistent with CCAMLR conservation and management measures. The scheme met with initial successes (for example, closing down the port of Walvis Bay, Namibia to toothfish operators), but has not been implemented by all CCAMLR parties and is, to some extent, also being circumvented by fraudulent certifications issued by non-participating States and by a growing black market in non-certified toothfish. On the other hand, the extent of illegal operations within the CCAMLR area has been highlighted by evidence of substantial increases in reported catches from high seas areas adjacent to the CCAMLR area – the bulk of which are believed to be fraudulently misreported.

The second measure established by CCAMLR, partly as a response to one of the major problems with the catch documentation scheme, is a policy to enhance cooperation between CCAMLR and non-contracting Parties, particularly with a view to such non-contracting Parties participating voluntarily in the catch documentation scheme and either taking steps to prevent their flag vessels from fishing in the CCAMLR area or joining the organization. The scheme has contributed to the development of a new concept of “cooperating non-Party”, whereby benefits in the fishery may be granted to non-parties who show a willingness to cooperate with the conservation and management measures established by the RFMO. In the case of CCAMLR, the policy has resulted in Namibia and Vanuatu acceding to the Convention. Efforts have been made to engage other non-contracting flag States and port States, including Belize, China, Guinea Bissau, Maldives, Mauritius, Mauritania, Panama, Seychelles, St. Vincent and the Grenadines, Taiwan and Togo. As a result of these efforts, Mauritius undertook to close its ports to toothfish landings without valid catch documentation as from 2002 and Mozambique in 2002 denied landing to a Uruguayan-flagged vessel, Dorita. Belize cooperated with CCAMLR in ordering one of its vessels to remain in port in Durban pending an inspection by South African authorities.

3.4 South West Indian Ocean Fisheries Commission (SWIOFC)

In 1999, the former Indian Ocean Fishery Commission (an FAO body) was formally abolished. Since that date, a series of intergovernmental consultations have been convened with a view to establishing a new RFMO in the South West Indian Ocean. The most recent such consultation took place in July 2004 in Seychelles. Although there is a growing view (even amongst the participants involved) that the fisheries which prompted the decision to establish a new RFMO are now generally depleted and possibly no longer of major interest to those who had pioneered the expansion of the fishery (Molenaar, 2003), the proposed new body would manage straddling fish stocks and demersal species, including Hoplostethus atlanticus (Orange roughy), Allocyttus niger (Black oreo), Neocyttus rhomboidalis (Spiky oreo), Pseudocyttus maculatus (Smooth oreo), Beryx splendens (Alfonsino) and Hyperoglyphe antarctica (Bluenose), in a large area of the Indian Ocean roughly corresponding to FAO Statistical Areas 51 and 57. It would not manage highly migratory fish stocks, which are within the competence of the Indian Ocean Tuna Commission (IOTC). Importantly, too, the proposed new RFMO would have competence only over the high seas portion of the fishery, with a separate regional body to be established, under Article VI of the FAO Constitution, for waters under the sovereignty of coastal States.

In the view of this author at least, this is symptomatic of an extremely worrying trend, which almost takes us back to the reasons why it was necessary to convene the UN Fish Stocks Conference in the first place. Given the emphasis in the UNFSA on the need to manage both straddling fish stocks and highly migratory fish stocks throughout their range and on the need for compatibility between measures adopted for areas within national jurisdiction and on the high seas, it is difficult to see how the proposed new organization can hope to achieve the management objectives set out in the UNFSA within such a structure. Decision-making procedures within the proposed high seas body are relatively robust, with the current proposal being a qualified (four-fifths) majority vote in default of consensus, but it is difficult to see how this can fit comfortably with a system where coastal States are under no binding obligation to
apply compatible measures within areas under national jurisdiction. A point that is often overlooked with respect to UNFSA is that coastal States, including many developing coastal States and some developed ones, were at least as much to blame as distant water fishing nations for mismanagement and overfishing of straddling stocks and highly migratory fish stocks. The UNFSA therefore makes it abundantly clear that the principles and measures for management set out in Articles 5 and 6 are to apply both within areas of jurisdiction and on the high seas. Within areas under national jurisdiction it is primarily the responsibility of the coastal State to apply those measures. Seen in this light, the proposed SWIOFC, in its present form, cannot be viewed as anything but a retrograde step.

4. MAIN TRENDS

Whereas the first workshop in this series, in 2001, concluded that although international fishery instruments revealed a high level of consensus at global level on the factors to be addressed, but failure to implement existing instruments was a major problem, the above summary of developments since 2001 indicates a clear recognition in most multilateral fora that we need to focus on better implementation of existing instruments, not on creating new international agreements that will not be adhered to. This is a significant positive trend, if only because it has enabled the international community to focus its attention on attempting to identify the main weaknesses in implementation that need to be addressed. Broadly, these would appear to be:

(a) lack of implementation (by both coastal States and fishing States) of the basic principles for conservation and management set out in Part II of the UNFSA;

(b) this lack of implementation is largely associated with undermining of the provisions of the UNFSA by IUU activities, particularly in high seas areas adjacent to areas under national jurisdiction;

(c) the urgent need to reduce fishing capacity and the link between IUU fishing vessels, operating outside international management schemes, and the problems of excess fishing capacity; and

(d) the urgent need to fill gaps in existing high seas management arrangements, for example, for deep sea fisheries, including by addressing the role and competence of existing RFMOs.

At the same time, there are strong indications that existing instruments have not been fully implemented. In general, there has been a failure to operationalize the enforcement provisions of the UNFSA. For example, no high seas boarding and inspection regime under the UNFSA has been established anywhere in the world. The problem of flag State responsibility has not been dealt with and the concept of the ‘genuine link’ between flag States and their vessels remains unresolved.

A more fundamental problem is the continued bias in international fisheries management towards biological management, i.e. management that is centred on stock assessment and the fish stock as the unit of management. Although one of the important achievements of the UNFSA was a more precise (if imperfect) legal definition of the precautionary approach to fisheries management, recent years have seen a growing emphasis on the need for an “ecosystem approach” or “ecosystem-based fisheries management.” This is at best a fuzzy concept which has not yet been defined in clear enough terms to give rise to legally-binding rights and obligations. The strong scientific bias in management derives from a somewhat idealistic view prevalent in the 1950s that fisheries management could be rational if based on scientific findings and the “best available evidence.” Unfortunately, this overlooks the fact that, not only is the never-ending quest for “best available” scientific evidence often invoked as an excuse for inaction, but also that the science structures in most RFMOs are excessively politicised. This in turn leads to the existence of inconsistencies and apparent incompatibilities in science relating to global phenomena that is artificially compartmentalized and delivered on a regional basis. A particular problem in science-based systems is the dominance of developed countries’ science over developing countries,
that do not have access to the same levels of expertise. This leads to imbalance in the institutional structure. To what extent can an institution be effective if most of its science comes from one source, or is dependent on the vested interests of a small group of members? These problems have been addressed to some extent in the WCPFC through the existence of a relatively independent advisory body (the Oceanic Fisheries Programme of the South Pacific Community) and by a carefully designed science structure which filters the scientific advice that is considered by the (political) Scientific Committee through independent “scientific experts”. On the other hand, whilst scientific knowledge of fish stocks is clearly a very important element in any fisheries management system, it is only one of a number of elements which are often overlooked, even in the WCPFC, including economic and social considerations.

Not only has there been a failure to give effect to existing instruments, but also several recent trends show a disturbing fragility in the level of consensus relating to existing instruments. The South-west Indian Ocean negotiations, for example, represent a significant step backwards from the notions of compatibility of measures within and beyond EEZs that are emphasized by the UNFSA. The fact that, within the Northwest Atlantic Fisheries Organization (NAFO), potential unilateral measures are once again under seriously consideration by Canada, raises serious concerns, as does the fact, on the other hand, that even apparently responsible developed countries are reported to have unilaterally decided not to observe multilaterally-agreed NAFO quotas. Such actions show a serious failure of and lack of confidence in existing multilateral institutions but can only lead to unravelling of the gains that have been made so far through instruments such as UNFSA and the IPOA – IUU.

Slightly more positive trends have emerged from WCPFC and CCAMLR. The latter has made particular progress with respect to the problem of securing compliance by non-parties and the judicious implementation of trade-related measures, particularly against so-called “flags of non-compliance.” WCPFC has made significant progress in setting up institutional structures that reflect the requirements of UNFSA, but, like UNFSA itself, failed to establish a mechanism for allocation.

5. CONCLUSION

Overall, it can be said that there has been a mixed response to calls for the reform of RFMOs and that little real progress has been made to date. In particular, little progress has been achieved in dealing with the fundamental questions of “real interest”, allocation of fishing opportunities, new entrants and binding decision-making. The latter are critical problems. They relate directly to the major causes of unsustainability, i.e. poor governance and lack of secure user rights. At the heart of the conceptual debate with respect to high seas fisheries is a polarization of views about the fundamental purpose of RFMOs. The fundamental objective on which UNFSA is based is the need to seek, as a collective responsibility of all States concerned in a particular fishery, compatible conservation and management regimes both inside and outside areas of national jurisdiction. On one view, which it is submitted is the preferred (pro-UNFSA) view, RFMOs are intended to be conservation oriented, with responsibilities as effective stock managers. On another view, which it has to be said is the traditional way in which RFMOs have been approached by major distant water fishing nations (DWFNs), RFMOs exist merely as a mechanism for allocation of quotas and stock access rights between those who are members of a rather exclusive “club” in which notional allocations to developing countries and new entrants simply operate as mechanisms to support reflagging and transfer of effort by distant water fishing nations. If one looks at the situation in IOTC, ICCAT and WCPFC (less so in IATTC), the coastal States in the area of competence of the RFMO are mainly developing countries, with the high seas portion of the catch taken almost exclusively by DWFNs, who have very different interests to coastal States. Two divergent and potentially disastrous trends are apparent.

1. DWFNs active simultaneously in all RFMOs cooperating with one another (openly or implicitly) to use RFMO allocations as a means of gaining access to coastal States EEZs and transferring excess capacity to other regions.
2. Developing coastal States using RFMOs to obtain high seas allocations and develop their own capacity as new entrants (frequently acting as proxies for excess DWFN capacity with little real benefit flowing to the coastal State).

It is essential that original thinking is brought to bear rapidly on the question of how to fairly accommodate developing country interests in already over-subscribed high seas fisheries. This might take the form of (at one end of the spectrum) effort limitations (as applied by IATTC) rather than catch limitations to (at the other end) models where “high seas rights” may be traded in place of quota.

The fisheries debate is further complicated by newly-emerging concerns over how to accommodate an ecosystem-based approach to fisheries and to problems such as the protection of high seas biodiversity. Proposed solutions such as the establishment of high seas marine protected areas (MPAs) are imperfectly supported by existing legal instruments, which even if they authorize the establishment of high seas MPAs, offer few tools for enforcement. Nor do they provide a satisfactory mechanism to re-allocate fisheries resources where access is denied in order to protect biodiversity. Neither the LOSC nor the Convention on Biological Diversity offer any robust solutions to the dilemma of managing inter-related living and non-living resources as common property. We cannot avoid the fact that we have reached a crisis point with respect to high seas governance. Major changes are needed if the law is to keep pace with science and technology. Unfortunately, institutional change is also a very slow and difficult process, dependent upon political will and motivation for change and highly resistant to the influence of vested interests on the part of elites. With an important review conference for UNFSA likely to take place in 2006, and a review of the LOSC itself during the same year, it is imperative to take a fundamental look at the shape of high seas governance arrangements that will be needed in the future.

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DISCUSSION PAPER 6

ESTABLISHING ACCESS REGULATION AND RIGHTS

by

Joseph Catanzano

Summary

The assessments and expert reviews carried out at the request of some West African governments show the existence, even now, of national-scale weaknesses in fisheries management policy (FAO 2000, CNROP 1998, IMROP 2002, SIAP 2002). Because of these weaknesses the countries run the risk of seeing their natural resources depleted as a result of excessive use by some, non-rational use by others and/or failure by most of them to capitalise on those resources.

Open access to fishery resources is the main cause of overexploitation of those resources (structural aspect). This is due to there being too many fishermen and a lack of control over the rise in their numbers, and to excess fishing capacity and fishing effort (short-term aspect).

The challenge for the countries is to put their public and private fishing economies in order, if possible simultaneously, by mobilising the funds needed for essential structural reforms, prior to introducing mechanisms for allocating rights of access to resources. These mechanisms will be to remove negative externalities and gradually lead to an equitable and efficient way of dealing with the problem of rights allocation.

Fishery development strategies in the southern countries are hampered by conceptual and institutional limitations brought about by: (i) the perception of the management problem, (ii) the perception of the role of government measures, (iii) the need to refocus the role of public institutions, (iv) the introduction of long-term co-operation arrangements.

This paper deals with these four aspects by laying the groundwork for the implementation of access control policies. The aim is to ease the way for and guide the reform of management systems in West African countries. This implies, first, a willingness to break with current situations, followed by the introduction of arrangements for granting access rights, prior to developing management plans.

This paper takes account of the conventions and FAO 1005 Code of Conduct for Responsible Fisheries (Code of Conduct) under which the countries have already taken measures and focuses, in particular, on the question of access to fishery resources. It draws on the situations in the three “pilot” countries engaged in defining such processes and implementing management mechanisms: Guinea, Mauritania and Senegal. It should encourage new management initiatives, especially access control, and should help those involved to organise work timetables prior to mapping out a series of useful institutional reforms. It should also help in the identification of support measures and risks associated with each stage of the process. In addition to drawing attention to the theory of management and its links with development, this paper also deals with the opinions of the players involved, be they administrative officers, fishermen or researchers and, for that, draws on a consultation carried out in summer 2003 in each of the three countries concerned.

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1. INTRODUCTION

The aim of fisheries management as defined by FAO (Article 7 of the Code of Conduct) is the long-term sustainable use of fishery resources. Therefore, measures have been devised to maintain or restore stocks to levels where they will be capable of maintaining a constant maximum yield, bearing in mind pertinent environmental and economic factors, including the special requirements of developing countries.

The assessments and expert reviews carried out at the request of some West African governments show the existence, even now, of national-scale weaknesses in fisheries management policy (FAO 2000, CNROP 1998, IMROP 2002, SIAP 2002). Because of these weaknesses the countries run the risk of seeing their natural resources depleted as a result of excessive use by some, non-rational use by others and/or failure by most of them to capitalise on those resources.

These weaknesses lead to conflicts between fishermen and make it more difficult to reach decisions on the allocation of fishing rights (between small-scale and industrial fishermen, between members of a single fishing family and between nationals and foreigners).

These weaknesses result in:

- increased fisheries management costs
- increased fraud
- low taxation returns from the sector
- the sector failing to make an adequate contribution to national development
- major risks for the bio-ecological balance

2. THE CONCEPTUAL AND INSTITUTIONAL LIMITATIONS OF PUBLIC FISHERY POLICIES

Fishery management has for a long time focussed on the overfishing problem to the detriment of the overcapacity problem (Cunningham, 2002). The limitations of management aimed solely at preserving the productive and reproductive capacity of stocks by means of technical measures (catch selectivity and/or limits on total catch) (Troadec et Boncœur, 2002) became clear when all the chances of redeploying excess capacities disappeared in a given place and at a given time.

In a situation of uncontrolled access, overcapacity increases the risks for the resources, often leading to an unsustainable cycle of exploitation, as illustrated by the “tragedy of the commons” (Hardin, 1968). In uncontrolled fisheries, there are economic incentives which lead to over-fishing. These incentives are all the more effective given that fisheries management fails to use or makes insufficient use of economic control mechanisms. The market cannot alone produce regulations capable of blocking the effects of externalities.

Traditionally, two ways have been developed to try to deal with this problem: incentive blocking or incentive adjusting (Gréboval and Munro, 1999).

In the absence of a policy to deal with the question of access to fishery resources, conflicts of interest between fishery operators are on the increase (Christy, 1982). This has been quickly followed by conflicts within particular communities (territorial, social, occupational, and institutional), sometimes affecting several of these at the same time.

Public measures, especially in the countries under review in this paper (cf. Appendix), are often directed to resolving these conflicts. This often leads to confusion about the place and role of the institutions and to a waste of funds which could otherwise have been applied to the resolution of genuine management issues.

Some conflicts can affect an entire society (this is particularly true where international agreements are concerned). This occurs when the resources are no longer spoken of in terms of their economic classification (common), but in terms of their legal status (res nullius) (Boncœur, 2003). This is what happened during negotiations on fishing agreements with the European Union (EU) and in connection with transboundary conflicts which ended with physical interventions on national fishing vessels.

2.1 Government measures: an obligation to undertake reforms

A raft of government measures are needed to offset the effects of open access. However, this does not mean that the private sector cannot participate in the decision-making and implementation of the proposed regulatory system. There is a whole range of co-management options available, based on general policy approaches (such as decentralisation, regionalisation, community participation and delegation of authority), and the social practices in the country concerned.

The public authorities have to play a part in fishery management for strategic and legal reasons. These reasons are virtually universal and are not dependent on a country’s level of development. But there are also operational reasons, justified by the level of decline of the sectors and resources, and by the countries’ general weaknesses caused by their lack of development (in building infrastructure in general, under-equipped public services and the general lack of funds in the sector).

The situation in the developing countries is usually the opposite of that in the developed world, Europe in particular. In the former, the factors conducive to management reform stem from the relative weakness of the institutions (in the sense that networks are still being developed and, therefore, likely to undergo radical change), whereas constraints are due mainly to a shortage of the resources needed to introduce and support the reforms, especially funding.

However, one cannot but note that putting management reforms into place in Europe can take a considerable length of time\(^6^0\) and can consume large amounts of public funding despite the level of development of the economies involved.

This should prompt States to pay greater attention to the obstacles likely to arise throughout the reform process. It should also encourage them to take advantage of their institutional weaknesses and make a clean break with past positions and policies.

2.1.1 A suitable strategic position for action

From a strategic viewpoint, the public authorities are in a better position to provide a fully comprehensive picture of the management problem. They are able to stand back and take an overall view of the problems affecting: (i) the future of the resources, (ii) the economic sectors whose income depends on the exploitation of those resources and, (iii) the social conditions that can reasonably be expected given a country’s level of development or the level of development that country wishes to achieve.

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\(^{60}\) It is worth noting here as an example that current EU discussions on the introduction of mechanisms relating to access rights are proving difficult and it has not been possible to introduce any definitive reform despite the fact that overfishing has been a problem worldwide since the eighties, when a good number of fisheries were found to have close to 40 percent overcapacity. This should also encourage the countries to create a common exploitation area (in the countries of the sub-region) prior to ensuring that each country develops a culture whereby fisheries regulations are accepted and put into practice.
However, this does not mean that the public authorities can or should undertake this task alone. On the contrary, this should be a joint effort, for experience shows that the quality of the systems provided depends to a large extent on the players lending their support to the decisions made and on account being taken of public and private interests. Indeed, it is often at this stage that the groundwork is laid for the establishment of consultation bodies or future public/private mixed institutions (agencies, committees or commissions). This is also the time when the first training plans begin to emerge and training requirements are identified. Requirements in terms of information (observatory, etc.) also begin to be considered, with attention paid to management content, objectives and constraints.

Thus, with a clearly defined objective (improve one’s situation and ensure one’s future), small-scale and industrial fishermen will, by this stage, have a good idea of the issues to be negotiated and the constraints facing the public authorities and the other players. These are the points they will discuss. They will then move gradually from a clearly defined objective to a common objective (e.g. to achieve equitable and transparent access to resources).

2.1.2 Keeping operational requirements within limits

From an operational viewpoint, especially in the context of the developing world, public authorities have an even greater obligation to rationalize their choices and limit their financial commitments in the private sector, provided that neither international law, social peace, security nor any of their other crucial responsibilities will be affected by any such decisions.

However, in the current context of fishing, where sharply declining conditions and the results of fishery resource exploitation are well-known, one cannot but note that the introduction of effective government regulations is subordinate to public sector investment in the private sector.

Government measures could involve incentives to encourage fishermen to leave the sector (capacity reduction plan) and the creation of income-generating activities outside the fishery sector which would channel inputs to other production sectors.

Incentives could also be directed toward institutional support, especially for those institutions capable of promoting the new control mechanisms or those able to help remedy the lack of knowledge, bring the players up to the necessary levels (training and consultation) and improve the dissemination of information prior to the reforms being adopted and the players support obtained.

Investing in the reform of the regulatory systems with donor support also prompts questions as to which type of institutional framework is most suited to monitoring that commitment. Now, there is often a danger of confusing the institutional plans designed to ensure that the sector’s regulatory systems remain effective in the long term with institutional plans for monitoring support programmes whose main aim is to rehabilitate the fishing sector.

In the case of the former, ways must be found to delegate and transfer authority to the private sector whereas, for the latter, there is a natural tendency to aim at the top of the public institutional pyramid when assigning responsibility, even if the involvement of private players is increasingly appreciated by all the donors (World Bank, ADB, BADEA, bilateral co-operation, etc.).

Confusion between these programmes and management system reforms tends to cause friction between the institutions on these matters and on the responsibilities assigned to them. They also experience some difficulty in adjusting to the new management conditions.

In order to cope with management reform and responsibility for access control, the configuration of the institutions must be clearly seen to be capable of generating new sectoral institutional plans, otherwise the result is likely to be fragmentation of responsibilities and a loss of funds, already considerably lacking in most situations.
2.2 Refocusing management objectives

Management objectives in the countries of the region, as in most of the countries of the world, are often confused with sectoral objectives which are, in fact, development objectives. Sometimes, they are even confused with public policy objectives which do not come under the regulatory powers of national public institutions with responsibility for fisheries. This is particularly true of current regulatory mechanisms which remain essentially regulatory.

Traditionally, public policy objectives coincide with specific interpretations of the concepts of resource conservation, production system rationalisation, the pursuit of well-being and social peace, often through the protection of the social structures in place. (A.T. Charles, 1992).

This does not prevent sectoral policy statements from including a random collection of objectives, including production growth, resource protection, increased added value, sustained employment, contribution to the trade and currency balance, and meeting food requirements. This is true of all the countries of the region.

Past management failures (given the state of fishery resources and economies) show that dissipation of resources is often attributable to the fact that objectives have often been contradictory and the public institutions have been incapable of prioritising them.

2.3 The need to break with the past

The contradictions are a sign of the difficulty experienced by sectoral public institutions in taking up a position which is in line with general policy aims. They also suggest the absence of a clear vision of the issues involved in public control and are the reason why it has not been possible to refocus and prioritise public measures. This is particularly true of the institutions dealing specifically with fisheries.

When we speak about raising living standards, improving the quality of life and social protection, we consider that the funding needed to achieve these objectives has to come from outside. However, just reducing the loss of value of the resources – not to mention stopping the dissipation of fishery income61 – would suffice to satisfy all or some of these expectations. Therefore, the managers are responsible for providing figures to show how loss of earnings could be offset by an access control policy. If they can show this, they will then be in a position to point to the real issue which should be at the heart of the public debate, i.e., how to share the benefits of management.

This question concerns:

- fishing rights’ beneficiaries (the holders of access rights under the terms of the new concession mechanisms);
- those players who have left the sector (to some extent the “short-term” victims of the reform who may be liable to compensation under capacity reduction plans); and
- finally, the population in general, whose interests must be protected by the public authorities.

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61 For economists, the fishery sector should be organised so as to maximise rent from the resource, i.e. the resource’s rent value or the amount that the State, as the virtual owner, could legitimately expect to receive from the allocation of access rights to exploit the resources. Preliminary estimates, as opposed to the more reliable ones obtained by means of bioeconomic models, can be done in most of the sub-region’s fisheries, but one cannot but note that only rarely do these estimates mobilise the public authorities into action. That may be taken as a first indicator of the need to explain the real benefits of use rights mechanisms. The logic behind aid schemes and support programmes often reinforce the view that external funding is required to meet the financial requirements for improving the living conditions of the people involved in fishing.
By tackling the public debate in two parts, the public authorities will help to clarify the fishery question. These two parts may be described as follows.

- Part 1 should be limited to the fisheries sector considered in the widest sense (taking into account questions such as biodiversity protection) and cover the technical side of fishery control; in other words, ways to meet the traditional objectives of sectoral sustainability (economic, social and bio-ecological).

- Part 2 should cover the people (fishermen, civil society and consumers) and deals with questions concerning the sharing of the products obtained as a result of rights allocation; in other words, revenue obtained from income earned from the resource.

### 2.4 Consulting and obtaining the support of the players

Management reform must not be systematically confused with the idea of institutional reform. On the contrary, it is desirable that existing institutions, albeit those which do not hinder the reforms due to their function, structure or role, should be maintained and adapted so as to ensure a certain institutional stability. This implies that a debate should be undertaken on the new functions of regulation and on the existing institutions’ new duties, following some adjustments (in terms of status, resources, operation and inter-institutional links).

Existing processes, including traditional, sound consultation processes and spontaneous local regulations associated with traditional fisheries (small-scale communities) must be used to lend support when extending the new regulations nation wide. This will be possible provided that the regulations are shown to be effective and to have met social requirements, even though they might not necessarily be incorporated in the fishery legislation in force. In following a bottom-up approach, going from local practices to national legislation, enhances the chances of the regulations being supported by the players. The opposite, i.e. the top-down approach, whereby regulations and draft legislation are passed down from the national level, in most cases has effects contrary to expectations (more lawless behaviour, a hardening of fishermen’s demands, a freeze in inter-institutional relations). This requires a survey of existing regulatory methods and institutions to be carried out and an objective status report on the regulations to be drawn up. An evaluation of the compatibility of the existing systems with the new rules of access must be made through joint discussions between the sector’s administrators and the fishermen.

These surveys of institutions and regulations must as far as possible be conducted within the framework of a consultation process which might highlight the need for training and information.

One way of obtaining the players’ support would be to introduce consultation procedures capable of doubling up as training, discussion and motivation sessions. This would require the involvement of all the fishermen and their families, and all the sector’s players (administrators, researchers, etc.). Coherent messages would also have to be sent out concerning management aims and methods with regard to resource access as opposed to an analysis of the current state of the sector. If the players are to support the new regulations, they must be told what to expect, i.e. the constraints as well as the short-term compensation and the medium and long-term gains. This means that experts, guaranteed to be objective, must be mobilised to deal with these matters. These could be community authorities, comprising local players and experts, or outside experts brought in to work alongside the sector’s own technical experts.

Consultation mechanisms must be brought in at the evaluation stages and continue until the new regulations are proposed. They must be seen as part of management’s day-to-day activities. This means that it must be made clear that consultation is an integral part of the institutional reforms and that as soon as the consultation committee has been put in place it must be given the means to operate adequately, otherwise it will soon become merely a protest group.
3. Establishing an access control policy for fishery resources

Before the operational side of the question of concession mechanisms can be dealt with, a transitional phase or plan will have to be put in place to assist the changeover from the systems in force to the systems based on access control. This culture change is too important not to be backed up by training.

It is equally important to recognise that these reforms must take place over a long enough period so that imbalances can be dealt with. The reforms must also be supported by a participatory process aimed at assisting institutional adjustment and must be backed by funding to offset short-term negative impacts. Other questions to be dealt with are the economic and social impact of overcapacity and over manning, the transfer of responsibilities, management costs, and the establishment of institutions to manage the mechanisms designed to control and monitor the transfer of rights and the updating of the legislation. It would be wise to assess the cost of all this and include it in the transition plan to rule out any idea of having long-term support measures.

This is a long drawn-out process and not a “quick-fix” legislative reform to make up for the current lack of access rights.

The adoption of access control mechanisms implies general consensus on the evaluation of the sector and its resources and close cooperation throughout the planning and implementation of the rights.

The adoption of access control mechanisms shows that the need for fisheries control in economic terms has been recognised. However, this does not mean that technical measures geared to the specific characteristics of the resources fished (protection for juveniles, breeding grounds and ecosystems in general) and certain macro-economic choices including non-use (protection for certain species and fishing grounds) are being challenged.

Controlling access to fisheries cannot be dealt with until other use values (tourism-related activities) and non-use values (existing values justifying the protection of certain marine species or certain complete ecosystems) are taken into consideration. This means ensuring that the rent-maximising objectives are consistent with the macroeconomic assessment of public regulations (Wilson, J. and J. Boncœur, 2000).

3.1 Useful definitions

The concept of access rights concessions relates to the general treatment of the question of contracts between the State (or its representative), in its capacity as the virtual owner of fishery resources, and the beneficiaries of the right of access to these resources.

The term right of access will be preferred when referring to the form of right acquired and the technical criteria applicable (e.g. territorial rights, quotas etc.). This distinction suggests that this matter goes beyond the technical definition of access rights. It also covers:

- their implementation and management within a more general public policy framework (role of economic incentives, taxation, tradeoffs between the components of a sustainable development policy); and

- the country’s political choices which influence sectoral choices (special types of delegation or
devolution of authority, the fishery sector’s place in the global economic and social development picture, social treatment of transition plans).  

By describing access rights concession mechanisms in these terms, we avoid any possible confusion with the management plan concept. A management plan provides options for all fisheries or specific options for some particular resources or fisheries. These objectives may require different forms of access rights provided that the idea of rights concessions is confirmed in national legislation.

It must be recalled that concession mechanisms are defined in terms of general principles, set out in the Act laying down the fisheries code. Management plans are a tool for implementing different types of access rights depending on the case. All access rights, however, must comply with the principles laid down in the Act.

Once these principles have been defined, there is then freedom of choice as regards support for the access rights (i.e. their definition criteria, such as quotas and areas), and the method used to implement them.

- A coordinated, blanket approach for all players and all fisheries, currently the situation in Senegal which can be explained by the structure of and history of its fishery sector.

- A coordinated approach by segment or fishery. This is the preferred approach in Mauritania and, to a lesser degree, Guinea, again due to the history and structure of the sectors. The dominant fisheries in Mauritania (cephalopods and shrimp) are relatively new activities which rely on a relatively new sectoral social fabric. On the other hand, Guinea’s national fisheries, also recently formed, do not appear as dominant economically and none is sufficiently significant to require a definitive solution to the access problem.

What is more, in each case, the true role of the licensing mechanisms is ambiguous, added to which there are obstacles blocking any policy change with regard to access control.

3.1.1 Specifications

The specifications are a major aspect of the technical task of defining access rights and a fundamental component of the concession principle: they set out the reciprocal contractual commitments between the State and the beneficiaries. The specifications must:

- be consistent with the State’s obligations with regard to international law, agreements and principles agreed to as part of a national liberal policy;
- explain to the beneficiaries practical ways to obtain these access rights, their limitations, authorised practices, penalties and conditions of transfer, withdrawal or reassigning of the rights which are part and parcel of fisheries control and must be complied with by fishing enterprises;

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62 These factors help us to understand that the most advanced situations in terms of the introduction of access rights and the adoption of economic regulations are to be found either in special national contexts where fishing plays a major economic role (e.g. Iceland), or where the fisheries, given their social, biological and territorial structure, are more likely than other sectors to promote more effective access control methods (e.g. Canadian crab fisheries and New Zealand’s red tuna fisheries). This should encourage a certain pragmatism when launching management plans since the principles for the granting of these rights are laid down in law.

63 A management plan is generally understood as a series of scheduled measures, aimed at achieving certain objectives in certain areas of interest or concern (economic, social, biological, political and commercial) relating to a series of factors and a group of designated players. Several plans can co-exist as they may concern different resources even though they relate to some extent to the same players. The management plan is also a way of implementing public measures which may involve private sector players through consultation and co-management mechanisms. A plan should, by its very nature, evolve to be able to include protection and forecasting activities. In the case of public measures, it should fulfil certain requirements (coherence, legitimacy, precaution and good governance) and meet certain objectives (fairness, sustainability and transparency).
be consistent with the other technical measures already in force, not least those effective enough to be retained in the long term;

take into account the need for caution and related measures, such as good governance, when drawing up the procedures for granting and managing these rights, so as to ensure the sustainability of the resources and related economic activities.

The technical work involved in planning the implementation of these access rights must aim to:

- ensure that the transition phase allowing the gradual changeover from current regulatory practices to the recommended concession system will take place and is politically, administratively, technically and socially acceptable and feasible;
- identify the market mechanisms that would gradually be able to play the role that certain technical measures are currently expected to play;
- deal with the questions of responsibility and the types of institutions best suited to handle the concession mechanisms concerned;
- encourage the State to control the concession mechanisms, especially their transfer (mediation and monitoring), either directly or through specialised institutions (gradual reforms linked to this particular aspect of transfer and monitoring of the exchange of rights is a sine qua non);
- ensure that the planned reform is comprehensive and in keeping with management principles which can be adopted within a relatively short time even though it must be borne in mind that a successful management process will take several years;
- define and promote a programme to monitor the initial results of the implementation of the concessions so as to allow the necessary adjustments to be made in order to improve the effects of practices endorsed nation-wide and amend, where appropriate, the level of responsibility transfer between local and national authorities. Some of these transfers depend largely on the success of the training and “institutional capacity strengthening” components which should provide support for the reform programme;
- define and adopt a timetable taking account of the need to make gradual progress with the types of concessions selected, e.g. quota mechanisms (fishing effort, catch capacities or catches);
- ensure that the proposed principles comply with general national legislation and are in keeping with the existing institutional context; and
- increase the chances of success of these mechanisms by:
  - defining each segment of fisheries exploitation,
  - taking account of the technical, social and economic situations underlying each fishing effort component and each fishing technique competing for the resources,
  - having a good understanding of the respective roles of each operator and his/her dynamics,
  - making clear which statutes and obligations relate to the concession principles,
  - being willing to take immediate steps to halt the trend toward overcapacity and increased fishing effort in areas already threatened by irreversible damage.

3.1.2 General concession principles

By general concession principles are meant those principles that will be laid down in the Act prescribing the marine fishing code, including the various types of access rights and the specific practical methods of allocation and transfer between the various fishery players.

These principles will have to:

- Be in keeping with the need for transparency and fairness and must be similar even if the beneficiary of the right may differ in legal and social terms (e.g. individual, vessel, company, group of individuals, association and territorial community). They must not be discriminatory
but, where appropriate, may include discriminatory payment conditions, e.g. for the case of foreign fleets benefiting from comparative advantages relating to subsidies;

- allow for a period of transition. The concession principles must therefore be compatible with all the tools in use at the present time (licences, permits or prior declaration);
- provide for effective and efficient fisheries control and, to this end, allow for the implementation of capacity and/or fishing effort adjustment policies for each of the fisheries concerned.

These elements are vital to ensure that the concession project has the best chance of being accepted. Consequently, it must not automatically replace the right allocation tools currently in place even if these have been shown to be of limited value. Consideration must be given to adjusting current licensing schemes and social regulations in some fishing or territorial communities.

In terms of these general principles, the following suggestions may be useful.

- The nature of the right must be perfectly in keeping with the law of the sea and with all the State’s crucial responsibilities. These remain non-transferable, as does the ownership of the resources which remains under State sovereignty.

- In legal terms, the right must relate to fishing alone (no exceptions are possible) and, if possible, cover recreational, experimental and other types of fishing.

- The duration and terms of these concessions must allow operators to have a time frame in keeping with that of the investments needed to carry out and develop their activity, and reduce their production costs, at the same time as giving the State, if necessary, the opportunity to make adjustments to the state of the resources.

- The principle of financial compensation should be considered.

- The concession principle should allow for the adoption, if required, of specific or general management plans.

3.1.3 Introducing access-control mechanisms

Before control mechanisms can be introduced, there must first be a policy decision to grant access rights, in compliance with international law and national legislation.

This decision implies adequate political strength and a clear policy statement rejecting open access for all uses of fishery resources, bearing in mind that all national and foreign players are potential candidates for access rights. Such a statement must:

- reflect the willingness to break with existing practices. In addition all players must understand: (i) the need to control access, and (ii) the terms of a public policy, based on participation;
- promote the mobilisation of the authorities with direct responsibility for the sector, but also the government authorities operating in the sector (research, supervision, funding, employment and health issues);
- help mobilise administrative authorities who will pass judgement on management results, i.e. are use conflicts still ongoing or have they been resolved, has the sector improved its level of contribution to the country’s general economic balance (financial, employment, social, trade and food security);
- lead to action aimed at bringing up to standard the administrative authorities (finance, fisheries, environment, employment and trade), the commercial fishermen, civil society, the NGOs involved
• in fisheries and the environment, as well as those helping to improve the coastal people’s living standards;
• be followed by constant communication efforts, supported by comprehensive sectoral, social and economic analyses, as well as by analyses of particularly vulnerable fisheries for which public action is required as a top priority. The aim of this is to raise the awareness of the players as to what to expect of the new regulations (preceded by a management plan);
• encourage the administrative authorities and the players to come to an agreement as to which institutions should define the tools needed to implement this access control policy (transition plan, management plan and capacity reduction plan). The institutions could be selected by means of nation-wide consultations or by a national committee or commission. Decisions arrived at will have to be consistent with the proposed tools and with the institutional context preferred by each State.

The proposed process must ensure the coherence and inter-relationship of the major elements of the reform of the existing regulatory system, which are:

• to break with the past, with the introduction of a transition plan;
• access control, with the definition of access right concessions;
• fisheries management, by working on management plans.

The first two elements mark the stages toward effective access control and will no longer be needed once the conceptual framework has changed (from open to controlled access) and once the concession conditions and principles have been defined, thereby allowing for many types of rights based on management plans. This three-pronged approach changes the conceptual framework whilst the choice of time and pace will depend on the context. The management policy then becomes a consultation process comprising continuous actions, strengthened by a monitoring protocol and an ability to adapt through management plans and in line with sustainable development policies.

3.2 The players’ perception (Cf. Appendix)

Player perception is a major factor to be considered and dealt with, if possible, before any general policy is put forward. This will strengthen the political position and ensure that the players participate in the preparation of the reform process.

A common and mature perception by all players of the question of access control and the need to take appropriate action will be the basis for a general policy and start the desired process.

Players’ support for the idea of reform is often strengthened by the authorities’ failure to come to grips with fraud and enforce existing regulations. This leads to a breakdown in relations between the fishermen and the administration and to policy decisions being taken without consultation (discretionary power). When this happens, the next step should be an attempt at reconciliation based on a general review of all existing systems.

Table 1 summarises fishermen’s organisations’ opinion of their country’s fishery system. It shows the differences in their perception of some access control concepts and of fisheries management in general. It also shows the subtle differences between the three countries studied (cf. Appendix).

3.3 Break with the past

It is important to point out that the State has acknowledged the need to break with past measures and, under its authority but in close consultation with all the players, must promote a change in players’ attitudes and relationships.
The break with the past must be characterised by the following:

i) a policy statement at a high institutional level;
ii) the promotion of a series of measures aimed at mobilising the players;
iii) the preparation and speedy implementation of a transition plan.

3.3.1 The policy statement

Generally speaking, even though the content of this statement depends largely on the degree of force the State wishes to give to this break and the pace at which it feels it can bring about the changes in the sector, it must be in line with the State’s general objectives and take account of its international commitments.

It must set out the objectives targeted in terms of improving fishery management generally and fishery’s contribution to national development. It is essential to prioritise the objectives, most of which are still incompatible: added value, trade balance, employment, exports and food security.

The statement should also cover subjects such as: increased fairness, improved transparency, the steps needed to increase the sustainability of fishing operations, the promotion of efforts to ensure good governance, applying the principle of prudence, etc., with a view to gaining the support of all the players for the reforms. All these questions relate, to some degree, to current public policy shortcomings with regard to fisheries.

The statement should also include the decision to introduce access rights concession mechanisms, thus clearly marking the break with open access. It should also express a willingness to promote this new policy through close, continuous consultation with all the players with an interest in the future of fishery operations (usage or non-usage). Finally, it should specify the procedure for designating the authorities responsible for the implementation of the policy (ministry, inter-ministerial group, administrative department, committee, commission and agency).

3.3.2 Mobilising the support of the players

This will involve several stages, including raising the awareness of government departments and explaining the decision to break with the past to these departments as well as to private players and institutions with an interest in the future of fishery resources.

Specific measures must be promoted in order to speed up this process:

- sectoral assessments (economic, social, biological and technical);
- an assessment of the existing regulatory system;
- an institutional assessment;
- training for players involved in fishery control (administrators, fishermen, NGOs, and politicians);
- definition of management objectives and costs;
- consultation and discussion days must be held in an effort to encourage the players to exchange information;
- awareness-raising for all members of civil society and those communities deprived of traditional means of communication (radio, press, NGO newspapers, professional newspapers, television programmes, round table discussions in the field with local players and discussions in schools);
- an assessment of the need for these measures and the provision of facilities for communication and training and participation (through external funds or public funds from tax receipts or fishing agreements).
3.3.3 Transition plan

The transition plan must include emergency measures to deal with the sector’s deterioration, including:

- immediate implementation of measures such as a freeze on licences and registrations, ensuring that fleets’ comply with the law governing national flags, action (in consultation with the players) to deal with illegal fishing, such as the use of prohibited gear or techniques and fishing in protected areas (withdrawal of fishing rights, seizure of fishing vessels and fishing gear);

- a social and technical report on the movement of persons and equipment which influence fishery dynamics, in an effort to promote rational, long-term management of these movements: traditional migration, natural entries into and exits from the fishery (fishermen’s age pyramid), renewal of fishing equipment and vessels (census of vessels, capital flows, analysis of positive and negative financial incentives);

- review of income-generating replacement activities and ways to promote them through local participatory schemes;

- review of recruitment conditions in fisheries: work contract, social insurance, and work done by children.

The transition plan must assess and seek ways of implementing and providing compensation for the measures provided for under the plan (freeze, followed by reduction of fishing capacity, freeze, followed by reduction of fishing effort). It must be supported by the institutions responsible for identifying ways of discouraging new entrants and encouraging existing fishermen to leave the sector, as well as methods of compensation or aid for the redeployment of fishermen and the conversion of fishing vessels. The transition plan may require a provisional institution to be specially set up to manage it from its establishment to its implementation and evaluation. Where appropriate, this institution could then be wound up and the subsequent phases of preparation and introduction of management plans undertaken by long-established institutions with experience in these areas. The transition plan must have a fixed time-frame and be compatible with the various fishery sector components. It must tie in with the preparatory phases of work on the access control measures and with work on the management plans.

3.4 Defining access control

Lack of adequate across-the-board control of access to fishery resources results in individual appropriation of access. The rights which formalise access control and, thus, the end of the concept of open access are intended to put an end to inefficient management – inefficiency reflected in the continuous challenging of the types of individual appropriation which benefit private players bent on continuing the race-to-fish. The main aim of access control is to make fisheries control effective which, in theory, is a first step towards responsible fishing.

Access control involves the following phases:

i) discussion and selection of the criteria for defining access rights, once the institution in charge of leading the work on the concessions has been activated;

ii) definition of the types of applicable rights based on their aptitude to allow current conditions and practices to evolve;

iii) drawing up of the specifications to accompany the access rights.

Institutional requirements, the form of the institutions and the links between them could also be defined at the same time as work is being done on the various types of rights and the specifications.
If the approach to the institutions is pragmatic and non-coercive, the legal supports and the expression of obligations which accompanies them would allow institutional planning to take place in a spirit of continuity and social stability. The aim should be to retain and adapt existing institutions rather than create new ones.

3.4.1 Choosing the criteria for defining access rights

Access rights may be described as regulatory tools relating to fishing area, fishery resources or fishing effort and capacity. These tools most often take the form of quotas or territorial and/or time limits, with certain fishing practices prohibited or restricted for given periods.

Once the institution in charge of preparing rights concession mechanisms (usually a working group, a committee or an ad hoc commission) is activated, the criteria will be defined following a series of discussions with all the stakeholders (fishermen, other nature users or protectors, administrators and scientists).

These discussions will provide information and knowledge about what can be achieved through access control mechanisms (in theoretical and practical terms). They will focus on current commercial fishing practices and on the aims and practices involved in resource protection and use, as well as on other recreational or commercial activities (tourism, sport fishing and nature protection).

The main aim of these discussions will be to take account of players’ proposals, provided that they meet the control objectives, and to encourage the players to support those objectives by making them aware of their responsibilities in the context of the reforms and the change of direction.

The group will have to be prepared to listen to the proposals of as many players as possible and to examine their advantages and disadvantages. Translators will have to be available to translate the languages of the players present. This would be essential for their participation in the discussions. The translations of the players’ proposals must be accurate and show how these are related to the theoretical concepts of rent, effort, access, capacity, quotas, access rights, control and technical measures. On-site meetings are also an effective way of increasing the chances of gaining the players’ support and directly providing them with information on the aims of the planned reforms. Such meetings must be planned and managed with due respect for the national and local fishermen’s representatives and the people’s representatives operating at territorial or community level.

Discussions should be based on criteria relating to the various types of access rights. These criteria will take into account players’ views on fishing areas, resources, fishing gear and capacity and effort. The discussions will encourage everyone involved in fisheries to express their opinions: players, administrators, scientists, civil society players and those representing other commercial uses.

The persons in charge of leading the discussions will have to try to explain the policies that may be adopted for each of the criteria to ensure that the access right system chosen coincides with what was discussed and that each and everyone understands the scope and limitations of each individual criterion.

It is important that all the proposals put forward by the players during the discussions are taken into account. In fact, these often involve adapting existing practices rather than radically reforming the regulations. This is why these proposals should be discussed with the players to ensure that they understand their limitations, i.e. the external constraints on the group concerned (the perception of the scale of the problem) or the difficulties in terms of implementation.

Typical examples in this regard concern criteria aimed at reducing fishing pressure by having fishermen leave the sector. The most undesirable people in fisheries are traditional, non-fishing investors (administrators who have invested in pirogues), and fishermen who use prohibited gear. When dealing with situations such as these, the players rarely go so far as to suggest that these fishermen should leave the sector or that fishing vessels should be decommissioned. They simply recommend a change of vessel
(capital) or a change of fishing gear. It is important to show that this resolves neither the fishermen’s problem nor the overfishing problem which, at best, remains unchanged. At worst (and this is usually what happens) this solution only serves to increase the pressure on segments of the fishing sector already under great stress.

The situation is similar in the case of proposals for dealing with migration. Migratory movements which are part and parcel of their traditional way of life are not condemned by the fishermen; on the contrary, they seem to think that regulatory measures should not apply to these migrants, whereas recent international migration, even if legal in terms of international agreements signed by the governments, are condemned out of hand.

All these contradictions and constraints concerning access control must be taken into consideration when choosing a system of shared access rights. Basically, rather than taking a purely technical approach to access control (selecting the most effective tool) what is needed is an approach which tackles the question of access control from both the technical and political angles and is based on a fair distribution of rights.

3.5 The question of area

The territorial criterion already exists under international law (demarcation of exclusive economic zones) and national regulations aimed at protecting areas reserved exclusively for small-scale fishing or set aside for nature reserves (protected marine parks and areas).

Zoning may also be used as part of measures aimed at protecting endangered species or the species’ biological phases (breeding grounds and nurseries).

Apart from EEZs, other spatial demarcations do not involve a transfer of responsibilities with regard to surveillance, monitoring, resource evaluation and access control.

Some management responsibilities can be transferred to local fishing and/or territorial communities, provided that this is not in contradiction with local social or professional practices.

However, at the present time this is the exception rather than the rule. Responsibility for some regulations has been taken over by territorial authorities in some cases, making it possible for these authorities to point the finger at the shortcomings of government departments, not least with regard to the settlement of conflicts, the implementation of certain regulations, the monitoring of certain resources, the provision of empirical knowledge and market regulation.

The legislation prescribing the territorial divisions requires the State, *inter alia*, to take on the duties of surveillance which are known to be difficult at the present time due to excessive pressure being exerted on the resources and on surveillance facilities (pirate vessels in the EEZ, industrial vessels in areas reserved for small-scale fishing and the migration of small-scale fishermen).

This clearly shows that, given the insufficient means available to them, State services are rarely able to ensure compliance with the apportionment of the seas.

National zoning brings with it international obligations. The most advanced country in terms of regulations imposes rules and regulations on neighbouring countries based on the need to protect its fishermen and the principle of fairness with regard to compliance with the regulations. So, Senegalese fishermen must pay to fish outside of their national waters, whereas access to their country’s EEZ remains free of charge.

In the case of fragmented fisheries involving a large number of mobile fishermen, there is often a willingness to place a maritime area under the supervision of a terrestrial area, based on that terrestrial area’s capacity to self-monitor activities on the sea area. This has already been done in Senegal and,
during a period of conflict, Mauritania’s professional small-scale fishery organisations expressed the wish to privatise surveillance facilities.

But a land area cannot systematically be placed under the supervision of a territorial community (commune, department or region) for, sometimes, the communes are too close to each other and fishermen’s mobility makes it impossible to decide which land area should take charge of supervision of any given sea area. In this scenario, the land area could comprise a group of communes or territorial communities or a landing point (when the coastline is relatively undeveloped and sparsely populated, as is the case on the Mauritanian coast and for isolated landing points in other countries).

However, in this region, area cannot be the only criterion for defining rights. This should be considered in conjunction with other criteria which take into account resources, fishing gear and maritime populations.

### 3.6 Taking fishery resources into account

The diversity of exploitable and exploited resources in West African fisheries, as in most, but not all tropical fisheries, is the reason why scientists and managers show a clear preference for fishing effort control measures.

In view of this, measures designed to directly control catches of target species are totally ignored and often considered unenforceable in this context (without serious evaluation being made). This is the situation even though we know that fishermen focus their fishing effort (fishing capacity, geographical location, choice of fishing techniques) on certain target species (octopus, shrimp, hake and some other coastal demersal species) despite the diversity of potentially exploitable resources.

The choice of species also determines the many technical measures pertaining to the types of gear and fishing vessels. In addition, regulatory measures are adopted by the fishing communities (self-regulatory measures covering fishing time, the number of fishing trips and catch quotas for endangered or temporarily undervalued species). Often, the number of these species targeted by small-scale fisheries is fewer than five and industrial fisheries target fewer still.

The monitoring and control of landings have often seemed to be necessary measures to meet the need to control market supply in times of accidents or crises, e.g. when prices for catches have appeared to be too low.

Despite the fact that fishing vessels are widely dispersed (this is particularly true in small-scale fisheries), bottlenecks occur in the marketing channels (especially where exports are concerned) and these could be good points at which to carry out quota checks. These channels could be used to introduce catch control mechanisms for resources for which scientists have recommended limits (between $x$ and $y$ tonnes for species such as octopus, or a small batch of coastal demersal species or shrimp). Quota mechanisms could be based on relative and not absolute values in the case of species subject to wide variations or in danger of depletion.

These mechanisms could subsequently be taken over by local authorities which have already shown themselves capable of regulating catches (past reactions to short-term market decline at small-scale fishery landing sites or through professional industrial fishing organisations).

The current refusal to use catch quota mechanisms cannot be justified given the failure of direct and indirect measures to control fishing effort.

It is well worth taking account of the resources in the following cases: a resource isolated from the others, a group of species which form a “pertinent” group, part of a shared stock (in the EEZ or internationally), part of a biological population (an exploitable population in terms of area and gear).
These resources must also be considered in terms of their current level of exploitation: over-exploited, threatened with over-exploitation, etc.

3.7 Taking fishing gear, fishing capacity and fishing effort into account

In situations where overcapacity is the problem, as in the countries under review here, commercial fishermen usually stress the importance of reporting incidents involving the use of illegal fishing gear. In their opinion, this could be a good reason for withdrawing fishing rights and might even win immediate support for a capacity reduction plan.

As we have already seen, the priority attached to this aspect reflects their preference (conscious or unconscious) for regulations which remain within the framework of the existing system and for simply applying the rules in force (national flag rights, illegal gear and practices). This would rule out any need to recommend system reform despite the fact that it is impossible to operate within the old system, but it also rules out the need to take direct responsibility for implementing emergency measures to reduce fishing capacity and effort. Given this attitude, the responsibility to ensure that the measures are complied with should lie with the State and its departments.

This is a common situation in all three countries. It reflects the players’ reluctance to take steps to control effort and capacity. Also, in their view, social measures are needed if fishers are going to have to give up fishing.

Whilst the fishermen have no objection to non-traditional fishermen and non-resident fishermen (i.e. new migrants) being excluded, they refuse to accept that illegal fishing by traditional fishermen should result in their being forced out.

This is why the participatory process is so important in that it allows the players to be gradually involved in dealing with overcapacity and/or the reduction of fishing effort. It is also important to note that fishing effort and fishing capacity are still very abstract concepts for the fishermen to absorb. Also, being difficult to quantify, they pose many problems. Explaining and describing the concepts in a language that is familiar to fishermen and managers alike should help to achieve a consensus as to the action to be taken and the responsibilities to be shared.

By setting out spatial considerations in parallel with considerations about resources, fishing gear, and fishing capacity and effort, it should be possible to make it easier to adopt one form of regulation or another and, in time, shape the institutions which go hand in hand with these types of rights concessions.

3.8 Defining the types of access rights

The types of access rights selected will be based on closely related to the results of discussions on the criteria mentioned previously and on the evaluations carried out during the preparation of the transition plans, including those on existing regulatory mechanisms, on the financial and technical situation of the fishing enterprises and on the status of the resources.

In theory, the available regulatory options are common to all fisheries and apply to:

- fishing effort or capacity; and
- catches

The trend is toward right-based options, i.e. away from administrative regulations (most of the current situations in the region) to economic regulations, in other words:

- from non-transferable licences to transferable licences ;
- from non-transferable individual quotas to transferable individual quotas.
Other incentive-based (positive or negative) economic control mechanisms may also be applied to effort and catches. These would take the form of taxes or subsidies on inputs and/or production. The range of these incentives is potentially very wide and may allow precise targeting in terms of management objective (size, species, market, exports, techniques, gear, periods, catch areas, fishing vessel and player status). This range of incentives could strengthen the technical measures.

Discussions on these various available options should remove any preconceptions which might prevent changes being made to the existing system, often in spite of the failures encountered. Discussions should also allow separate treatment of matters relating to the choice of quota type, i.e. effort or catch, before considering the method of control of that variable, with priority given to economic regulation. The discussions should be based on theoretical demonstrations of the pros and cons of the various systems. Reference to situations elsewhere, where systems of the type recommended already exist, could be a useful way of educating the players.

The advantages of the rights chosen must be pointed out and systematically highlighted during the discussions between players (transparency, fairness, sustainability, care, flexibility and adaptability), so that they can appreciate the feasibility of introducing the types of rights recommended.

Several types of rights can exist side by side so long as the fisheries are sufficiently segmented and independent of each other. This must also be borne in mind so as not to block a reform process which can take place gradually, based on species or type of fishery, and controlled by individual quotas. The players cannot envisage this solution for the time being due to the current structure of the sector and the current level of knowledge.

3.9 Drawing up the specifications

The technical work on the specifications will be closely related to the types of rights chosen and the existing overall institutional framework extending from the State to the potential beneficiary of the access right. The same type of right could be held by different holders.

For example, we could consider allocating individual quotas for industrial fishing, whilst small-scale fisheries for the same species could, in the initial stages, retain their group or community rights (professional, ethnic or territorial group). Local or community regulations could ensure that these vessels do not indulge in fish chasing.

The specifications closely relate to the types of rights and the institutions involved in their allocation, monitoring and transfer. Questions to be dealt with in terms of specifications are:

- To whom should the fishermen’s specifications be issued: to the fishing vessel, the skipper or the vessel owner?
- Should there be specifications for the institutions managing the rights and, if so, what form should they take and how will they guarantee control and validation (professional group commitment or State responsibility)?

64 There will be several specifications – for the institutions to which the rights have been allocated, the institutions managing the rights and the potential beneficiaries of the rights. The specifications shall cover the specific obligations and rights of each of these parties and include community fishing draft agreements, signed by each of the countries. These lay down the obligations of the access right holders and also define the acquired right, its duration, the penalties that may be applied in the event of illegal conduct by the beneficiaries and the appeal procedures that may be taken in the case of legal proceedings being brought. This is what is understood by specifications here. The example of draft fishing agreements with the EU also show that the right may be given through supervision institutions acting as intermediaries between the signatory African State and the vessel-owner or the European vessel, holder of the access right (Commission and Member States).
• Should a code of conduct covering all existing rights be issued separately from the specifications so as not to confuse expectations?

• Precisely what should the specifications contain and how should they be applied and how should their application be monitored?

There should be a minimum of two types of specifications.

• One concerning the State as part of its commitments to professional or other separate institutions, each dealing with a different type of fishery or fishing ground: small-scale, national industrial and foreign industrial, coastal strip, protected marine areas, man-made reefs, etc. These specifications relate to the following linkages:
  A. State linked to Commercial fishermen’s institutions (fishermen’s organisations, federation, trade union, association, etc.)
  B. State linked to Territorial institutions (commune, region, association of communes, nature park, marine areas, and various territorial groupings)
  C. State linked to Hybrid institutions (State + professional fishermen, + civil society + NGO)

• Another concerning private players (status to be specified according to whether the right applies to the vessel, the owner or the fishermen) and the interface institutions.

Whatever the type of institution directly in contact with the State (State here means an institution or department representing it), i.e. an A, B or C type linkage, the part of the specifications applying to the State will include standard obligations which are the responsibility of government, such as:

- compliance with international agreements;
- compliance with the State’s crucial responsibilities which are non-transferable and cannot be delegated;
- compliance with specific objectives relating to the future of the natural resources (such as protection and sustainable exploitation).

Type A, B and C linkages can each apply separately (A or B or C) to the fishery resources authorised for exploitation.

However, a type C institution may have to be established first (an institution set up specifically to manage the concessions, e.g. an advisory bureau or agency), prior to setting up option A or B, or A and B, i.e. one or more professional or territorial institutions.

Preference may be given to other solutions. For example, the State may transfer limited authority to a territorial institution to grant the rights to professional institutions. This could occur in small-scale fisheries and could be done through a decentralisation or devolution mechanism whereby powers held by the State can be delegated.

An example of this could be the appointment of a Council for natural resources with a say in the granting of concessions to professional or territorial institutions or other types of hybrid institutions (e.g. local council or maritime chamber).

Other solutions may also exist alongside those mentioned here. This would not make any significant difference to the specifications. A simple transfer of responsibilities to a State-recognised institution is all that would be needed.
In the event of the appointment of a Council (a hybrid institution) or other “lead” institution (in a pyramidal organisation), the specifications will have to list the State obligations transferred to that institution.

For the players downstream of this institutional link who are affected by the concessions (i.e. small-scale or industrial fishermen and other players such as wholesale fish traders and vessel-owners), the specifications will not make reference to the authority to which they should refer in order to obtain, transfer, or renew their access right.

These players will be concession holders through their occupational status (skipper, vessel owner, fisherman or share-holder), civil status (member of a nature protection association or resident of a given commune) or civil and occupational status. This will depend on the choice having been made beforehand between A, B or C.

In the case of a hybrid institution (type C), either the representatives of the territorial rights will work in the hybrid institution alongside the representatives of the commercial fishermen, or type A and/or C links will exist simultaneously. It is the aim or nature of the concession (area protection, physical management of a fishing area, area closed to fishing, area reserved for a given small-scale or industrial segment) that will determine the linkages.

4. CONCLUSION

Some countries take direct action under management plans as soon as any mono-specific fisheries are in need of urgent action. This is a good basis for developing a public initiative in conjunction with operators who are clearly and willingly involved in the reform process. This is the case in Mauritania and Morocco for octopus fisheries and in Madagascar for shrimp fisheries. It must be noted that the management process requires that questions relating to transition and access control be dealt with during the management plan preparation stage. The risk involved in direct action based on management plans is that access control under a plan may not deal radically and exhaustively enough with all the segments likely to be involved in a management plan at any given time.

The logical procedure presented here is not compulsory. Management plans have been prepared without going through stages proposed here. However, it is important to note that all or part of these stages will have to be dealt with (in part) in the management plans and this partial treatment may result in failure, as operators currently not involved in the plan and feeling that they are not explicitly concerned in the access reform process may, in the future, be encouraged to claim a special right of access to the resources covered by the plans.

Once the types of access right potentially usable in the context of fisheries management have been defined, the technical work may be organised in the following stages:

- define the fisheries on which action is to be taken and the objectives to be reached through management in line with national and sectoral development objectives;
- define and put into operation the body in charge of drawing up the management plan (comprising a variety of players and institutions);
- draw up a timetable and a method of work based on available knowledge and reports to be prepared before any action is taken.

At this stage, the work involves coordinating access control and technical measures and drawing up the management plans under which the regulations will gradually be introduced and the supervisory institutions will carry out their duties. The plans will set out the priorities and how they will be achieved. A management plan, like access right concessions, must be based on some key principles,
including: forward planning, prudence, comprehensiveness, pertinence, good governance, sustainability, continuity, adaptability, environmental protection.

\[65\] These principles are set out in the paper concerning the octopus fisheries management plan for Mauritania (Cunningham, May 2002).
Access control is not seen in the same way in all three countries. Mauritania and Senegal have similar views. For them it is a means of controlling industrial and small-scale fishing vessel numbers and sharing what is perceived as a limited resource. Guinea-Conakry is more concerned with giving its nationals access to the resources rather than with controlling access.

Almost all the players in all three countries stress the importance of good governance and awareness raising as essential elements for the success of any access control policy. The meaning of these concepts varies depending on the players and the country concerned. Some players stress the need to be transparent, to clearly identify the responsibilities of each body, to have a coherent policy and a participatory approach. Generally speaking, all the countries recognise that the bodies involved must be well-established. The fundamental difference between players and countries on this point is the degree of doubt cast by the players about the maturity of their own institution.

Another important factor is the differing views of players in a single country. The differences are greater in some countries than in others, but in all three there are differing views between institutions, between members of a given institution or between representatives of associations and their members. If we are to have a shared view of problems in order to be able to share the solutions, as stressed by several players in Senegal and Mauritania, communication and awareness raising requirements have to be identified.
Table 1: Summary of interviews with fishery players carried out in summer 2003

<table>
<thead>
<tr>
<th>Topics</th>
<th>Mauritania</th>
<th>Senegal</th>
<th>Republic of Guinea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key concepts</td>
<td>Sustainable balance between resources and exploitation</td>
<td>Balance between resources and enterprise viability</td>
<td>Provision of funding in order to access fishery resources</td>
</tr>
<tr>
<td></td>
<td>Equitable resource redistribution</td>
<td>Resource to be shared when exploitation can no longer be stepped up</td>
<td>Sharing of fishing grounds among different fisheries</td>
</tr>
<tr>
<td></td>
<td>Future generations</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Reduction of fishing effort</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical matters</td>
<td>Improved control</td>
<td>Improved monitoring</td>
<td>Improved monitoring and application of penalties</td>
</tr>
<tr>
<td></td>
<td>Fishing ban</td>
<td>Freeze on issue of licences</td>
<td>Provision of credits for the purchase of inputs</td>
</tr>
<tr>
<td></td>
<td>Licences with <em>numerus clausus</em></td>
<td>Fishing rights concession (territory, catch, capacity)</td>
<td>Development of port infrastructure</td>
</tr>
<tr>
<td></td>
<td>Quotas by vessel and by fishing ground</td>
<td>Registration of pirogues</td>
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<td></td>
<td>Dissuasive taxation (indirect methods)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Registration of pirogues</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Minimum safety conditions/pirogues (indirect methods)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other key considerations</td>
<td>Common understanding of problems</td>
<td>Common understanding of problems</td>
<td>Need for better governance: problem of responsibility, participation,</td>
</tr>
<tr>
<td></td>
<td>Best time for implementation</td>
<td>Best time for implementation</td>
<td>transparency, coherence, and competition for power</td>
</tr>
<tr>
<td></td>
<td>Small-scale fishing = social sector</td>
<td>Good governance: transparency, fairness, participation, responsibility, coherence, awareness raising/communication</td>
<td>Small-scale fishing = social sector and provides a living for local population</td>
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<tr>
<td>Topics</td>
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<td>Senegal</td>
<td>Republic of Guinea</td>
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<tr>
<td>Key concepts</td>
<td>Long-term future of the resources</td>
<td>Reducing fishing effort by controlling access to small-scale and industrial fisheries</td>
<td>Economic and social issues</td>
</tr>
<tr>
<td></td>
<td>Future generations</td>
<td>Responsible fishing</td>
<td></td>
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<tr>
<td></td>
<td>Preserving the ecosystem</td>
<td>Balancing open access and selective privatisation</td>
<td></td>
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<tr>
<td>Technical matters</td>
<td>Registration of pirogues</td>
<td>Registration of pirogues</td>
<td>Licences (industrial fisheries)</td>
</tr>
<tr>
<td></td>
<td>Zoning (industrial fishing/small-scale fishing/intra-zone small-scale</td>
<td>Minimum safety conditions/pirogues (indirect methods)</td>
<td>Quotas / on-board observer</td>
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<tr>
<td></td>
<td>fishing)</td>
<td>Satellite surveillance under way (industrial fishing)</td>
<td>Zoning (industrial fishing/small-scale fishing)</td>
</tr>
<tr>
<td></td>
<td>Land-based monitoring</td>
<td>Strengthening of monitoring facilities at sea</td>
<td>Satellite surveillance (in the pipeline)</td>
</tr>
<tr>
<td>Other key considerations</td>
<td>Improved inter-institutional relations</td>
<td>Transboundary small-scale activity Bilateral and subregional cooperation</td>
<td>Small-scale fishing = social sector</td>
</tr>
<tr>
<td></td>
<td>Importance of good collaboration</td>
<td>Common understanding of problems</td>
<td>Operational difficulties with regard to zoning control</td>
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<td></td>
<td></td>
<td>Awareness of short and long-term economic issues</td>
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<tr>
<td></td>
<td></td>
<td>Good governance: Agencies involved must be well-established, responsibility</td>
<td></td>
</tr>
</tbody>
</table>

**Part 2 Table 1: Points of view of the authorities responsible for surveillance and control**

<table>
<thead>
<tr>
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<th>Senegal</th>
<th>Republic of Guinea</th>
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</thead>
<tbody>
<tr>
<td>Key concepts</td>
<td>Provide pertinent data for decision-making</td>
<td>Provide technical data for decision-making</td>
<td>Rational and sustainable fisheries management</td>
</tr>
<tr>
<td></td>
<td>Improve readability and programming in step with the requirements of the</td>
<td>Communication / Awareness-raising</td>
<td>Provide advice based on reliable recent data</td>
</tr>
<tr>
<td></td>
<td>administrators and professionals</td>
<td>Alarm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interface between Profession and Administration</td>
<td>Broker between authorities and professionals?</td>
</tr>
<tr>
<td>Other key considerations</td>
<td>Good governance : inter-institutional relations and rigour within each</td>
<td>Common view of problems and of the state of the situation</td>
<td>Sounding alarm/resource</td>
</tr>
<tr>
<td></td>
<td>institution</td>
<td>Good governance : participatory approach, bodies involved long-established, responsible organisation of professionals</td>
<td></td>
</tr>
</tbody>
</table>

**Part 3 Table 1: Points of view of players involved in public research**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Mauritania</th>
<th>Senegal</th>
<th>Republic of Guinea</th>
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</thead>
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<tr>
<td>Key concepts</td>
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<tr>
<td>Other key considerations</td>
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<tr>
<td>Topics</td>
<td>Mauritania</td>
<td>Senegal</td>
<td>Republic of Guinea</td>
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<tr>
<td>Key concepts</td>
<td>Responsible fishing</td>
<td>Adjust effort to the resource</td>
<td>Ministry</td>
</tr>
<tr>
<td></td>
<td>Prudent approach</td>
<td>Need for access control (industrial and small-scale)</td>
<td>Fishing sustainability</td>
</tr>
<tr>
<td></td>
<td>International commitments</td>
<td>International agreements</td>
<td>Rational use</td>
</tr>
<tr>
<td></td>
<td>Balancing resources and profit (jobs, currencies, tax receipts)</td>
<td>Reconciling public and private interests</td>
<td>Extraction of added value</td>
</tr>
<tr>
<td></td>
<td>Balancing resources and fishing effort</td>
<td>Reducing conflicts</td>
<td>Fleet development</td>
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<td></td>
<td></td>
<td></td>
<td>Conflict reduction in industrial/small-scale sectors</td>
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<tr>
<td>Technical matters</td>
<td>Management plan</td>
<td>Surveillance/ control</td>
<td>Zoning</td>
</tr>
<tr>
<td></td>
<td>Surveillance/ control</td>
<td>Management plan</td>
<td>Fishing agreements</td>
</tr>
<tr>
<td></td>
<td>Access rights (small-scale and industrial fishing)</td>
<td>Licences</td>
<td>Reorganisation of national fisheries exploitation</td>
</tr>
<tr>
<td></td>
<td>Registration Licence (+licence /small-scale fishing zone)</td>
<td>Access right concession</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zoning (industrial/small-scale and intra-zone small-scale fishing)</td>
<td>Zoning of small-scale zone</td>
<td>Industrial licence</td>
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<tr>
<td></td>
<td>Port infrastructure / land-based control</td>
<td></td>
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</tr>
<tr>
<td>Other key considerations</td>
<td>Consensus on general state</td>
<td>Common understanding of problems</td>
<td>Communication / control</td>
</tr>
<tr>
<td></td>
<td>Awareness-raising / Training</td>
<td>Consensus on the need to take action</td>
<td>Good governance: Involvement of well-established bodies</td>
</tr>
<tr>
<td></td>
<td>Communication / Training</td>
<td>Awareness-raising / Training</td>
<td>Small-scale fishing = social sector</td>
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<tr>
<td></td>
<td>Awareness of short/long-term economic issues</td>
<td>Communication / Training</td>
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<tr>
<td></td>
<td>Best time for implementation</td>
<td>Good governance: institutional reform</td>
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<tr>
<td></td>
<td>Good governance: transparency, separation of duties, participation, responsibility, coherence, well-established bodies</td>
<td>Good governance: consultation, making people aware of their responsibilities, interaction mechanisms, transparency, fairness, decentralisation, coherence (reconversion)</td>
<td></td>
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<tr>
<td></td>
<td>Internal organisation: communication, coherence</td>
<td>Small-scale fishing = social sector</td>
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<tr>
<td></td>
<td>Small-scale fishing = social sector</td>
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</tr>
</tbody>
</table>

Part 4 Table 1: Points of view of officials in the fishery departments and ministries
REFERENCES


DISCUSSION PAPER 7

CAPACITY MANAGEMENT AND SUSTAINABLE FISHERIES: INTERNATIONAL EXPERIENCES

by

Sean Pascoe and Dominique Gréboval

Summary

This paper addresses the progress to date of the implementation of the FAO International Plan of Action for the Management of Fishing Capacity. The plan calls for assessment of overcapacity and for taking steps to manage capacity and to reduce it when required – both sustainably and in a way that does not adversely affect other national or international fisheries. Main issues faced in implementation are reviewed – including institutional deficiencies – and paths to solution are proposed in relation to national and international fisheries. The core issues are discussed in relation to access to all fisheries, to rights and to financial incentives/disincentives. Key institutional and policy implications are also analyzed, especially with respect to establishing management partnerships with stakeholders (building consensus and trust for effective co-management with few players (industrial fisheries) and a larger number of players (small scale commercial and recreational fisheries) or few collaborating States (in the context of Regional Fisheries Management Organizations).

1. INTRODUCTION

Overexploitation and the unsustainability of fisheries is a major international concern. Recently, considerable attention has been paid to illegal, unregulated and unreported (IUU) fishing and its effect on the world stocks – especially on the high seas. While this is a significant problem, much of the fishing activity that contributes to overexploitation (unhealthy stocks and/or economic waste) occurs in waters that can be controlled, either through the introduction of effective management, or the enforcement of existing management.

The focus of this workshop is on factors that contribute to unsustainability and overexploitation in fisheries. A critical factor identified in previous workshops is the existence of excessive fishing capacity, resulting in unsustainable harvest rates (Gréboval, 2002; Swan and Gréboval, 2004). Indeed, both FAO (1997) and Mace (1997) identified overcapacity as the single key problem afflicting marine capture fisheries resources. However, excess fishing capacity is not a factor affecting unsustainability per se, as it is the consequence of the set of economic incentives that result in both overcapacity and unsustainability. Therefore, it is the visible face of overexploitation.

As will be shown later in this paper, the existence of excess capacity does not necessarily result in unsustainability, but does lead to lower production levels than might be achieved, and also a reduction, if not total dissipation, of the economic benefits that may be generated from a fishery. However, overcapacity can also result in stock depletion, and unless capacity is effectively controlled, there exists the potential for unsustainable levels of fishing effort to be developed and exerted.

Capacity management is generally concerned with the explicit control of the level of capital employed in the fishery, unlike effort control which is also concerned with the utilization of this capital on targeted stocks. Cunningham and Gréboval (2001) define capacity management as the implementation of a range

66 The views expressed in this paper are solely those of the authors.

67 For the purposes of simplicity, the terms ‘excess capacity’ and ‘overcapacity’ will be used interchangeably. Pascoe et al (2003) differentiate the terms, with the former relating the actual to potential catch relative to the short run catch-effort relationship, while the latter relates the actual catch relative to the long run catch-effort relationship.
of policies and technical measures aimed at ensuring a desired balance between fixed fishing inputs and production from capture fisheries. This may be through direct controls, such as limited entry schemes (eventually including buyback programmes), or indirect controls through developing appropriate incentive systems for capacity to self-regulate.

In response to growing concerns about the relationship between overcapacity and overexploitation, FAO (1999) produced an International Plan of Action for the Management of Fishing Capacity (IPOA-Capacity). This calls for all Member States to achieve efficient, equitable and transparent management of fishing capacity by 2005. The progress in the implementation of the IPOA-Capacity was recently reviewed at global level\(^{68}\). As part of the review, the factors that constrain the effective development of capacity management plans were examined.

In this paper, the relationship between overcapacity and unsustainability will be briefly examined, and the mechanisms available for managing capacity will be reviewed. The progress in the implementation of the IPOA will also be discussed. The main focus of the paper will be on the challenges experienced by Member States, and in particular those that constrained their ability to introduce effective capacity management plans.

2. THE RELATIONSHIP BETWEEN OVERCAPACITY AND UNSUSTAINABILITY

Overcapacity and unsustainability are essentially two facets of the same problem. The fundamental factor leading to the existence of excess capacity is the lack of well defined property rights in fisheries. Without well defined property rights, individuals will increase their effort, and in fisheries without efficient licence limitations, new fishers will enter, provided that greater profits can be earned in the fishery than in other industries or activities. As a consequence, the level of investment in the fishery can exceed that required to harvest the resource at its greatest productivity level (e.g. maximum sustainable yield), and also the level required to harvest the resource to achieve its greatest economic value to society (i.e. the point at which economic benefits, or resource rent, is maximized).

While the lack of property rights can lead to excess levels of capacity building up in fisheries, it doesn’t necessarily result in unsustainable harvest levels. In theory, fishers will stop entering the fishery when there are no more economic profits to be gained. This can result in a sustainable level of output that is less than optimal (from either a biological or economic perspective). Difficulties arise, however, if even greater levels of capacity enter the fishery. This may occur if short term catch rates are substantially higher than at their long run equilibrium level. Hence the fishery may appear more profitable than it is under average conditions. The result of induced investments is that the fishery would, in the longer term, be operating at an economic loss, even if some of this capacity may eventually exit the fishery returning to a sustainable (but sub-optimal) level.

It is at this point that a second important factor of unsustainability comes into play, namely barriers to exit. These take two main forms: the lack of alternative employment opportunities and the ‘non-malleability’ of capital. In many cases, fishers have nowhere else to go. Similarly, there are few alternative uses for fishing vessels when fisheries are overexploited. As a result, the ‘opportunity cost’\(^{69}\) of both labour and capital is negligible if not zero, and fishers will continue to operate in the fishery as long as they can continue to cover their running costs. This would result in the stocks and economic performances being further depressed.

The resultant low incomes in the sector, the lack of alternative employment opportunities and the non-malleability of capital may attract subsidies from governments. The existence of capacity-enhancing subsidies further exacerbates overexploitation, and therefore can result in unsustainability. Subsidies may

\(^{68}\) Technical Consultation to Review Progress and Promote the Full Implementation of the IPOA for the Management of Fishing Capacity (FAO, 2004).

\(^{69}\) Opportunity cost is a concept used in economics to represent the return a factor of production could generate if used in the next best activity. If there is no alternative use of a factor, then its opportunity cost is zero.
either reduce the cost of fishing (e.g. if the cost of capital or fuel was subsidized) or increase the revenues of fishers (e.g. through price support). In either case under relatively free access, they result in increased fishing activity and subsequently increased overexploitation.

A further factor that links overcapacity to unsustainability is technological development. Even with barriers to exit, a sustainable position in the fishery can be achieved, albeit at a substantially lower level than is desirable. However, technological developments may either reduce the cost of fishing or increase the catch per unit of fishing effort. As a result, fishing capacity may expand further even though the level of capital in the fishery does not increase, creating further pressures on the stocks.

3. DEALING WITH OVERCAPACITY – INTERNATIONAL APPROACHES

As noted above, capacity management is concerned with the control of the level of capital employed in the fishery, and hence aims at improving both the economic and biological sustainability of the fishery. There are numerous approaches to capacity management, and in many cases combinations of approaches are applied.

The main instruments used in capacity management can be classified as either incentive-blocking or incentive-adjusting measures. Incentive-blocking instruments are largely aimed at preventing further expansion of capacity through command-and-control style restrictions on entry and on fishing activities. Incentive-adjusting instruments, in contrast, provide incentives for fishers to adjust capacity themselves. These approaches have been well documented (e.g. Gréboval and Munro, 1999; Cunningham and Gréboval, 2001; Ward and Metzner, 2002) so will not be discussed in any detail in this paper.

A recent survey was undertaken by FAO to determine the extent to which Member States have adopted some form of capacity management plan, and to identify any constraints or challenges faced during the development and implementation of such a plan. Eighty member States responded to the survey, 14 of which were major producers. Details of this survey and the main results are presented in FAO (2004).

Capacity management in some form or another is undertaken in most countries. From the FAO survey, around 80 percent of respondents, and over 90 percent of the major producers, indicated that capacity management has been integrated into their general fisheries management policies. Capacity management measures implemented by Member States varied considerably, ranging from basic entry restrictions to rights-based management (Figure 1). At the most basic level, these involve licensing fishing vessels and limited entry, generally combined with area and/or time closures as well as gear restrictions.

Problems of overcapacity requiring urgent remedial action were identified by around two thirds of the responding States. To address this overcapacity, capacity reduction programmes were being implemented by almost three quarters of the major producers over the next five years, while over half of this group had implemented some form of capacity reduction programme in recent years. These programmes have predominantly involved buy-back of licence and/or vessel.

From the survey, nearly 90 percent of respondents indicated that they employ some form of restriction on either: area, season fished, or gear - restrictions that may be successful in protecting fish stock or productivity, but often worsen the overcapacity problem unless they are accompanied by effective measures to restrict access. Restrictions on access and the level of inputs have therefore been adopted quite widely (by about 85 percent of respondents) and are the most frequently used form of capacity management. A key issue is therefore, the effectiveness of access restrictions – generally reduced, inter

70 In this case we have differentiated capacity from capital. Capital can be considered the stock of physical inputs employed in the fishery while capacity is the ability of this stock of inputs to catch fish. Technical change can therefore increase the capacity of the fleet without changing the level of capital invested.

71 The major producers were those in the top 25 countries in terms of total output, which combined comprised around 80 percent of global marine production.
alia, by input substitution, technological development and non-compliance as fishers would still have incentives to increase their capacity and fishing effort rather than to match fishing capacity with a set quota.

From the results of the survey, there is some evidence that greater consideration in general is being given to incentive-adjusting management systems such as rights-based approaches and financial incentives. Around 40 percent of the respondents have used some form of individual rights-based approach, while around 50 percent have employed some form of community rights-based approaches. An even greater proportion (around 60 percent) stated that they have applied some form of tax or royalty system, although not necessarily for the purpose of managing fishing capacity.

A number of developing countries have begun to complement access restrictions with catch-based management systems, imposing a total allowable catch for individual species. For example, Morocco has implemented such a system for its cephalopod resources. This approach has had the effect of encouraging a race for fish and the development of fishing capacity. Faced with this difficulty, the Moroccan authorities are currently looking into moving the management system towards an individual use right basis (Cunningham, 2004). Similarly in Peru, both industry and government authorities now favour the use of individual transferable quotas (ITQs) despite earlier resistance (Aguero, 2004).

**4. CHALLENGES FACING THE IMPLEMENTATION OF CAPACITY MANAGEMENT PLANS**

Free and open access is still a predominant feature of many small-scale and artisanal fisheries throughout Asia and Africa. In some cases, free and open access exists as a result of an explicit policy, while in most it exists as a consequence of difficulties relating to institutional capacity. In many countries where access has been limited, problems of overcapacity have still developed. As noted above, problems of overcapacity were identified in around two thirds of the Member States responding to the FAO survey.

While lack of adequate property rights over the resource has generally been acknowledged as a key factor leading to both overcapacity and unsustainability in fisheries, relatively few countries have attempted to address this issue directly. Instead, as identified above, most countries that have adopted a capacity management strategy of some sort have adopted some form of input control based system. These are ‘second best’ approaches to capacity management, as they do not directly address the

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**Figure 1. Fishing capacity management activities undertaken by Member States**

*Source: FAO, 2004*
underlying problem. However, managers are faced with other considerations and constraints that limit their ability to introduce rights based systems.

The FAO survey identified a series of issues and constraints relating to the development, and subsequent effectiveness, of such policies. In addition, a series of regional reviews were also conducted to examine capacity management in more detail in Africa (Cunningham, 2004), Southeast Asia (Lindebo, 2004), South America (Aguero, 2004) and Europe (Pascoe, 2004). The key issues and constraints identified by these reviews and the FAO survey are outlined below.

4.1 Employment impacts

In the first International Workshop on Factors Contributing to Unsustainability and Overexploitation in Fisheries (Gréboval, 2002), the lack of alternative livelihoods was identified as the most significant single pressures on fisheries resulting in unsustainable fishing practices. As outlined above, this is often a reason for the development of overcapacity in fisheries, and is often the reason preventing capacity naturally exiting the fishery.

Capacity reduction, where undertaken, does have a negative impact on employment. For example, the scrapping of 132 vessels in 2002 put 1300 Japanese fishermen out of work, and caused significant hardships to others who had been working for tuna related industry. In the EU, 28 000 jobs are expected to be lost because of fishing vessels being scrapped over the period 2002-2006, following the reform of the Common Fisheries Policy (Commission of the European Commission, 2002).

This is a particular problem in many developing countries, where alternative employment opportunities are limited. For example, the fisheries sector in almost all Southeast Asian countries is dominated by small-scale, coastal fishing operations, with more than 75 percent of the total fish catch attributed to these fisheries (Lindebo, 2004). These fisheries play an important role in local employment, food and income provision. In Vietnam, for example, 8 million people rely on fisheries as their primary income source, while an additional 12 million get part of their income or subsistence from fisheries, representing over one quarter of the total population. This problem is not unique to Southeast Asia, as similar constraints in terms of alternative employment apply also in many coastal communities in Africa, Latin America and the Caribbean.

Substantial numbers of fishers employed in small-scale fisheries are not limited to developing countries. Around 260 000 fishers are employed in the Mediterranean as a whole, most of which would be considered small-scale or artisanal fishers (Breuil, 1997). Small scale fishers outnumber larger fishing vessels in nearly every fishing nation.

Although it is recognized that, at least in some cases, catch is in excess of sustainable levels in these countries, with little alternative employment and income generating opportunities in many coastal communities, capacity reduction is not a desirable or feasible option. As a consequence, there has not been a genuine desire to reduce capacity in small-scale fisheries, with attention instead focused on the management of larger scale vessels. The strategy of capping small scale fleets and reducing industrial fleets is de facto in place in many developing countries.

This constraint is recognized by the IPOA-Capacity. Article 22 suggests that States should give due considerations to socio-economic requirements, including consideration of alternative sources of employment and livelihood to fishing communities which bear the burden of reductions in fishing capacity. This may require assistance in developing alternative opportunities in the coastal communities to complement capacity management, or assist in relocation of displaced fishers to more sustainable activities.

Several Member States have developed plans to either generate alternative employment opportunities or to retrain fishers so that they can enter different industries. For example, China’s Bureau of Fisheries is
planning to move 200,000 fishermen (4 percent of the total) to other jobs by 2007, largely through subsidizing fish farming gear and offering training.

In Europe, a number of measures are being introduced as part of the Financial Instruments for Fisheries Guidance (FIFG) programme. These include individual compensatory payments for fishermen losing their jobs as a result of scrapping or permanent withdrawal of their vessel, funding for retraining to find employment outside the fisheries sector, and support to national early-retirement schemes (Commission of the European Commission, 2002). These funds can be used to support boat owners as well as their crews, and they can be used to encourage older fishermen to scrap their vessels. Such schemes could be used by States wishing to direct capacity reductions towards specific groups of boat owners and/or of fishing vessels. Additional funds are available for rural development in fisheries dependent areas that can produce alternative employment opportunities. These include the European Social Fund (ESF) and the European Agricultural Guidance and Guarantee Fund.

Not all countries have the same financial resources as the European Union to support the development of alternative employment opportunities. However, recognition of the need for such development is widespread. A recent review of Poverty Reduction Strategy Papers (PRSPs) from 29 African nations found that while most (22 out of 29) identified the issue of overexploitation in fisheries as significant, relatively few suggested that the solution to poverty reduction lay in further development of the fishing sector (Thorpe and Reid, 2004). In contrast, most African governments did not see fisheries improving food security and reducing poverty (Thorpe and Reid, 2004). Many African States intend to introduce capacity reduction programmes over the next five years, coupled with policies to re-train and re-locate fishers non-fishing activities and areas (Cunningham, 2004).

The need to develop alternative employment opportunities was also highlighted by the FAO Expert Consultation on Catalyzing the Transition Away from Overcapacity in Marine Capture Fisheries (Metzner and Ward, 2002). The group concluded that capacity reduction programmes should explicitly consider means of minimizing the employment impacts of capacity reduction, such as the development and use of alternative skills through training and other programs; the provision of income and other supports during the transitional period; and working with affected communities to set up new development alternatives and specific economic activities for displaced fishers (Metzner and Ward, 2002).

### 4.2 Conflicting objectives of management

A further factor increasing the difficulty of dealing with overcapacity in many countries is the multi-objective nature of Government fisheries policy. In many cases, maintaining employment in fisheries is an explicit objective of fisheries management. This is particularly the case in small-scale fisheries in developing countries where alternative employment opportunities are limited.

However, employment objectives of fisheries management are not limited to developing countries. For example, a stated goal of the International Baltic Sea Fisheries Commission is to manage the resource while maintaining fishing activity (in terms of numbers of participants) as high as possible (see www.ibsfc.org). Mardle et al (2004) also found fishing and regional employment to be considered more important by fisheries administrators in UK fisheries than sustainability.

As noted in the previous section, capacity reduction is associated with a reduction in employment. Consequently, capacity management in many countries is confronted by a double constraint. First, a limited ability to re-employ displaced fishers resulting in resistance of fishers and communities to

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72 National early retirement schemes for fishermen aged 55 and over who can provide proof of at least 10 years’ experience as fishermen and who wish to retire less than 10 years before the national statutory age of retirement.

73 Recent surveys by MacFadyen and Corcoran (2002) also found that PRSPs have made little explicit reference to livelihoods in small-scale fisheries.
embrace capacity management; and second a lack of political will to impose capacity reductions when maintaining employment is an objective of government. Here again, scaling down large scale fisheries may be a solution.

4.3 Institutional capacity

In the FAO survey, several States identified difficulties in their own institutional capacity to manage fishing capacity. This ranged from inadequate knowledge of their resource base and its potential (i.e. the current state of the stocks and potential yields) to inexperience in developing, implementing and enforcing effective capacity management systems. Strengthening national institutional capabilities, especially in capacity management; monitoring, control and surveillance (MCS); capacity measurement and stock assessment, was identified as an area requiring further support. Several States identified the need for workshops and training in these areas.

The ability of States to monitor and enforce fisheries management plans is limited in many countries due to insufficient financial resources, staff and MCS experience. For example, countries like Chile, Peru, Brazil, Argentina and Mexico, have extremely long coasts, which are difficult to monitor with the level of available physical and human capacity (Aguero, 2004). Difficulties in implementing effective MCS systems were also explicitly identified in the African and Asian region (Cunningham, 2004; Lindebo, 2004), and were raised by several Member States in the survey.

Measuring and monitoring fishing capacity has proven to be particularly problematic in many developing countries. Where attempts have been made to register and monitor boat numbers, obtaining reliable measures is also difficult due to the large number and mobility of the vessels, and their wide geographical distribution with many ports and beaches from which they can operate. With many of these fisheries being essentially open access, fishers may freely move from area to area, and in some cases from EEZ to EEZ where enforcement of fishing activity in national waters is limited. For example, in Senegal, the 1997 census estimated that there were around 10 000 artisanal vessels, but many may be registered more than once to allow for their traditional migrations from one fishing ground to another, whereas others are not registered at all as they fish mostly in neighbouring EEZs. Similarly, movement between fisheries makes assessing capacity levels on a fishery or local basis very difficult. Given this complexity, the concept of capacity measurement has been criticized as too theoretical and in need of being adapted for small-scale and artisanal fisheries (Lindebo, 2004). Improvements in MCS systems may help overcome these latter problems, e.g. the participatory systems recently trialed in Africa (Cunningham, 2004). More appropriate stock/fisheries assessment methods are also required.

In some instances, national legislation does not exist to enable effective capacity management. In such cases, developing capacity management plans is not just a case of better stock assessment and fisheries economic analyses, MCS systems or greater financial resources, but also requires legislative reform. Such reform is presently under way in many developing States: to allow for restricted access, to strengthen MCS capabilities, to allow for individual or collective right-based system, or to allow for some form of decentralization and co-management.

The characteristics of the fisheries and the degree of MCS capabilities have greatly influenced the type of capacity management system introduced. Input control-based systems are relatively easier to monitor and enforce than rights based systems such as individual transferable quotas. It is also more relevant to multispecies fisheries. This largely explains the preference for input based systems, particularly in developing countries. The predominance of small scale fisheries also explains the growing interest for decentralization and community-based management in these countries.

In contrast, individual rights-based measures (such as individual catch or effort quotas) have been mostly applied to larger scale fishing operations and single species fisheries. These involve generally fewer vessels in number, making MCS easier than for small-scale fisheries. Such measures are increasing used in developed countries, but are also considered by a growing number of developing countries for specific fisheries.
4.4 Building consensus with stakeholders

From the survey, several States identified difficulties in gaining the cooperation of the industry as a constraint to the implementation of capacity management. Gaining the support of the industry and other stakeholders is essential for ensuring compliance with a capacity management plan (Cunningham and Gréboval, 2001).

Stakeholder involvement can take several forms, ranging from industry participation in management advisory committees, to full devolution of fisheries management responsibility (such as in several New Zealand fisheries). Industry and community collaboration can also be achieved without complete devolution of management responsibility to the community. Development of co-management structures – where industry and other stakeholders have a direct input into the development of the management system through a consultative process – are also increasing.

Stakeholder participation in management advisory committees involves less devolution of management authority to the stakeholders, but ensures that their concerns are included in the development of the management plans. Such management advisory committees are in use in the USA and Australia and are being developed in the EU. In Chile and Peru, Fisheries Committees that include representatives of small-scale fisher associations have an important influence in policy matters (Aguero, 2004). This is similar to experience in Africa in countries such as Ghana, Madagascar or South Africa.

However, involving stakeholders from small-scale fisheries in the development of capacity management plans has proved difficult. With many thousands of fishers, identifying individuals that are representative of the industry as a whole may not be feasible. Ensuring sufficient representation may result in management committees that are too large to function effectively. Further, given limited employment opportunities in fishing communities in developing countries, changes in fisheries management may impinge on the community as a whole. Consequently, consulting communities in the development of capacity management measures is equally important but necessarily complex.

Industry participation in management may not always be positive. Vested interests by fleet owners and processing plants in maintaining current harvest levels can act as a constraint to introducing policies that reduce fleets, effort or catch. In such cases, stakeholder participation will impede the development of effective capacity management plans. This may be particularly the case if participation is industry-wide and disconnected from the management of specific fisheries.

Stakeholder participation (and co-operation) can be affected by the management system in place. For example, ITQs have been found to give fishers a much greater say in fisheries management. The basis for this self-management is secure property rights provided through the ITQ system (Arnason, 2002). ITQs provide a means for resolving conflicts over the distribution of the resource, and are therefore considered key to the development and success of the co-management structure evolving in New Zealand, where fishers are active in research, enforcement and the development of management plans (Bess and Harte, 2000; Hughley, et al., 2000; Yandle, 2003). The Netherlands also has a well-developed co-management system facilitated by the ITQ system (Dubbink and van Vliet, 2000).

Property rights do not necessarily have to take the form of ITQs to enhance community participation. Around 50 percent of the respondent States who have implemented some form of capacity management indicated that they had developed some form of territorial, group or community rights-based system for capacity management. Community based quotas have been introduced in several fisheries. In the Alaskan Pollock fishery, quotas are allocated to co-operatives rather than individuals, and members of the co-operative make collective decisions on how the quota is to be harvested (Mansfield, 2004). Similarly, community quotas have been applied to smaller vessels (in combination with ITQs applied to larger vessels) in the Scotia-Fundy groundfish fishery (Sinclair et al, 1999). Traditional territorial use rights based systems (TURFs) are also still effectively used in many fisheries, and have facilitated community involvement in management through reducing conflict and competition between fishers (Brown and Pomeroy, 1999).
Community based management was viewed as an option for managing small-scale fisheries in south east Asia, and has been applied in many inshore fisheries in Asia, Africa and Latin America (see Lindebo, 2004; Cunningham, 2004; and Aguero, 2004). Community based management has also been successful in controlling overexploitation in many inland fisheries (e.g. Bangladesh, Uganda). For these to be successful, management units need to be sufficiently small. For example, in Uganda, a network of about 500–700 Beach Management Units (BMUs) being introduced at the community level (Cunningham, 2004). In Indonesia, fisheries management has also been devolved to local government responsible for managing the fisheries in their areas, allowing greater community participation in decision-making (Satria and Matsuda, 2004). In these cases, formal property rights were not assigned, but the community groups responsible for each area were sufficiently small that they could manage the fishery in common. As pointed out by Mansfield (2004), in such cases, individuals acting collectively will operate the same as a single collective entity (i.e. a sole owner).

Stakeholder participation thus occurs increasingly at two levels according to the policy framework under consideration: at the sectoral level and at the level of specific fisheries defined explicitly as management units. One of the key problem affecting stakeholder participation and the management of fishing capacity at large is, however, that management units are still poorly defined in most countries or not defined in terms that allow for a clear delimitation of managerial responsibilities and participation by primary stakeholders. Fleet mobility (across fisheries and borders) and the related issue of multilevel governance are indeed presenting challenges that are not yet fully understood.

4.5 Technological change

A difficulty confronting capacity management based on inputs is that the productivity of these inputs generally tends to increase over time. For example, in Iceland, productivity was estimated to have increased by roughly 6 per cent a year between 1983 and 1995 (Runolfsson, 1999). Similarly, in the Australian Northern Prawn fishery, productivity is believed to have increased by around 5 per cent a year since the mid 1980s (AFFA, 2003). In Europe, technical change has been relatively low over the last decade, averaging at around 1 percent a year (Banks et al, 2001). However, even low rates of technical change can have a substantial cumulative effect over time.

Technological change is not limited to fisheries in industrialized countries, nor is it limited to industrial fleets. For example, the addition of outboard engines to canoes greatly increases the range over which these small-scale vessels can operate. It also allows them to operate more gear each day, increasing their overall impact on the stock. The use of GPS has had similar effect in many fisheries.

The impact of technical change on fishing capacity depends on the capacity management system in place. With input control based systems, technological change results in increased capacity, and consequently the need for continual capacity reduction programmes. For example, in the Northern Prawn fishery, the increase in productivity identified above has resulted in stock declines and forced the continual imposition of input controls on the fishery by the management agency. These include the shortening of the season in 2002, and a 25 percent reduction in allowable headrope length to try and offset the increase in effort produced by the accumulated effects of technological change (AFFA, 2003). In the Faroe Islands, which is managed by individual effort (days-at-sea) quotas, the total allowable number of fishing days had to be reduced by 17 percent for the largest vessel groups between 1997 and 2002 to compensate for increased efficiency in the fleet as less efficient vessels were removed (Faroe Islands Ministry of Fisheries and Maritime Affairs, 2002).

In contrast, in fisheries managed through a rights-based system of management such as ITQs, technological change can result in improved economic performance as well as maintaining sustainability in the fishery. Such rights based systems provide incentives for capacity to self-rationalize (hence they are considered incentive enhancing mechanisms to use the earlier classification). In the Icelandic fisheries, which are managed through ITQs, the productivity change has been accompanied by a
reduction in total fishing capital as individual owners trade their quota shares to rationalize the level of capital invested in the industry. If vessels are discarded in this context, these may nevertheless join other fisheries or EEZs.

Technological change can also aid capacity management through improved MCS systems, such as computerized records of landings and fleet information. Vessel monitoring systems (VMS) are becoming commonplace in many large scale fisheries, and are also being considered in small scale fisheries. For example, in Senegal and in Mozambique, a system was tested that involved a computerized chip attached to a registration plate. Information on the vessel included in the chip, as well as information on catch of that vessel that day, could be sent to a central server over a mobile phone network. In this way the activity of the vessels could be monitored in real time (Cunningham, 2004).

4.6 Export of Capacity

Export of capacity is still a common element of capacity reduction programmes in some regions. In many cases, only the fishing licence is purchased, and the boat is exported to fisheries elsewhere. This was particularly a problem for developing countries, which had access to a large supply of relatively cheap capital as a result of decommissioning in more industrialized countries. The EU is prohibiting export of decommissioned capacity from December 2004 (Pascoe, 2004), although most other States still allow excess capacity to be exported.

4.7 High seas and straddling stocks

Free and open access in the high seas has been a major cause of overcapacity in these areas, particularly with tuna fisheries. Attempts have been made by some individual States to reduce their own contribution to overexploitation of high seas resources. For example, as mentioned previously, Japan scrapped 132 tuna vessels in 2002 in a bid to reduce overcapacity in the tuna fisheries. However, despite the efforts of the individual States as well as international organizations to limit capacity, a number of new, large purse-seiners are being built in several shipyards that will increase the fishing capacity of this sector. The potential also remains for increases in fishing capacity by non-tuna vessels that fish on the high seas in areas not covered by regional fishery management organizations (RFMOs). Acceptance of the 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas by all contracting States will help reduce this problem.

Several Member States raised the issue of straddling stocks as a particular constraint for capacity management. This included issues of assessing the stocks, allocating catches between States as well as lack of control over capacity outside their own borders. Movement of capacity across borders – both legally and illegally – was a further difficulty, particularly in the Asian and African regions.

5. ROLE OF REGIONAL FISHERIES MANAGEMENT ORGANISATIONS

The main role of RFMOs is to address the issues associated with high seas fishing and straddling stocks mentioned above. The IPOA identified strengthening of RFMOs and related mechanisms for improved management of fishing capacity at regional and global levels as a major objective. Articles 27 through 38 of the IPOA are concerned with regional collaboration and participation in international agreements that relate to the management of fishing capacity. This collaboration is at two levels: first, in relation to shared or straddling stocks; and second, in relation to high seas fishing.

Collaboration with RFMOs and the development of appropriate bilateral agreements is well established in all regions. Bilateral agreements are primarily concerned with straddling stocks between adjoining States, but in the North Atlantic extend to areas of high seas also. From the survey, almost two thirds (61 percent of the respondents were members of a RFMO, while a further 10 percent were co-operating non-members of RFMOs.
The primary role of RFMOs and bilateral agreements has been the allocation of the shared resource between the contracting States. Total allowable catches (TACs) of each species are determined by the RFMO, or agreed by the collaborating States, and allocated between the contracting States.

In some cases, more explicit capacity management measures are also imposed. For example, while the main role of Northeast Atlantic Fisheries Commission (NEAFC) is to allocate the agreed TAC between the Contracting Parties, it may also limit the number of boats and effort in line with the fishing opportunities available to that Contracting Party. Similarly, the General Fisheries Commission for the Mediterranean (GFCM) provides advice on the status of the resource, and appropriate measures for its rational management, including advice on area and seasonal closures, TACs, minimum landings sizes and fishing effort. Around nine percent of the FAO survey respondents indicated that capacity reduction measures were being implemented in regional or international fisheries in which they participate (FAO, 2004).

In addition to the RFMOs, a number of other regional organizations exist that encourage and facilitate fisheries management. For example, in West Africa, the Sub-Regional Fisheries Commission (SRFC) hosted a workshop (in collaboration with FAO) to consider capacity issues and facilitate the development of capacity management plans. The South African Development Community (SADC) hosted a workshop focusing on responsible fishing in Southern and Eastern Africa. This workshop dealt with the harmonization of marine fisheries policy in general but the capacity question was inevitably included. Similar workshops have been conducted in Southeast Asia under the auspices of the Southeast Asian Fisheries Development Centre (SEAFDEC).

Substantial progress has also been made with respect to capacity management for fleets exploiting highly migratory species such as tuna. An FAO coordinated project on the potential capacity in the global tuna purse seine fleet found unused capacity in all fisheries for all major tuna species. This project includes direct involvement of RFMOs such as the FFA (Forum Fisheries Agency), as well as individual tuna fishing nations (e.g. Japan). In addition to setting and allocating catch quotas, IATTC, ICCAT and IOTC have adopted measures to limit the number and capacity of tuna fishing vessels. The IATTC has also developed a draft plan for regional management of fishing capacity. The Japanese Government and the international longline industry (OPRT) carried out the buy-back program mentioned previously, in which many large-scale longline vessels were scrapped. The international purse-seine industry (WTPO) has also expressed an interest in limiting expansion in the international tuna purse-seine fleet.

Consideration of capacity issues has also been raised at regional and international economic forums as well as RFMOs. For example, APEC, OECD, G8 and ASEAN have all considered issues of fishing capacity in their Member States.

As with the individual Member States, institutional capacity is also limited at the RFMO level, particularly in Africa and Asia, due to limited financial resources. These organizations rely on contributions from Member States that, themselves, have limited financial resources. As a result, their ability to develop and implement capacity management and capacity reduction programmes has been limited.

6. CONCLUSIONS

The IPOA-Capacity has, to a large extent, been successful in focusing attention onto the causes of, and potential solutions to, the problem of overcapacity in fisheries. Further, it has required Member States to consider how they may implement these solutions, and most have responded by either developing or formalizing some form of capacity management plan. In doing so, a number of constraints to the implementation of capacity management have been identified.

The foremost constraint is the lack of alternative employment opportunities and the related social dimension of the sector. As any form of capacity reduction will result in some fishers being displaced from the fishery, there has been a lack of political will to introduce these measures as one set of problems
(overexploited fisheries) will just be replaced by another (unemployment and the resulting social problems). Development of alternative employment opportunities has been identified as a necessary complementary activity to capacity management, whether through rights based systems or input controls.

In some cases, maintaining employment in fisheries is an objective of management, so capacity reduction is not even considered an option. However, it is unclear to what extent this ‘objective’ is really driven by the above constraint (i.e. lack of alternative employment opportunities). In many instances this concern and related considerations (preserving fishing communities, regional development, etc.) may best be achieved by reducing the share of large scale vessels). The lack of financial resources to buyback or streamline large scale exploitation is another major constraint.

Institutional deficiencies were also identified, particularly in developing countries. These included inadequate knowledge of the resource and its potential yield, inexperience in developing and implementing management plans, and also insufficient resources to undertake appropriate levels of MCS. With large numbers of small scale fisheries, even basic information on fleet size and activity is both difficult and costly to collect, and many States lack the financial resources to undertake these activities. This extends to some RFMOs involving primarily developing countries, who also lacked the financial resources to develop and implement regional capacity management plans.

Overcapacity and the resultant unsustainability of fisheries resources arise primarily from the absence of secure property rights over the resource. This is the single key factor underlying overexploitation of fisheries. Given this, an obvious solution to the problem of overcapacity is to introduce some form of rights-based system of management. However, institutional capacity constraints have resulted in ‘second best’ incentive-blocking measures being applied, where any measures are applied at all. These measures may contain capacity in the short term, but create incentives to increase, rather than decrease, capacity in the longer term. There again, developing countries who are presently attempting to introduce stricter licensing schemes could benefit from the experience gained in developed countries and related technical assistance.

A key advantage of the use of rights based approaches for managing fishing capacity is that they provide a mechanism through with stakeholders can more easily and actively participate in the management process. They provide a means for resolving conflicts over the distribution of the resource, and also provide a means for allocating the benefits from the use of the resource. As a result, they also foster stakeholder participation and support, essential for ensuring compliance with the management plan. Rights-based management systems can take many forms and do not necessarily have to involve ITQs in order to provide benefits to the fishers and communities. These may include territorial use rights (TURFS), community quotas, and community based management (i.e. common management). In all cases, by removing the incentives to compete, and providing a mechanism to allocate benefits from fishing activity, capacity will self-adjust in order to most benefit the holders of these rights (individuals or communities). Financial incentives that impact investment are also revisited in most countries, with a definite trend to the reduction of related subsidies and with a growing number of countries considering some form of rent extraction – in the form of access fees or management cost sharing arrangement.

REFERENCES


Summary

Australia’s Northern Prawn Fishery (NPF) is often cited as a model of the co-management approach to fisheries. It is characterised by long term access rights guaranteed by law, a comprehensive data program, extensive stock assessments, well informed and extensive stakeholder engagement in all facets of management and a structure that removes politicians from direct decision making.

Adjacent to the Northern Prawn Fishery is the Torres Strait Prawn Fishery (TSPF). It catches the same species and many of the northern prawn fishers also have access to this fishery. Unlike the Northern Prawn, the Torres Strait Prawn Fishery does not have secure access rights, or an effective consultative process. Limited resources have been devoted to research and the limited compliance assets available have been diverted to deal with illegal fishing for other species. All decisions are made by a group of three politicians; one from the federal “conservative” government, one from the State “labour” government and one from the regional indigenous authority.

When comparing the two management environments you would think that the Northern Prawn is likely to produce a superior fisheries management result. Yet until 2004 tiger prawns in the northern prawn fishery were overfished and the stocks in the Torres Strait Prawn Fishery were above target levels.

This paper presents a case study of the arrangements in place in the two fisheries and their effects on the sustainability of the stocks. In particular the paper will look at the effectiveness of participation of stakeholders in the management process, the use of the process to delay decisions and responses when a problem is identified.

1. BACKGROUND

1.1 The Australian fisheries context

Australia is a federation of six sovereign states and two territories. As such Australia has a tiered system of fisheries jurisdiction. Fisheries from three nautical miles from the coastline out to 200 nautical miles are managed by the Australian federal government. Those within the three nautical mile limit are generally managed by the State government.

In cases where it would make sense for a single stock, area or fishing method to be controlled by one agency the Australian government and the States have generally been able to reach an agreement to pass jurisdiction to one party through an Offshore Constitutional Settlement. Such is the case with the Northern Prawn fishery which is managed in whole by the Australian government.

At the federal level there are two different legislative regimes in place for fisheries. Most fisheries are managed under the provisions of the Fisheries Management Act 1991. Fisheries under this Act are managed by the Australian Fisheries Management Authority (AFMA) an independent statutory body on behalf of the government.

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74 The views expressed in this paper are solely those of the author Trysh Stone, Australian Fisheries Management Authority, Canberra, Australia, trysh.stone@afma.gov.au.
The other regime in place is the *Torres Strait Fisheries Act 1984*. This Act applies only to the water of the Torres Strait. Fisheries in the Torres Strait are part of a Treaty agreement between Australia and Papua New Guinea. On the Australian side these fisheries are managed by the Torres Strait Protected Zone Joint Authority (PZJA) which is a Board made up of the Australian Minister for Fisheries, the Queensland Minister for Fisheries and the Chairperson of the Torres Strait Regional Authority\(^{75}\) (TSRA). Instead of establishing a separate organisation the PZJA contracts AFMA and the Queensland Fisheries Service to provide fisheries management delivery on its behalf.

### 1.2 The AFMA model

In 1989 the Australian government released a new policy for fisheries management – *New Directions for Commonwealth Fisheries*. This policy statement incorporated several new changes to fisheries, in particular:

- incorporating ESD and economic efficiency as prime objectives for fisheries management;
- the establishment of property rights in the fisheries;
- making output controls the preferred method of management;
- requiring a partnership approach to management; and
- removing direct decision making powers from politicians and placing them with an expert Statutory Authority.

As part of this fisheries reform the Australian Fisheries Management Authority was created in 1992 operating at arms length from the Minister with decisions being made by an expertise based Board of Directors.

The AFMA model is based on a partnership approach to management in which a wide range of stakeholders are directly engaged in developing and implementing all aspects of fisheries management.

A key feature of this partnership approach is the system of Management Advisory Committees (MACs) who provide management advice and Fisheries Assessment Groups (FAGs) who provide scientific and economic advice. These groups are made up of fishers, managers, scientists, economists, environmental representations and representatives of other key stakeholder groups (e.g. recreational fishers).

To ensure the integrity of the scientific advice presented, FAGs and MACs provide their advice to the Board separately. This helps ensure that scientific advice is not “filtered” through the management process.

### 1.3 AFMA’s legislative objectives

AFMA legislation requires that it pursues five key objectives in its management of Australia’s fisheries resources:

a) implementing efficient and cost effective fisheries management;
b) ensuring the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ESD and the exercise of the precautionary principle, in particular the need to have regard for the impact of fishing on non-target species and the marine environment;
c) maximising economic efficiency in the exploitation of fisheries resources;
d) ensuring accountability to the fishing industry and the Australian community; and
e) achieving government targets in relation to the recovery of costs.

The objectives are not in any priority order and each one must be balanced in achieving outcomes.

\(^{75}\) An indigenous regional representative body.
2. THE NORTHERN PRAWN FISHERY

2.1 Overview

With an average annual value of about US$70 million, the Northern Prawn Fishery is one of Australia’s most valuable fisheries and the most valuable managed by the Australian Fisheries Management Authority (AFMA). The average annual catch is about 8,000 tonnes taken by 96 otter trawlers. Over 90 percent of the product from the fishery is exported.

Geographically the fishery is very large. It extends from the low water mark to the edge of the Australian Fishing Zone along approximately 6,000 km of coastline between Cape York in the east to Cape Londonderry in the west. It occupies approximately 771,000 square km of waters in some of the remotest areas of Australia (Figure 1). There is little infrastructure and few roads. Besides Darwin there are only two towns of any significant size in the area of the fishery. These are Karumba and Weipa which both have a population of less than 2,500 people. Much of the coast line of the fishery is Aboriginal land and contains Sacred Sites thus landings are restricted.

To allow boats to stay on the fishing grounds for the whole fishing season they are supported by a system of independent carrier boats or “motherships”. The motherships transport the catch to port and reprovision the boats.

While up to nine species of prawns are taken commercially, fishing focuses on four species: white banana (Penaeus merguiensis), Indian banana (Penaeus indicus), brown tiger (Penaeus esculentus), and grooved tiger (Penaeus semisulcatus). Other species taken include giant tiger (Penaeus monodon), blue endeavour (Metapenaeus endeavouri), red endeavour (Metapenaeus ensis), western king (Penaeus latisulcatus) and red spot king (Penaeus longistylus).
Banana prawns have a very high natural variability and hence catches fluctuate dramatically (from 2,000 to 12,000 tonnes). They are targeted for a short period of time in April and into May. They form dense aggregations known as “boils” because of the way that they disturb the mud and discolour the water. Fishermen use spotter planes to locate boils and guide the boats. Shot time is about 15 minutes.

Conversely, tiger prawn fishing relies on using a small “try” net to identify concentrations of prawns and then pattern trawling with shot times of about three-four hours.

While banana prawns make up most of the catch, tiger prawns are really the focus of the fishery. Not only is most of the fishing year spent targeting tiger prawns but they are the more valuable on Asian markets because their superior size and tiger like stripes make them pleasing to the eye. The fishery for tiger prawns is the focus of this paper.

2.2 Management arrangements

A Statutory Management Plan is in place for the NPF which spells out both the fishery objectives and the management “tool box”\(^\text{76}\). Objectives in the plan are very broad and have been operationalised through preparing a five year strategic plan for the fishery.

Under the Management Plan fishers have been granted Statutory Fishing Rights which are secure long term access rights which have been recognised as a form of property. All Statutory Fishing Rights in the fishery are fully transferable and may be bought, sold or leased.

The principal control on effort is through limits on fishing gear, with each Statutory Fishing Right representing one share of the total allowable gear pool. In addition fishing time is limited to less than 5 months and a series of large area closures are in place which protect particularly sensitive areas such as seagrass beds and juvenile habitats covering about 8 percent of the total area of the fishery (Anon 2003).

To protect by-catch species and important charismatic mega-fauna the use of turtle excluder devices and by-catch reduction devices are mandatory throughout the fishery. A series of by-catch limits apply on a number of important species.

2.3 Consultation mechanisms

AFMA’s management philosophy of a partnership approach means that cooperation with relevant stakeholders, such as the fishing industry, government agencies, the environmental community and others with an interest in the resource, is a vital part of management.

Stakeholders are involved in all aspects of management, science, compliance and planning through a series of committees. All aspects of management are first discussed with the Northern Prawn Management Advisory Committee (NORMAC) and its sub-committees before it is passed to the Board for decision. Figure 2 shows the structure of the consultative mechanisms. Industry is in the majority on each committee other than the Northern Prawn Fishery Assessment Group (NPFAG).

As part of the extension program for the fishery there is an annual briefing session for vessel skippers (who are generally not the owners of the Statutory Fishing Rights). Recently training course for members of the crew have been implemented to provide them with a broad understanding of why different rules are in place in the fishery (with the aim of improving compliance) and to try to improve

\(^{76}\text{Plan outlines what measures can be taken and provides the scope for AFMA to make “Directions” and “Determinations” which set the actual quantum (e.g. season dates) in a timely manner. The plan includes mechanisms to ensure that AFMA undertakes consultation before deciding on changes and provides sufficient notice of changes.}\)
environmental practises (e.g. training in handling sea snakes). This program has proved a success with over 50 percent attendance.

The use of sub-committees in the process not only allows detailed consideration of issues but as the membership is drawn from outside the NORMAC and NPFAG; it allows a broader participation in the process.

There is also a broader process of consultation. Periodically NORMAC holds a well attended industry workshop. The workshop format includes a number of presentations by scientists, managers and fishers and then discussion both in small groups in open plenary. The workshops have covered a wide range of areas usually on a topical issue. Workshop topics have included stock assessment concepts including the opportunity to “play” with simulation models and fish behaviour and by-catch reduction.

It is also worth mentioning that industry take an active role in the science on the fishery. This not only includes participation in determining research priorities and participating in the stock assessment but also in funding and carrying out research. Of particular note is a program of crew based observation. About 15 percent of the vessels in the fishery have volunteered and been trained to collect detailed biological information each day and collect samples. Many will believe that industry collection of this type of data is open to manipulation, but previous programs in the fishery have shown that this data is just as reliable as that collected by scientists placed on board commercial boats (Robins 2002).

An assessment of how the fishery rates against the “paths to solutions” identified at the Mauritius meeting is included in Appendix 1.

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**Figure 2. The Consultation model for the Northern Prawn Fishery**

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77 There is no payment to those involved in the program but the annual training and briefing course is held somewhere “attractive” as a reward.
2.4 Why did stocks become over-exploited?

The reason that the tiger prawn stocks in the northern prawn fishery became severely overfished is simple; while the message was clear that effort needed to reduce, it took six years to make decisions and put in place measures to achieve a reduction. To appreciate how this occurred some history is needed.

The NPF has had a long history of considerable scientific investment (at least on an Australian scale). During the 1980’s there were problems with both biological and economic overfishing. These were addressed principally by a series of “buybacks” aimed at removing fishers out of the fishery using both government and industry funds. These buybacks were largely unsuccessful (Meany, 1993) and resulted in a compulsory acquisition of 30.76 percent of the units of capacity attached to each licence in early 1993. A full account of this period and the industry and government responses to the scientific advice can be found in Dichmont (in press).

There were two major outcomes of this compulsory surrender that it is useful for readers to understand. The first is that both industry and managers agreed that the management system had to be changed (an explanation can be found at Appendix 2). Consequently in 1993 NORMAC and AFMA embarked on a process of consultation about a new management system. This process of consultation dominated management discussions until the current “gear unit” system was eventually put in place, in July 2000.

The second is that the acquisition resulted in a 25 percent decrease in the number of boats in the fishery. With the consequent reduction in effort both the managers and industry believed that the fishery had turned the corner and an air of optimism prevailed. This resulted in the removal of a number of other restrictions on fishing effort which were considered an impediment to economic efficiency and no longer necessary to contain effort.

The optimism was short lived. Late in 1993 CSIRO started to express some “concerns” about the expected recovery of tiger prawn stocks and about the high rate of fishing power increase in the fishery (CSIRO, 1993). These concerns were repeated at the NORMAC meetings in 1995 and 1996 (Anon, 1995 and 1996). With most attention focused on discussions about a new system of management for the fishery, a “wait and see” attitude prevailed.

By November 1996 there was general agreement in the industry and unanimous agreement at NORMAC that the system of management should change to a system based on tradable gear units. However at the beginning of 1997 things started to change.

Firstly tiger prawn stocks were officially declared “over-fished”. Also at that time discussion on gear based management turned from the concept to the specifics. Once discussion of how the transition from one system to another would be handled, and most importantly the formulae for allocation, any consensus quickly vanished. Each operator started to calculate what they would be likely to receive as an allocation under the scenario proposed. Those who considered that they would be disadvantaged in the subsequent allocation began to vehemently oppose the change.

This group, composed of smaller SFR holders, also disputed the stock assessment, they disputed that fishing power was increasing and believed that changes in the CPUE were largely attributable to either environmental factors, predation or the fleet had been reduced to too small a size to effectively work all of the prawn grounds (Cartwright, 2003). It is also likely that this group of operators believed that reductions for stock purposes on top of the reduction in the transition to the new management system would be difficult for them to adjust to. Unlike the fleet based operators their choices for adjustment were limited to buy/lease more SFRs or leave the fishery. This marked the beginning of a lengthy process of obfuscation and delay.

In 1998 NPFAG advised that an immediate 35 percent reduction in effort on tiger prawns was required. In response a three week closure, which was estimated to reduce fishing effort by 15 percent was
implemented. Major effort reductions continued to be put off until the “holy grail” of gear based management was implemented.

The advice of the Fishery Assessment Group continued to become stronger and more urgent, particularly in light of continuing fishing power increases. As the advice became stronger so did the criticism of the stock assessment by members of industry. At each turn objections were raised and further research was sought. The key developments in the stock status and management responses are summarised in Table 1.

Table 1. Key developments in the northern prawn fishery

<table>
<thead>
<tr>
<th>YEAR</th>
<th>DEVELOPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>CSIRO expresses concerns about apparent lack of recovery of tiger prawn stocks&lt;br&gt;NPF industry workshop discuss need for further reductions in effort</td>
</tr>
<tr>
<td>1995</td>
<td>CSIRO advise that effective effort can not be increased&lt;br&gt;Fishing power estimated to be increasing at 5% annually and adjustment recommended&lt;br&gt;NORMAC requests a position paper on how to handle effort creep</td>
</tr>
<tr>
<td>1996</td>
<td>CSIRO advises effort should not be allowed to increase above 1993 effective level&lt;br&gt;Effective tiger prawn effort in 1995 was 14% higher than 1993.&lt;br&gt;Fishing power estimated to be increasing at 5% annually and adjustment recommended&lt;br&gt;NORMAC recommends no action at this time but examines longer closures</td>
</tr>
<tr>
<td>1997</td>
<td>NPFAG advises that both tiger prawn stocks are overfished and recommends a minimum immediate reduction in effort of 10%&lt;br&gt;Fishing power estimated to be increasing at 5% annually and adjustment recommended&lt;br&gt;The northern sector of industry disputes the stock assessment and opposes gear based management.&lt;br&gt;NORMAC recommends an 18% reduction in gear in 1999 and increasing closures by 3 weeks.&lt;br&gt;Board accepts advice</td>
</tr>
<tr>
<td>1998</td>
<td>NPFAG advises that spawning stocks is well below target levels and that rebuilding of stocks “…requires significant and urgent efforts”&lt;br&gt;Northern sector claims that there is no stock problem; problem is a lack of boats/time to fish in all grounds.&lt;br&gt;Seasonal closure converted to an area closure to allow exploration of unfished grounds. To achieve a compromise solution one major fishing ground left open (Wallner, pers com).</td>
</tr>
<tr>
<td>1999</td>
<td>NPFAG advised that in the past year effective effort has increased 19% on grooved tiger prawns and 25% on brown tiger prawns because of the changes in closures.&lt;br&gt;NPFAG advises fishery is overfished and effort needs to reduce by 35%&lt;br&gt;NORMAC majority recommendation to return to a total closure and increase closure length to reduce fishing effort by 15% Some sectors dispute stock assessment.&lt;br&gt;Gear based management subject to a review by the Australian Senate.</td>
</tr>
</tbody>
</table>
2000
Senate endorse gear based management.
Gear based management enters into force in July with a built in 15% reduction in gear (about 4% in effort)
NPFAG report closures have been successful in reducing effort by 15% but stocks are still over-exploited and declining
Stock assessment opposed by northern sector of industry, they propose removing additional closures
AFMA Board and Minister write to NORMAC insisting on reductions in effort

2001
New model developed for tiger prawns and reviewed by Dr R Deriso
Tiger prawn stocks are considered to be over-exploited. In particular brown tiger prawns are less than 50% of their target level.
Minister calls meeting of fishers and local politicians to demand action
Chair of the AFMA Board advises that if NORMAC cannot reach a decision the Board will
NORMAC sets a rebuilding target for tiger prawns
NORMAC agrees to a 40% reduction in effort to take place in July 2002.


2.5 Where did management fail?

It wasn’t as if AFMA didn’t try many ways to seek a resolution to the issues. There were endless meetings and workshops (more than 20), over a dozen consultation papers and other opportunities for seeking public views, letters from the Minister and the Chair of the Board urging NORMAC for unanimous recommendations and even the employment of a professional mediator to assist industry in coming to a united view.

While the lack of agreement continued, most decisions could be avoided and those that were reached were to be implemented at some time in the future despite the continued advice from NPFAG that “significant and urgent efforts” were needed to rebuild stocks. Eventually in 1999 the Board decided that there was no possible solution other than to proceed with the introduction of gear based management without the support of some sectors of industry. The introduction of the new system included an estimated 15 percent decrease in the amount of net used in the fishery, which could be expected to give about a four percent decrease in effort (Venables, 2003).

At this point in time NPFAG still considered the stocks to be over exploited. Table 2 shows the amount of each stock compared to targets and NPFAG’s suggested reduction.

Table 2. Status of each tiger prawn stock at the end of 1999

<table>
<thead>
<tr>
<th>Species</th>
<th>$S_{1999}/S_{target}$</th>
<th>Recommended reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown tiger</td>
<td>63%</td>
<td>40%</td>
</tr>
<tr>
<td>Grooved tiger</td>
<td>82%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Source: (NPFAG, 2000)
of ecologically sustainable development and the exercise of the precautionary principle...”. However it allowed one of its most valuable fisheries to become, and continue to be, over-fished on its watch.

In looking at the causes it is important to understand that managers were strongly committed to bringing the new gear based management into being, a process which had started in 1993. A goal that always seemed around the corner. The industry members who supported the stock assessment advice also strongly supported gear based management, those that believed the assessment flawed vehemently opposed the new system of management. This set up a situation where the introduction of a new system of management and the action that needed to be taken to reduce fishing effort became inextricably linked, one could not be progressed without the other.

One of the major motivations behind considering new management arrangements was the “blunt nature” of the system in place at the time and its inflexible nature when adjustment was needed. There were concerns both within industry and within AFMA of how well such reductions could be implemented under the inflexible management system that was in place at the time. With the introduction of gear based management seeming only to be a short time away (little did they suspect it would take another 3 years to implement) a delay in action to address tiger prawn status seemed a fair compromise for progressing gear based management.

In addition to the controversy the fact that management objectives for the fishery were vague did not assist in the discussions. The lack of a definitive trigger point, decision rules and specific performance targets provided another area for endless discussion.

However, most importantly was the lack of will on the part of the agency to make a decision without unanimous NORMAC support. While AFMA’s legislation requires it to ensure accountability to the fishing industry and the community for its management decisions it does not require it to only act with the complete consensus of industry.

The reason for the lack of will to act may possibly be understood by looking at why the agency was created. AFMA was set up in 1992 in response to industry criticisms about fisheries management. Industry distrusted assessments and lack of involvement in the process of fishery management and the previous agency (the Australian Fisheries Service) was seen to be unable to resolve user group conflicts (McColl, 1996). A key tenet of the new organisation was a “partnership approach” centred around the use of MAC’s and FAG’s both with substantial industry membership to provide advice to an expertise based Board who were ultimately vested with the decision making powers. The organisation was heavily invested in making the MAC system work and every opportunity to achieve a consensus view from the MAC was pursued. This allowed those who disagreed to use their position in the MAC to delay or soften management action.

Add to this heavy political lobbying on this issue by both sectors of industry (something which was a rarity in the federal fishery management sphere at the time) and the agency was put in a difficult situation. A decision either way would result in heavy criticism and the partnership approach may be seen to be failing in just the situation it was set up to avoid.

2.6 How were decisions eventually reached?

In 2002 one of the largest ever reductions of real effort in Australian fisheries was negotiated through a unanimous agreement of NORMAC in a single meeting. The reduction, which achieved a 40 percent reduction in effort on brown tiger prawns and a 25 percent reduction in effort on grooved tiger prawns was the result of three changes.

1. Gear based management was in place. This broke the nexus between the issues allowing effort reduction to be considered only on the basis of biological need rather than as a part of a new system of management. It also meant that industry had more flexibility to adapt to the new system of management which removed some of the trepidation.
2. A meaningful recovery target for the fishery had been agreed. This removed the debate about the quantum of reduction needed.

3. There was the political will to make a decision.

This new political will was evidenced to fishers in two ways. Firstly, there was a new Minister responsible for fisheries, the Hon. Wilson “Iron Bar” Tuckey. He called the industry and their political representatives together and told them that he supported the science and wanted a decision made on reduction of effort in the fishery. He told them that he would brook no political interference in the matter (he wasn’t called Iron Bar for nothing) effectively cutting off the opportunity for political lobbying.

The second was that the new Chair of the AFMA Board attended the NORMAC meeting and told them that if it could not come up with a recommendation to reduce effort in the fishery that the Board would make its own decisions. Industry was in no doubt that this solution would be more draconian than anything they could come up with themselves.

Add to this an independent review of the assessment which removed all opportunity to criticise the assessment. After a three-day meeting, a unanimous agreement was put forward to implement a 25 percent reduction in the value of gear units in the fishery and reduce the fishing season by 13 percent.

This reduction, combined with a few years of higher than average recruitment has resulted in both species of tiger prawn being rebuilt and no longer being classed as overfished (NPFAG, 2004).

3. THE STORY REPEATS ITSELF

Unfortunately, delays in taking necessary management action in the NPF are not an isolated experience. Similar stories can be told about a number of other fisheries managed by AFMA where stakeholders have used their role in the management partnership to delay or moderate actions that are needed.

Lack et al (2003) have documented the decline of the Australian Orange Roughy Fishery. Despite warnings from 1994 that there was a potential problem, the TAC for the fishery was not reduced until 2000, and then only at a rate of 10 percent annually. Subsequently the TAC has been reduced by 50 percent. Lack et al attribute this lack of action, in part, to the inclusive approach to management which provided the fishing industry with the opportunity to defer or soften management decisions.

A similar story can also be told for the Southern Shark Fishery. Concerns were expressed about severe over-fishing of school shark from 1991. This was initially met with a one-third reduction in net allowances. This was insufficient to address the situation and SharkFAG continued to advise that the current level of effort was continuing to deplete stocks which were estimated to be between 15-25 percent of virgin levels. Industry opposed the stock assessment at every turn and further work and an independent review was commissioned. Despite largely accepting the stock assessment and a rebuilding target for the fishery at the end of 1996 there was a protracted debate about how the necessary reductions should be achieved. Each option proposed was opposed by industry. Again the process dragged on attempting to find compromise until 2000, when the Board decided in the face of industry opposition to implement quotas to the Southern Shark Fishery and substantially reduce school shark TACs (Sachse 2003). However the latest advice (BRS 2003) is that at the current level of TAC the stock cannot be rebuilt by the target date of 2011.

In the East Coast Tuna fishery the debate over the management plan for the fishery has raged since 1992. While some progress has been made on individual issues (such as seabird protection measures) industry has strongly opposed every management measure that is likely to cap effort. The draft Plan of Management is currently has under-going an unprecedented third public consultation process. It is unlikely that the Plan of Management could be implemented before 2006.
Table 3 provides a short summation of the domestically managed fisheries, which have been classed as overfished by the Bureau of Rural Science, when advice was first given that there were stock issues and when effective reductions were put in place. The Bass Strait Scallop fishery and the Eastern Gemfish fisheries have not been included. These species have been over-exploited since the 1980’s and are therefore not relevant to the issues at hand.

### Table 3. Overfished species, management advice and action dates

<table>
<thead>
<tr>
<th>Fishery</th>
<th>First advice for reduction</th>
<th>Action taken</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Warehou</td>
<td>1996i</td>
<td>2001</td>
<td>Initial reduction in 1997 but in 1998 TAC was increased above historic catch levels. Despite reductions in 1999 and 2000 ability to “carry over” quota saw no effective reduction in TAC. Even at current low levels of catch recovery is not occurring on the eastern stock.</td>
</tr>
<tr>
<td>Redfish</td>
<td>1999</td>
<td>No response yet</td>
<td>Growth overfishing occurring. Technological responses being examined in research project. Industry has refused to adopt.</td>
</tr>
<tr>
<td>Silver Trevally</td>
<td>2001</td>
<td>2002</td>
<td>Complicated by split jurisdictions. TAC has been reduced to by-catch levels of offshore fishers but substantial catches are taken inshore.</td>
</tr>
</tbody>
</table>

4. TORRES STRAIT PRAWN FISHERY

4.1 Overview of the Torres Strait Prawn Fishery

With an average annual value of about US$19 million the Torres Strait Prawn Fishery is much smaller than its valuable neighbour. The fishery produces an average annual catch of 1 700 tonnes taken with 76 otter trawlers. However few vessels fish exclusively in the Torres Strait and 17 of the boats also fish in the NPF (Anon 2004).

The fishery is restricted to a relatively small area of the TSPZ (approximately 8 000 square km or 20 percent of the area of the TSPZ). These fishing grounds are bounded to the west by the Warrior Reef complex, the east by the reefs surrounding Darnley Island, the north by the border of the TSPZ and the south by the border of the ‘outside but near’ area. The main fishing ground is to the east of the Warrior Reef complex with a focus around Yorke Islands (figure 3).

![Figure 3. Location of the TSPF and trawl closure areas](image)

To allow boats to stay on the fishing grounds for the whole fishing season they are supported by a system of independent carrier boats or “motherships”. The motherships transport the catch to port and reprovision the boats.

The majority of the catch is made up of brown tiger and blue endeavour prawn prawns. Because of the absence of major river systems banana prawns are not found in the Torres Strait.

4.2 The Torres Strait and the Treaty with Papua New Guineas (PNG)

Torres Strait Islanders are a unique group of indigenous people within Australia. They are island people with a strong cultural connection to the sea and a dependence on it for their survival. Much of their custom and tradition have survived European settlement (HRSCATSIA, 1997).

The northern islands of the Torres Strait are within five kilometres of the PNG mainland and there has always been interaction between the people of the Torres Strait and those of PNG.
In 1985 Australia and PNG ratified the Torres Strait Treaty. While the Treaty establishes the international border and the sharing of fisheries resources between PNG and Australia its principal purpose is to “…acknowledge and protect the traditional way of life and livelihood of the traditional inhabitants including their traditional fishing…”. The Treaty and the Torres Strait fisheries act provide stronger acknowledgment of traditional fishing rights that have currently been granted to other indigenous people in Australia.

To give effect to the provisions of the Treaty three prawn fishing licences have been set aside for islanders. However, because of economic and social issues the licences have never been activated.

In the 1990’s an important part of Australian history was initiated in the Torres Strait by Eddie Mabo. Mabo successfully challenged the principle of *Terra Nullius* that had existed, and established traditional ownership and indigenous land rights. There is currently a claim for large areas of the sea in the Torres Strait before the courts.

The Treaty also provides for each party to access the other waters. Under the Treaty each party is entitled to 25 percent of the allowable catch in the other’s side of the Protected Zone. To give effect to this provision there is a bilateral agreement which allows seven PNG vessels access to Australian waters for prawn fishing. There has been a small amount of fishing on these licences.

### 4.3 Management Arrangements

There is no statutory management plan in place for this fishery. The fishery is managed through a series of notices and conditions placed on annual licences. Licences and their conditions are granted at the discretion of the PZJA. They can be revoked or varied at any time.

The main management tool is a form of individual transferable effort units. Each fishing operator is allocated a number of days of fishing time on their licence. The days are tradable but there are restrictions and forfeiture provisions. These provisions have seen very limited adjustment in the fishery.

In addition, fishing gear is limited with a maximum headline length applying to nets and a series of large area closures in place, which protect particularly sensitive areas such as seagrass beds and juvenile habitats.

To protect by-catch species and important charismatic mega-fauna the use of Turtle Excluder Devices (TEDs) and By-catch Reduction Devices (BRDs) are mandatory throughout the fishery. A series of by-catch limits also apply on a number of important species.

### 4.4 Consultation mechanisms

The consultative structure in place for the fishery has provided an opportunity for a range of stakeholders, in particular the fishing industry, to provide input to the PZJA decision making process. In 2002 the PZJA established a new consultative structure of advisory bodies which allows for greater participation from Islander representatives at all levels of the consultative process. Islander representatives, together with industry and government representatives, now actively participate in the development of management arrangements (Figure 4).

The Prawn Working Group (PWG) provides much the same role as a MAC in the AFMA consultative structure the key difference being that there are no environmental members on the committee. Also the absence of a suite of sub-committee to deal with specific issues limits detail consideration of these issues and limits discussion to the membership of the PWG.

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78 There have been difficulties in islanders reaching agreement on how these licences should be allocated amongst themselves.

79 There are some small areas where the provision is for 50/50 sharing.
There is only a single Scientific Advisory Committee (SAC) for all of the twelve Torres Strait Fisheries. Industry and Islander membership is restricted to two and three representatives respectively. This means that the group is not able to deal in detail with issues affecting the prawn fishery or to provide stakeholders with the same opportunity for input into the assessments. To try to resolve this gap some open stock assessment meetings have been held, but without a core group of people and the ability to undertake inter-sessional dialogue the process has not been as successful as a formal Fisheries Assessment Group (FAG) could be.

4.5 Why has the TS prawn fishery survived?

There are three factors which has kept effort in check in the fishery:

1. the failure of PNG and TSI to take up their entitlements;
2. the economic considerations: catch rates drop off severely towards the end of the season and all boats have access to other fisheries; and
3. the number of boats was cut back early before they started fishing there.

For the early part of the fishery the first two of these factors, together with a closure of the important nursery grounds, were enough to sustain the fishery. However, in the late 1980’s the scene for prawn fishing in Australia was changing.

In the early 1980’s Australia had decided to support its ailing ship building businesses by providing a ship building bounty. For each boat built in Australia over 23 metres the Federal government met
25 percent of all the costs of construction. Combined with other tax advantages it became an attractive proposition for NPF operators to build a new boat rather than spend money maintaining and upgrading older vessels. However, these older boats were then sold off or redeployed into other fisheries, in particular the Queensland East Coast fishery, which was an open access fishery at that time. This fishery clearly could not withstand the increased fishing effort. Several boats also entered the Torres Strait fishery.

In December 1985 entry was limited in the Queensland fishery and a program was set up to reduce the number of boats. This was achieved by encouraging operators to amalgamate multiple smaller boat licences into a single licence for a larger vessel. This program was very successful and resulted in a dramatic decrease in the number of licences and vessels (Glaister, 1993). However, once again a number of serviceable small trawlers were becoming available and were looking for new fishing opportunities.

At the same time the NPF embarked on the first of its buyback schemes. This scheme was aimed at removing boats from the fishery to decrease fishing pressure on stocks and increase returns to those who remained in the fishery. Again this resulted in a number of serviceable boats who had been paid handsomely by the government to exit one fishery to seek other fisheries for their boats.

The easiest target was the adjacent Torres Prawn Fishery. While the entry to the fishery had been limited early in 1985 the criteria for access was so broad that 500 boats had licences and a further 500 more remained eligible to obtain a licence (Anon, 1987). However, only 130 of these boats had ever fished in the fishery.

At that time the fishery was considered to be fully exploited and increases in effort where not acceptable either biologically or economically. Seeing the potential for large increases in effort to occur quickly the Ministers acted decisively. Without any consultation they implemented new eligibility criteria designed to reduce the number of boats to those who had actively fished and were economically dependent on the fishery.

Clearly, a consultation process which would have involved those with a deliberate interest in holding the door open for themselves to gain access to the fishery would have taken time, enough time in fact to allow new entrants to the fishery. While the ability to impose retrospective access rules applies so does a system of appeal on the grounds of individual circumstances. At that time review bodies were generous in their treatment of those who had joined fisheries late.

Since the 1990’s a more inclusive and consultative approach to management has been adopted in the Torres Strait. This has resulted in some of the same difficulties that have been experienced in other fisheries.

In 2002 a new stock assessment was developed for the brown tiger prawn stocks in the TSPF. The assessment advised that the level of effort was too high and unless it was reduced the brown tiger prawn stock would become over-exploited. This advice was opposed by industry. As a compromise position managers agreed to commission an independent review of the science by a person agreeable to both sides. The process to agree on a person to undertake the review took more than six months.

During this period PNG and Torres Strait Islanders signalled that they intended to take up their access to the fishery in the near future adding further momentum to the need to reduce the effort in the non-islander commercial sector.

The review was completed in October 2003. It indicated that the conclusions of the assessment were sound but some suggestions were made for improvement (Die, 2003). A majority of these improvements have now been completed and the advice is largely unchanged: a reduction in effort is needed to ensure that the fishery does not become overfished (Turnball, 2004).
PWG have met to consider the issue three times and no compromise agreement has been able to be reached. The PZJA had proposed a system of progressive reductions in the fishery over a period of 4 years and had intended to make a decision on effort levels in the fishery at a meeting in January 2004 but a series of elections prevented the meetings from going ahead.

Industry has been lobbying federal politicians seeking a government funded buyback scheme to at least in part meet the needed reductions. Industry have put forward the view that the entitlements of Islanders and PNG have never properly been allocated and therefore, the government should purchase existing licences to cover the activities of these groups.

There is a divergence of views as to the nature of the access rights in the fishery. Industry believes that they are secure and can not be altered or varied without due compensation. However, legal advice is that the annual licences are granted at the pleasure of the PZJA and they have the power to revoke, alter or refuse to renew licences and without any need for compensation (Menham, 2002).

Federal government agencies are currently investigating a scheme to remove Islander and PNG entitlements in return for some compensation. This would require a renegotiation of the Treaty between Australia and PNG. Until the investigations have been completed the government has decided that no further action should be taken to reduce effort by non-indigenous commercial fishers in the TSPF. It is therefore unlikely any reductions in effort will be made in the fishery until 2006. Current advice is that the fishery will be classed as over-fished in 2005 (O’Neill 2004).

5. CONCLUSION

The northern prawn fishery has long been held up as a paragon of a well managed fishery and in many ways it is. However, getting all the best practice processes in place does not guarantee good fisheries management results. Likewise a sustainably managed fishery does not indicate that the decision making framework is right. There could be as much good luck as good management.

The essential element of any management framework is the will and courage to make decisions when advice is provided, even in the face of considerable opposition.

Of course the involvement of stakeholders in fisheries management process is important and acts to ensure that in most cases rational, practical outcomes are achieved but it does not come without its costs and risks. The process is open to being used to reduce impacts on industry or delay decisions. This is particularly so when the decisions being taken involve, the allocation of access rights or a reduction of access.

Co-management systems can work, and work well, but it is important that the system is set up correctly. The co-management body must be given clear objectives, boundaries and performance indicators and trusted to act responsibly within those. It must also be in no doubt that if it fails to act within these guidelines that the responsible agency will act swiftly.
## APPENDIX 1

**COMPARISON OF THE FISHERIES AGAINST THE “PATHS TO SOLUTION” FROM THE MAURITIUS MEETING**

<table>
<thead>
<tr>
<th></th>
<th>NPF</th>
<th>TSPF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rights</td>
<td>✔✔✔✔✔✔</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Yes, statutory long term rights. Banks and third parties able to register a lien</td>
<td>No, annual licences granted at Ministers pleasure. No system to record third party interests</td>
</tr>
<tr>
<td>Transparent, participatory management</td>
<td>✔✔✔✔✔✔</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Yes, stakeholder involvement in management, science and compliance. Fishers bear costs of management</td>
<td>Process in place for involvement in management but little involvement in science. Decision made by a Ministerial council.</td>
</tr>
<tr>
<td>Support to science</td>
<td>✔✔✔✔</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Yes, industry contributes about 1% of GVP to science. Increases ability to attract substantial matching funds. Industry involvement in science projects.</td>
<td>No, only government contributions. Resources shared between 15 TS fisheries.</td>
</tr>
<tr>
<td>Support to enforcement</td>
<td>✔✔✔✔</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Yes. Industry contributes about 0.5% GVP.</td>
<td>No, limited resources presently diverted to preventing IUU for other fisheries.</td>
</tr>
<tr>
<td>Benefit distribution</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>No, some licences set aside for Islanders but costs and social issues have prevented them being used</td>
</tr>
<tr>
<td>Integrated policy</td>
<td>✔✔</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Yes for biological objectives Economic objectives under discussion No for social objectives</td>
<td>No, one explicit social objective but not enacted</td>
</tr>
<tr>
<td>Precautionary approach</td>
<td>✔✔</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Yes, legislated requirement</td>
<td>No</td>
</tr>
</tbody>
</table>

REFERENCES


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80 House of Representative Standing Committee on Aboriginal and Torres Strait Islander Affairs


Wallner, B. 2004. AFMA, Personal communication, 23 August.
The factors causing unsustainability in fisheries have been examined in two recent FAO workshops. Numerous examples have been presented illustrating many of the consequences of unsustainable practices in fisheries. Namibia supports a large industrial fishery, its character being similar to many of the world’s industrial fisheries. Due to good management practices (internalities) and fortunate circumstances (externalities), Namibia has developed a fisheries management regime that, according to our perceptions of fisheries management, should enable the recovery of its depleted stocks and then provide for long-term sustainable harvests. However, Namibia’s success has been mixed. The status of some of the economically important stocks has undoubtedly improved, while others seem to have remained stable. However, several stocks, especially sardine *Sardinops sagax* and anchovy *Engraulis capensis*, have declined to such low levels that they can now be considered “collapsed.” Additionally, the recently discovered orange roughy *Hoplostethus atlanticus* stock declined in just a few years such that the current catch levels are barely economically viable.

This paper presents Namibia as a case study, briefly illustrating some of the important aspects of the fishery that should have contributed to successful management. It then examines several of the main factors that are considered to have contributed to the recent declines of the sardine and orange roughy fisheries and an attempt is made to ascertain what more could have been done to ensure the sustainable utilisation of these fish stocks.

It is shown that despite achieving most of the factors that promote sustainable utilisation of fish stocks, long-term sustainability is not guaranteed. It is concluded that if conventional fisheries management has had limited success in Namibia, then the chances of sustained success elsewhere are unlikely.

1. **INTRODUCTION**

Fisheries management has evolved during the past century from the initial belief that it would be impossible to fish down the apparently inexhaustible abundance of fish in the oceans, to the current realisation that around 70 percent of the world’s fish stocks are either fully or over-utilised (FAO 1997). Despite the plethora of examples of declining fish stocks, there is still no clear agreement on the causes of overfishing, nor on the solutions.

Due to good management practices and fortunate circumstances, Namibia has developed a fisheries management regime that, according to our perceptions of fisheries management, includes many of the recognised “good practices” that should contribute to a sustainable fishery (Swan and Gréboval 2003). Such a management system should have enabled the recovery of Namibia’s depleted stocks to levels that would provide for long-term sustainable harvests. Despite this, Namibia’s success has been patchy at best. Some stocks have recovered, but others not. Indeed, several of the stocks have declined in abundance and are in a more depleted state than at Independence in 1990, when the current fisheries management regime was implemented.

The views expressed in this paper are solely those of the authors, David C. Boyer and Helen J. Boyer, Somerset, UK, and Witwatersrand, South Africa, boyer@orchardfarm.wanadoo.co.uk.
This paper takes Namibia as a case study, focussing primarily on two of the stocks that have declined in abundance: the sardine and orange roughy stocks. Throughout the paper the format of the previous FAO workshops on *Unsustainability in Fisheries* has been followed, dealing with the various aspects under the generic headings: bio-ecological, institutional, economic and social factors (Gréboval 2002, Swan and Gréboval 2003). The Namibian fisheries management system is largely based upon the use of economic incentives and penalties to encourage compliance; hence the institutional and economic factors that affect the sustainability of our two case-study species are dealt with together.

**Figure 1.** Namibia, showing the geographic features mentioned in the text

2. **BRIEF BACKGROUND TO NAMIBIAN FISHERIES**

Marine fishing in Namibia is a relatively young industry. Colonisation by Europeans occurred in the late 19th and early 20th centuries, later than most of the African continent, largely due to an arid and hostile natural landscape that appeared to have little to offer. Prior to this, few indigenous people visited the desolate coastline and although there are fascinating accounts of how small bands of nomads subsisted on shellfish and shallow water fish, their harvests can be measured in kilograms rather than tonnes. During the 19th century European and North American sailors plundered Namibia’s rich seal and guano resources from several small offshore islands, and whales in the open ocean (Shaughnessy 1984), but again, these were rather isolated events that, despite the devastating impact on the exploited populations, had a limited impact on the marine system as a whole.

Even after the colonists arrived, fishing largely remained a subsistence activity. The coastline offered little shelter and the riches that were to be harvested later in the century remained undiscovered. Between the two World Wars a small snoek (*Thyrsites atun*) fishery was attempted, apparently with some promising results (Lees 1969). Not least of these were some large catches of sardine; a portent of the riches hidden below the waves. World War II put an end to these activities, but on the resumption of peace a new type of fishery developed along the coast of south western Africa, employing all the technological advances of the day. Large mechanised vessels, hydraulic winches hauling synthetic nets and acoustic fish-finding equipment all entered the fishery in the 1950s and 1960s, enabling fishers to harvest ever greater catches. By the early 1950s sardine catches had risen to around a quarter of a million tonnes per annum, and by the late 1960s this fishery became one of the largest the world had ever seen, or is likely to. Official landings peaked at 1.4 million tonnes in 1968, but with discards and illegal
landings included, catches probably exceeded 2 million tonnes. This led to one of the most spectacular crashes witnessed within fisheries world-wide as catches declined to just 300 000 tonnes three years later and despite a small recovery in the mid-1970s, the fishery was reduced to a by-catch of just 12 000 tonnes in 1980.

Throughout the 1960s, as the fish stocks in their own waters were becoming depleted, a number of deepwater fleets from Europe and the Soviet Bloc countries relocated to Namibian waters, targeting first the abundant horse mackerel *Trachurus capensis* stock and then hake *Merluccius capensis* and *M. paradoxus*. By Independence, in 1990, it is estimated that 20 million tonnes of these valuable fish had been caught in Namibian waters, with hardly any benefit accruing to the Namibian nation (Nichols 2004).

Political Independence in 1990 was a watershed for fisheries in Namibia, as indeed it was for all facets of life. The control of this once valuable resource was at last vested in Namibian hands, and an aggressive policy to promote the recovery of the resources to previous levels, and in particular the prosperity of the industry, was implemented. The policy was also designed to ensure that Namibians would benefit to the fullest possible extent.

At Independence the newly elected government inherited a number of commercial fish stocks that were severely over-fished. In terms of fisheries management the authorities were in an enviable situation of being able to initiate a new management regime with few of the historical, social and political constraints that so often inhibit policy changes (Boyer and Boyer 2003). Realising the potential value of fisheries to the young post-Independence economy, the government implemented policies to re-build the fish stocks. This led to the enactment or reform of a number of Acts that sought to conserve Namibia’s natural resources, while promoting their sustainable utilisation (MFMR 1992, 2000). With support from foreign donors, biological research was initiated, an effective monitoring, control and surveillance (MCS) regime was implemented and a legal framework to facilitate these initiatives was enacted. This legal framework and the policies, upon which it is based, incorporate many of the international fisheries management instruments (Boyer and Boyer 2003) and this gained widespread praise internationally (MFMR 2002).

Large increases in stocks were expected (MFMR 1991) and the status of some of the economically important stocks has undoubtedly improved, notably rock lobster *Jasus lalandii* (Grobler and Noli-Peard 1997), monk *Lophius vomerinus* (Maartens and Booth 2001) and hakes (Boyer and Hampton 2001). For example, between 1990 and 2000, the TACs of hake increased from 65 000 tonnes to almost 200 000 tonnes, monk from 5 000 tonnes to around 12 000 tonnes and rock lobster from 100 tonnes to 450 tonnes, although the increasing preponderance of small hakes in landings and the inability of the industry to catch the lobster TAC is causing some concern at present. The biomass of several other stocks seems to have stabilised close to their maximum sustainable yield levels, although their precise status is debated (e.g. horse mackerel, Boyer and Hampton 2001, and crab *Chaceon maritae*, Le Roux 1997).

At the beginning of the third millennium Namibian fisheries had two major fish stocks that despite apparently responsible management were considerably below their potential and were in an even worse state than 10 years previously. These were sardine and orange roughy (Boyer and Hampton 2001). The following sections investigate the assessment and management of these two stocks in an attempt to understand which actions, or lack of action, may have contributed to the declines of these stocks. A third stock that has also declined in abundance in recent years, anchovy, has frequently supported annual catches in excess of 100 000 tonnes. This species is not dealt with here as it is not managed; in itself a cause for concern.
2.1 The sardine and orange roughy fisheries

2.1.1 Sardine

As noted above, Namibia’s sardine stock has yielded some of the largest catches ever seen, although at Independence in 1990 the sardine fishery had suffered more than a decade of catches averaging around 50 000 tonnes. Several years of good recruitment saw the stock size increase to around 750 000 tonnes and consequently TACs increased to over 100 000 tonnes in the early to mid 1990s. The stock then declined again to below 500 000 tonnes, and in some years to considerably less, and catches decreased accordingly. Despite the reduced catches, the stock was in such a poor state that a moratorium was announced for the 2002 season, although good recruitment in that year saw a small TAC allowed for 2003 (Fig. 2). Various reports deal with the history of this fishery, notably Beckley and van der Lingen (1999), Crawford et al. (1987), Cram (1981), Thomas (1986), Boyer et al. (2001a), but, with the notable exception of Cram (1981), these focus almost entirely on biological aspects of the state of the stock and dwell little on the economic consequences of management actions.

![Figure 2. Sardine catches from Namibian waters since the start of the fishery (left panel), with the period since 1990 expanded (right panel)](image)

2.1.2 Orange roughy

Exploration for orange roughy started in Namibia in 1994 and within 12 months several aggregations had been discovered, suggesting the existence of a biomass sufficient to support a viable fishery. During the next seven years the orange roughy fishery went through a three-year exploration phase, several years of profitable exploitation, and then a severe decline in catch rates. Catches peaked at over 15 000 t in 1997, but in recent years have been less than 2 000 tonnes per annum (Fig. 3). Whether this decline is a result of over-fishing, habitat alteration or disturbance of the spawning aggregations (Boyer et al. 2001b) is still unclear.

![Figure 3. Orange roughy catches from Namibian waters](image)
2.2 External factors affecting the sustainability of Namibian fisheries

All fisheries operate within a set of factors that are outside of the control of the fisheries management authorities: externalities. The Namibian fishing sector is fortunate in that many of the externalities that define the environment within which the sector occurs would seem to promote the likelihood of successful sustainable utilisation.

2.2.1 Bio-ecological

The Benguela upwelling system supports some of the highest levels of productivity in the world (Hutchins 1992). It is a relatively simple ecosystem with few trophic levels, each species having relatively straightforward interactions with other components of the system (Bianchi et al. 2004), and comparatively little seasonality (Cole 1997). Thus the dynamics of the system are considered to be somewhat less complicated than those of many other ocean systems, and hence comparatively easier to understand, monitor and manage.

A further factor that simplifies the management of the fishery relates to the political boundaries of the system. Environmental conditions close to Namibia’s two maritime borders form natural barriers that limit the migration of many fish stocks, especially pelagic species (the Lüderitz upwelling cell in the south and the Angola-Benguela Front in the north, Agenbag and Shannon 1988, Shannon 1985). Thus many of Namibia’s fish stocks are either not shared or only shared to a limited extent. Similarly, most fish stocks occur within 100 nm or so of the coast, well within the limits of the exclusive economic zone (EEZ) and are therefore not straddling stocks. Hence, the complicated, and often ineffective, international management arrangements that seem so often to contribute to the unsustainability of national fisheries are not as important in Namibia.

2.2.2 Economic and institutional

The economic and institutional environment within which the fisheries sector operates has several important characteristics that would seem to support the development of sustainable fisheries.

The Namibian constitution, which was implemented in 1990, was the first in the world to provide for the sustainable utilisation of natural resources based on scientific principles (Brown 1996). This has provided the basis for the promulgation of clear and robust legislation to facilitate fisheries management, and complimented with a strong and effective MCS, enables the courts to seriously punish transgressors.

Economically, fisheries in Namibia are one of the most important industries, accounting for 25 to 30 percent of exports and about 10 percent of GDP. The industry is one of the major employers in the country and as mining, Namibia’s other key industry, declines in importance, long-term projections indicate that fishing will attain even greater prominence in the future. Therefore the government has identified this industry as key to the economic success of the country and has placed great importance on developing a vibrant and sustainable industry.

In contrast to many developing countries, the fishing industry is composed of a few large industrial companies and no artisanal fishers. This allows for a relatively simple management model. Similarly, the country has only two harbours and therefore landings are relatively easy to monitor.

2.2.3 Social

These biological, economic and institutional factors are supported by several social factors that would also seem to promote the development of a long-term sustainable fishing industry. Not least of these is the fact that Namibian fisheries management started with a clean slate in 1990 at Independence. The
authorities were able to design a completely new fisheries management system with few of the historical cultural, social and political encumbrances that new policies so often have.

Additionally, the leaders of the country were politically very strong and therefore able to take unpopular but necessary decisions with impunity, i.e. they could plan beyond the time-frame of the next elections.

### Table 1. Summary of the externalities affecting Namibian fisheries

<table>
<thead>
<tr>
<th>Bio-ecological</th>
<th>Institutional-economic</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly productive, ecologically simple system</td>
<td>Constitution requires sustainable utilisation</td>
<td>Few historical or social constraints, easy to make policy changes</td>
</tr>
<tr>
<td>Few shared or straddling stocks</td>
<td>Economically valuable, therefore sustainable utilisation important</td>
<td>Strong government</td>
</tr>
<tr>
<td></td>
<td>Few large companies, no artisanal fishers; hence relatively simple management structure</td>
<td></td>
</tr>
</tbody>
</table>

#### 2.3 Internal factors designed to promote the sustainability of Namibian fisheries

The Namibian fisheries policy is similar to the policy of many industrial fishing nations, namely: to promote the utilisation of the living marine resources on a sustainable basis for the benefit of the nation, and to manage these fisheries based on scientific information and principles. Furthermore, Namibia has implemented a fisheries management system that incorporates many of the accepted best-practices as outlined in the major international fisheries conventions. Some of the major factors of this system are summarised below.

##### 2.3.1 Bio-ecological

Obviously the biology and ecology of the northern Benguela ecosystem are outside of the control of the authorities and therefore are considered externalities. However, understanding the system and developing the ability to manage the fish stocks within the dynamics of the system can clearly be affected by the authorities. To this end, a small but effective research unit was established at Namibian Independence and has been well-supported, both financially and logistically, since then.

In order to pay for this research effort a research levy on all catches is paid into a research and training fund. This tends to be sufficient to support basic monitoring of the major fish stocks during “normal” or “good” years. However during periods when stocks are depressed, and TACs are reduced, the income to the fund is also reduced, at a period when research may be most required.

While much of the research information collected prior to Independence was lost as distant-water fishing nations withdrew their vessels and research programmes, close co-operation with marine biologists from neighbouring South African institutes has provided support for local research. In addition, substantial development aid was received from several of the world’s leading fishing nations, partly in the form of material aid, but primarily in terms of training and more recently cooperative research. Hence considerable effort has been expended to track and predict the dynamics of the commercially important fish stocks, although as noted below (Section 3) much remains to be done.
Two further initiatives that are expected to have a significant impact on the fisheries management of the region are the BENEFIT\textsuperscript{82} and BCLME\textsuperscript{83} Programmes (BCLME 2002). These two programmes are complimentary research activities investigating the biological, social and economic framework within which the marine fisheries of the countries bordering the Benguela ecosystem operate. The ultimate goal of these programmes is to enhance all aspects of the management of this system.

2.3.2 Economic and institutional

Good governance is a prerequisite for sustainable fisheries. Namibia was perhaps even more aware of the necessity for good governance of fishing activities as the newly-elected government in 1990 inherited fish stocks that had been systematically depleted throughout the preceding decades. It is estimated that of the 8.6 million tonnes of hake caught in Namibian waters prior to Independence, only 0.004 percent of the value found its way into Namibia (Nichols 2004). One of the first acts passed after Independence was the proclamation of the 200 nm EEZ, demonstrating the importance attached by the government to responsible management of the marine region. This was followed in 1992 by the Sea Fisheries Act that was drafted for this newly established coastal state to take full control over its own resources and to build up Namibian involvement in the industry (MFMR 1992). Subsequently Namibia has signed various international fisheries management instruments that placed new obligations on the government that were not covered in the 1992 Act. Hence, in 2000 a revised act succeeded the original one, incorporating the key elements of these instruments (MFMR 2000). Thus, in terms of fisheries management, Namibia has adopted much of the important internationally accepted management legislature, with necessary adjustments for the particular circumstances of the country.

Concurrent with the development of the legislation to manage fisheries responsibly, Namibia’s MCS system was developed. This is based on having observers on all but the smallest fishing vessels to monitor compliance and collect vital research data, sea patrols to enforce compliance and air patrols to detect unlicensed vessels. Transhipments at sea are not permitted and all landings are monitored at the two commercial fishing ports, while discarding of valuable by-catch species is not permitted. The by-catch of non-target commercial species is limited through by-catch levies which are high enough to discourage targeting on such species, but not so high as to encourage discarding.

Of the total landings more than 90 percent come from total allowable catch (TAC) controlled stocks, which are issued as individual non-transferable quotas. These TACs are based on scientific recommendations, recommendations which are followed to a remarkable degree by managers. Effort controls are also used in an attempt to prevent over-capitalisation. These are implemented through limited long-term vessel rights, the period of the right being largely determined by the level of Namibianisation of the vessel (see below). Additionally, none of the Namibian fisheries are subsidised, hence market forces largely control the efficiency of the various participants.

As a result of these developments, Namibia has gained a reputation for having one of the more effective governance systems (Nichols 2004). However, the cost effectiveness of any management system is a fairly subjective judgement. While some countries boast a positive management cost: income ratio for individual sectors of their fishing industry, Namibia is one of the few fishing nations that has a positive ratio for the entire industry (Wiium and Uulenga 2003).

The cost of Namibia’s observer scheme is paid directly by the industry, while research is largely supported through levies on catches. Quota levies are also extracted, and have to be paid up-front, i.e. in advance of the fish being caught. This is the main form of resource rent that the fisher pays to the state for the right to harvest these fish. The levy is set at approximately 15 percent of any expected profit, thereby representing a high level of rent (Wiium and Uulenga 2003). The requirement that this levy is paid up-front encourages fishers to utilise the resource which they have been allocated and acts to deter inefficient operators. The overall cost of the Namibian management system has been estimated at around

\textsuperscript{82} BENEFIT is the Benguela Environment Fisheries Interaction and Training Programme.

\textsuperscript{83} BCLME is the Benguela Current Large Marine Ecosystem Programme.
6 percent of the landed value of the fishery for most years since Independence, although as TACs and fish product value have increased in recent years this had declined to 3.6 percent in 1999.

Lack of co-operation between states has been identified in some regions as a primary cause of overfishing, e.g. in European Union waters (Payne and Bannister 2003). This is largely avoided in Namibia because, as noted earlier, most fish stocks are only shared to a limited extent, if at all. Namibia’s neighbours, Angola and South Africa, have been supportive and co-operative, providing assistance in the apprehension of illegal fishers, sharing of data, etc., despite the only formal bilateral agreements being Memoranda of Understanding to co-operate in fisheries research.

Furthermore, the Namibian fisheries authorities have recognised the importance of regional cooperation and have played a central role in the formation of several international and regional agreements. The most important of these as far as fisheries management within EEZs is concerned is the South African Development Community (SADC) Protocol on Fisheries, which was signed in August 2001 by the 14 SADC members, although to date it, has not yet been ratified by all. Within fisheries research, the BENEFIT and BCLME programmes have been key developments and again Namibia has played a leading role, both in the initiation of these programmes and in their continuation.

Another recent agreement, the Convention on the Conservation and Management of Fishery Resources in the South East Atlantic Ocean was signed in April 2001 by Angola, the European Community, Iceland, Korea, Namibia, Norway, South Africa, UK (in respect of St. Helena and its dependencies) and USA. This convention aims to ensure the long-term conservation and sustainable use of high seas fishery resources and straddling stocks in the convention area (excluding tunas, which are covered by ICCAT), through the establishment of the South East Atlantic Fisheries Organisation (SEAFO). Indeed, this is the first regional fisheries management organisation established in terms of the UNFSA (Doulman 1999, Nichols 2004).

2.3.3 Social

Namibia has a long history of social injustices prior to Independence (Iyambo 2004) and in an effort to redress the inequities of the past; the policy of Namibianisation has been introduced to many facets of life. The fishing sector is a classical example of these inequalities, whereby prior to Independence the industry was largely owned and managed by foreigners, with some limited participation of white Namibians. The black Namibians that were part of the industry held lowly jobs, mostly as seasonal workers in on-shore fish processing plants. The Namibianisation policy encourages the participation of “previously-disadvantaged” Namibians in the fishing industry, both at the ownership and management levels and in the provision of jobs for workers, both on shore and at sea.

The participation of Namibians is promoted at all levels of the industry. Licences are issued preferentially to vessels that are owned and crewed by Namibians, and the largest quotas are given to companies that own vessels, process fish on land (thereby providing employment opportunities for Namibians) and support welfare and other social causes. In addition, rebates on catch levies are offered according to the level of Namibian involvement. These equate to 25, 50 or 75 percent of the levy depending on the level of Namibianisation and as such form a strong incentive for companies to Namibianise. This policy has seen a major structural rearrangement of the industry, which in itself has facilitated the introduction of new initiatives. See Oelofsen (1999) and Boyer and Hampton (2001) for more details.

Finally, mention must be made of the HIV/AIDS pandemic that has hit Namibia harder than most countries, where national infection rates are currently estimated to be greater than 20 percent and in coastal towns closer to 30 percent and rising (UNAID/WHO 2004). Fishing communities often suffer higher infection rates than other sectors (Allison and Seeley 2004) and hence it can be expected that this will have a profound impact on Namibia’s fishing and ancillary coastal industries. While some laudable efforts have been made by the authorities and fishing companies to reduce infection rates, the lack of planning to mitigate against the severe economic and social impacts of the disease is alarming.
Table 2. Some internalities that affect the Namibian fishing industry

<table>
<thead>
<tr>
<th>Bio-ecological</th>
<th>Institutional-economic</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective national research component</td>
<td>Development of effective legislature and fisheries management policies</td>
<td>Policies developed to address past social injustices, notably Namibianisation</td>
</tr>
<tr>
<td>Research supported by foreign countries</td>
<td>Implementation of recognised fisheries management instruments</td>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>Development of regional research programmes</td>
<td>Implementation of effective (and cost-effective) monitoring, control and surveillance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Authorities have actively promoted regional cooperation</td>
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</table>

3. FACTORS CONTRIBUTING TO THE DECLINE OF THE SARDINE AND ORANGE ROUGHY STOCKS

The previous section suggests that, due to the circumstances within which the fishing industry operates, and the policies introduced by the authorities, the management of marine fish stocks in Namibian waters would be more likely to be successful than in many regions of the world. As noted in the Introduction, contrary to this assumption two of the stocks, sardine and orange roughy, have declined in abundance, and consequently catches have fallen. This section highlights some of the factors that contributed to these declines, comparing factors that are common to both, and are hence likely to be of importance to other fisheries. This is particularly pertinent as these species are in many ways at opposite ends of the range of life-history strategies exhibited by fish and therefore it would seem that they have little in common. Sardine is short-lived and highly fecund, while orange roughy are extremely long-lived with a very low reproductive potential. Sardine occur in highly productive, near-surface coastal waters, while orange roughy are meso-pelagic/demersal, occurring at great depths where productivity is low and nutrient cycling is extremely slow. These differences, and the similarities between the two species, make it especially illustrative to consider why these two species in particular have fared so badly in Namibia.

3.1 Bio-ecological factors

3.1.1 Shoaling behaviour

One common biological feature of sardine and orange roughy is that both form dense shoals that facilitate, amongst other things, their capture by commercial fishers. Densely shoaling species often remain profitable to harvest, even when stocks are severely depressed, as the CPUE remains high even at very low stock sizes. Therefore there is a risk of the fishery becoming biologically unsustainable before it reaches economic unsustainability.

This factor becomes particularly important if the dynamics of the stock are poorly understood or not closely monitored. The consequence of this high catchability is evident in a number of the sections that follow, whereby we suggest that a lack of timeous management action by the authorities may have allowed the depletion of the stocks at a greater rate than would have occurred in non-aggregating species. Whether these declines could have been prevented, or at least partially alleviated, given more timeous
intervention is not clear, but given the social, economic and biological consequences in both of the fisheries documented here, there is clearly a case for taking all possible actions to reverse these trends.

3.1.2 Lack of knowledge

A considerable amount of research has been targeted at sardine over many decades, but in recent years the stock has been at such a low level that much of the accumulated knowledge has either been misleading or redundant. For example, previous spawning and recruitment relationships seem to no longer apply, hence predicting future stock levels has become increasingly difficult. This may be further compounded by changes in the ecosystem, possibly due to a regime shift, which means that much of this historical knowledge may be no longer applicable. In contrast, the dynamics of the deep waters where orange roughy are found is poorly studied and despite a dedicated programme directed at orange roughy being initiated soon after the fishery was started, knowledge of the ecology and behaviour of this species remains elusive. The high cost of deep-water marine research merely exacerbates this problem. The net result is that scientists currently have a poor understanding of the population dynamics of both species, making predictions for optimal catch levels highly uncertain.

A clear example of this is the management reaction to the decline of the sardine spawner biomass following several years of poor recruitment. Sardine is serial batch spawners with a high fecundity. Therefore, while many of the spawning products are lost the strategy of spreading spawning throughout a large part of the year, and probably throughout a range of environmental conditions, at least some will survive most years. However when a stock is reduced to a small fraction of its unfished state, and crucially to a few cohorts, as the Namibian sardine stock has been since the 1970s, the stock becomes particularly vulnerable to a number of consecutive years of poor recruitment. Twice during the 1990s the Namibian sardine stock suffered several years of poor recruitment. However, as neither egg, larval nor juvenile fish numbers were monitored, the subsequent decline in abundance was only detected in surveys of adult sardine once they had reached maturity. Initially it was not clear if this decline was simply due to survey variability or was in fact real. Thus it was only after several more surveys that the decline was “confirmed”, which was almost two years after the decline started. As a result of the uncertainties in predicting recruitment levels, the reaction of management lagged behind the dynamics of the stock, allowing fishing mortality to remain high during periods when the stock size was decreasing, thus exacerbating the situation. In contrast, potential yield was also forgone during periods of increasing stock size as the TACs were still set for the preceding poor periods.

Another example comes from the orange roughy fishery. The behaviour of orange roughy was, and still is, poorly understood. In 1998 and 1999 when the acoustic surveys recorded a considerable reduction in the abundance of orange roughy on the fishing grounds, a number of hypotheses were proposed to account for this decline (Boyer et al. 2001b). The most obvious hypothesis seemed to be that the original stock size had been overestimated and hence TACs set too high and therefore the decline was directly attributable to fishing mortality. However the results of population models to test this hypothesis were inconclusive and hence management was reticent to take any remedial actions.

Other hypotheses to account for the reduction in orange roughy catches were the occurrence of a mass emigration or mortality event, or that the formation of spawning aggregations were episodic events, rather than annual as occurred elsewhere. To date no evidence to support these hypotheses has been found.

The consequence of this lack of understanding of the aggregating dynamics of orange roughy is that the management of the fishery has vacillated between the various scenarios, unable to confidently follow a management strategy that could reverse the decline in the fishery. The TAC has been set at levels that, according to several of these hypotheses, are precautionary. However, the industry has failed to catch this TAC every year since 1998 suggesting that even these TACs may have been insufficiently precautionary.
More recent information supports a fourth hypothesis; that spawning aggregations of orange roughy are easily disturbed by fishing activities and that although the total stock size remains high, the behaviour of the spawning stock (which is also the fishable portion of the stock) changes due to disturbance by fishing. This evidence comes largely from one fishing ground that was closed for several years to test this hypothesis, and after four years a dramatic increase in abundance was recorded. The ground was re-opened to fishing soon thereafter and the fish once again disappeared.

3.1.3 Uncertainties in assessment

The shoaling behaviour of both these species allows for their assessment with a combination of acoustics and trawling and this technique has been used extensively in Namibia. Acoustics, like any form of assessment, has a number of inherent uncertainties resulting in imprecise results (Boyer and Hampton 2001). As noted above with the orange roughy fishery, as a result of these uncertainties management tended to disregarded scientific recommendations until the signs were incontestable (Boyer et al. 2001a). This lack of precision has also been used by the industry to cast doubt on the scientific recommendations in an attempt to keep TACs at a high level (Boyer and Boyer 2003, Boyer and Oelofsen 2004).

This is illustrated in the sardine fishery, where scientists have recommended a spawner biomass limit reference point of 500 000 tonnes (and a target reference point of 1 000 000 tonnes). However, this level is based on a rather poorly defined spawner-stock biomass recruitment relationship and consequently while the concept of such a reference point has been accepted in principle, it has not been applied in practice. This is principally because the application of such a limit reference point would have required the immediate closure of the fishery and hence has been resisted by both management and the industry.

Due to the aggregating behaviour of both species the occasional large catch has been made even during periods when these stocks have been critically depleted. The respective industries have consequently used these catches to insist that their stock is in a healthy state and place pressure on the authorities to maintain and sometimes even increase quotas during periods of stock decline when scientific assessments clearly suggested that caution was needed.

3.2 Institutional and economic factors

Section 2 of this paper concluded that Namibia has the basis of an effective management system that provides the necessary tools for the authorities to manage fisheries sustainably. It would therefore seem that the declines in the orange roughy and sardine fisheries cannot be accounted for by a lack of fisheries management instruments. However these instruments need to be effectively applied and the following paragraphs briefly discuss several of the key institutional and economic factors that hindered the application of these instruments, and consequently may have contributed to unsustainability in one or both of these fisheries.

3.2.1 Management strategy

The principal aim of the orange roughy fishery has been to develop a profitable industry based on harvesting at a sustainable level. At the start of the fishery, a management strategy was implemented whereby a fourteen-year fishing down phase was to be followed by sustainable fishing once the stock approached the maximum sustainable yield biomass. As detailed earlier, this strategy was not successful, and the fishery declined to considerably below the MSY level in just a couple of years.

In contrast, the goal for the sardine stock has been to promote a recovery following the pre-independence years of over-exploitation. However, conflicting strategies have been implemented while attempting to achieve this. Such a rebuilding strategy implies reducing catches, or even implementing a moratorium, but at the same time the continued operation of the sardine fishery, even at very low levels, is seen as critical to safeguard employment and the prosperity of Namibia’s main harbour town, Walvis Bay.
The lack of a clear and accepted management plan in the sardine fishery means that the objective of enabling the stock to recover has frequently been superseded by the needs of the fishing industry. However, in terms of orange roughy the existence of a clear management plan, with defined goals, did little to prevent the collapse of this fishery and clearly other aspects of the management of this species were also critical to the success of the fishery.

3.2.2 Secure rights

The lack of secure rights, and hence an incentive to look after a fish stock, has been noted as a major factor leading to the unsustainability of many fisheries. The Namibian authorities have granted secure rights lasting for between four and 15 years (20 year rights are also available, but to date no one has qualified). Despite this, fishers have frequently fought for higher short-term catches at the risk of the long-term sustainability of the stock. The threat of immediate foreclosure by financial institutions during periods of poor catches has obviously taken precedence over longer-term involvement in the industry. Until such a time that financial institutions align their policies to a long-term horizon for the fishing industry, and allow the industry to plan in terms of decades rather than annually, fishers will continue to be forced to take unnecessary risks in the short-term to ensure their participation in the longer-term, assuming of course that the fish stocks survive.

3.2.3 Co-management

Fishers are often fishers, at least in part, because the form of lifestyle offers a level of independence rarely found elsewhere. Such people take poorly to top-down controls traditionally found in fisheries management (Jentoft et al. 1998), the type of control system that to a large extent is predominant in Namibia. In recent years the Namibian authorities have attempted to incorporate some sectors of the fishing industry into the management process through formal arrangements. This is partly so that they can contribute to the process, but also to increase the transparency of the management process and to ensure that the industry has a part-ownership of any decisions that are taken (Boyer and Oelofsen 2004). This involvement of the industry in the management process is seen as an important component of successful management (e.g. FAO 1995, Gréboval 2002).

The main mechanism for this process in Namibia has been through the establishment of working groups that have been formally mandated for most fisheries to participate in the collection and analysis of research data. The development of the orange roughy fishery in the mid-1990s provided the first attempt for this form of co-management in Namibia and to some extent the process has proved to be successful (Boyer et al. 2001b, Boyer and Oelofsen 2004). Working groups have since been formed in partnership with a number of other sectors of the fishing industry, although this only occurred in 2003 with the sardine fishery.

While it is perhaps premature to judge whether such a management arrangement affected the decline in the orange roughy stock, it has to be noted that the fishery declined remarkably quickly despite the close involvement of the industry in the assessment of the state of the stock. Thus, in this case, a transparent and co-operative management system seems to have provided limited benefit.

In contrast to the orange roughy fishery, the involvement of the sardine fishery in management and research has until recently been considerably less structured (Boyer and Oelofsen 2004). This has resulted in lesser acceptance of the outputs of research and the subsequent management decisions, and possibly more pressure being applied to the managers to maintain catch levels during periods when they should have been reduced (Boyer and Oelofsen 2004).

3.2.4 Precautionary approach

The precautionary approach (FAO 1995) has become prevalent in virtually all of the recently formulated international fisheries management instruments and the Namibian management authorities have stated their intention of implementing precautionary strategies. However to date this has not been done in any
formal way. Similarly the precautionary approach has been incorporated into the SEAFO Convention, although how it will be implemented is not described. There are no obvious examples of the precautionary approach being applied to the small pelagic fisheries, and a number of instances when such an approach was clearly needed. For example, in the mid-1990s, when the sardine stock was perceived to be declining, the scientific evidence was seen as inconclusive and the TAC was allowed to remain high, the consequences of which were disastrous (Boyer et al. 2001a).

Some of the orange roughy management decisions have clearly been precautionary. For example the TAC in 1998 was set considerably below the scientifically recommended level, in order that the accumulation of fishing capacity could be done gradually (Boyer et al. 2001b). Another example was the assumption that the various orange roughy aggregations were independent stocks, which were then managed separately (Boyer et al. 2001b). However, other decisions have been less precautionary, in particular the rejection of the more precautionary hypotheses to explain the observed decline in abundance of aggregating orange roughy in favour of more optimistic explanations. This allowed a small reduction in TAC in 1999 when scientific evidence suggested that a much greater reduction was necessary. Subsequently the TAC has been kept relatively high, and even increased, despite the industry being unable to catch the TAC. Similarly, the decision to reopen a closed ground within weeks of a build-up of fish being discovered, part way through an experiment to monitor the aggregating dynamics of orange roughy in the absence of fishing, was hardly of a precautionary nature.

Therefore it seems clear that a more rigorous and formal application of the precautionary approach may have at least partially alleviated the declines in both fisheries.

3.2.5 Excess capacity

Excess capacity (and consequently over-fishing) is a burning issue for many fishing sectors and globally is considered as one of the main factors causing unsustainability in fisheries (Gréboval 2002). The primary management tool of the Namibian fisheries management system is TACs and thus, in theory, controlling capacity should merely be an economic factor.

The small pelagic purse seine fleet in Namibia has declined from around 40 vessels in the 1980s and early 1990s to less than 15 vessels by the millennium in response to declining TACs. Even so, these vessels are normally active for just a few months of the year, often catching less than 10 tonnes per GRT each year. This compares to about 90 tonnes per GRT per year in the mid-1970s, suggesting that a large over-capacity still exists (Manning 2000). Similarly, most of the Namibian canning and fishmeal plants lie idle for the greater part of each year. Hence it is not surprising that great pressure has been placed on the fisheries authorities to maintain quotas at a level that allows this massive capacity to remain productive (Boyer et al. 2001a, Boyer and Oelofsen 2004).

The orange roughy fishery was initially restricted to five vessels which, given the initial indications of stock size, matched the expected catches. However, when the availability of orange roughy declined in 1998, the fishery was left with excess capacity. Pressure was brought to bear on the authorities not to reduce the catch levels too far until irrefutable evidence was available to support such a reduction (Boyer et al. 2001b), and hence TACs were kept at levels above the scientific recommendations. Similarly, the recent opening of a closed fishing ground was contrary to scientific recommendations and driven by the needs of the industry to utilise its excess capacity.

Hence, despite the Namibian system of limiting catches through output controls, it is clear that excessive capacity (caused in this instance by the declines in both of these stocks) places extra pressure on fisheries managers to maintain catches above sustainable levels.

3.2.6 Variability

Most manufacturing industries prefer to operate under a climate of stability. However, in any form of industry that deals with natural living resources a certain amount of variability is the norm. This is
exaggerated in short-lived species such as sardine, which occasionally have population changes of more than an order of magnitude between one year and the next. Hence biologically optimal harvest levels also change, both up and down, by similar levels of magnitude. The economic and social consequences of this variability are difficult to manage, and there is an obvious case for changing the TAC slowly. Unfortunately, in Namibia both industry and management have tended to focus on the better years and to regard these as the norm. Hence effort levels are set commensurate with the yields of these years, and during years of lower productivity this excess effort becomes redundant and, as noted above, pressure is placed on the authorities to maintain catches at higher levels.

3.2.7 Excessive by-catch

Excessive by-catch is recognised as another contributory factor to unsustainability in many fisheries, and the need for its control is noted in a number of international fisheries management instruments. Namibia has developed a system of economic incentives to minimise by-catch and empirical data from the hake fishery suggests that under certain circumstances this can be effective. Monk has traditionally been a valuable by-catch and prior to Independence constituted around 3 percent of the total hake fishery landings. When the by-catch levy was introduced this by-catch declined immediately by about 50 percent as a result of reduced targeting of this species (Boyer and Boyer 2003). A particularly high by-catch levy has been placed on orange roughy and the by-catch of trawlers targeting other species in the same area is virtually zero. Whether this would have been so without such a levy system is unknown. However it can be concluded that by-catch has not been a contributory factor in the decline of the orange roughy stocks.

A different form of by-catch limitation is imposed in the midwater trawl fishery to protect the sardine resource. If any catch contains sardine (or more than five percent hake or young horse mackerel) the fleet must leave that area. Similarly, if the purse seine fleet catches more than five percent juvenile sardine, the area is closed to fishing for several weeks. The industry self-regulates these closures, and monitoring by the authorities suggests a fair degree of success. However it has to be noted that unsubstantiated rumours of discarding of young sardine by purse seiners and processing of sardine into fishmeal by midwater trawlers constantly circulate in the fishery, indicating that control of sardine by-catch may not be entirely successful. Thus for the sardine fishery the level of by-catches is unknown and it must be concluded that by-catch may have played a role in the decline of the stock.

3.3 Social factors

In recent years Namibia has undergone radical social change that has affected all spheres of life. Fishing has become an important component of the national economy and now provides employment for a large number of Namibians (Boyer and Hampton 2001). There are very limited opportunities for alternative employment and this provides a strong incentive to create stable fisheries industries. However this means that measures to reduce fishing activities are difficult to implement due to the short-term losses in jobs and revenue (Boyer and Boyer 2003). Almost invariably, any attempts to reduce catches (in any sector of the fishing industry) results in pressure on the authorities to maintain catch levels in order to keep existing fishing vessels and factories operational for as much of the year as possible. This has been clearly illustrated through lobbying of decision-makers by both the companies and labour unions of the sardine industry, appealing to the authorities to support the beleaguered industry such that jobs were not lost. This included attempts to discredit the science (and occasionally the scientists themselves). The uncertainties inherent in the surveying and assessment of the fish stocks are frequently highlighted and used to undermine the recommendations emanating from this research (Boyer and Oelofsen 2004). Despite the government being particularly strong, with only a fragmented opposition, it has proved politically expedient to occasionally acquiesce to such pressures.

While the HIV/AIDS pandemic has probably had limited impact on fisheries management in Namibia to date, this disease will undoubtedly have a major impact in the future.
4. FUTURE MANAGEMENT

The Namibian authorities have, either explicitly or implicitly, been considering several alternative fisheries management approaches to the conventional single-species management system currently employed; in itself a tacit recognition that such an approach does not work. These alternatives are briefly discussed below:

4.1 Ecosystem and multispecies management

Ecosystem approaches to management, including multispecies, ecosystem and biodiversity issues, are currently being investigated in Namibia, and indeed a stated goal for Namibia’s fisheries is to establish a fully functional ecosystem health monitoring system by 2005 (MFMR 2002).

The current single species management system requires fairly detailed comprehension of many of the bio-ecological aspects of each managed stock and, as we have noted above, such an understanding is often lacking or at best incomplete. Ecosystem and/or multispecies management is essentially a development of the current single-species system, but requires an even greater understanding of the system. Concerns have been expressed as to whether this is a realistic goal (Bianchi et al. 2004), not only in developing countries such as Namibia, but also within countries with a better developed fisheries research capacity.

We therefore question whether ecosystem approaches to fisheries management will increase the likelihood of long-term sustainable utilisation of stocks in any but the well-researched and monitored systems. The number of uncertainties in assessments will increase; hence managers will have less confidence in the information available on which to base decisions. This method certainly represents a worthy goal, but until the dynamics of fish stocks, and indeed ecosystems as a whole, are clearly understood and monitored we suspect that it will provide few benefits over the current single-species model, and probably at much greater cost.

4.2 Marine protected areas

Marine protected areas (MPAs) are gaining in popularity for the management of restricted habitats (e.g. estuaries) and sedentary organisms and their associated communities (e.g. coral reefs). In many ways, the MPA management approach is non-targeted and imprecise, and, in respect of knowledge and data requirements, at the opposite end of the scale to ecosystem management. MPAs may however represent a useful tool until our understanding of both the biological, social and economic aspects of fisheries (and their interactions) are better known.

MPAs have been used in several sectors of Namibian fisheries, including orange roughy when one of the aggregating areas for spawning orange roughy was closed to all fishing activities for four years. This resulted in a five-fold increase in the biomass of orange roughly aggregating on this ground and has led to suggestions that the concept of the MPA approach could be extended, possibly with some form of rotational opening of the grounds. This would allow some of the spawning stocks a resting period to recover from the disturbance caused by fishing, while others were being fished.

This example demonstrates that MPAs can be successfully applied to open-ocean wild fish stocks, although in this case it was limited to a part of the life cycle when the stock was relatively sedentary. Whether such a system can be successfully used to manage more mobile stocks, such as sardine, is less certain.

4.3 Controlling demand through market forces

Enhancement of demand for sustainably managed stocks through product certification schemes (e.g. the Marine Stewardship Council) is another tool that, while cumbersome, may well be useful until more precise fisheries management methods can be applied.
Indeed, controlling fisheries through economic penalties and incentives may well be the most realistic hope of limiting the exploitation of fish stocks by large industrial concerns, such as those in Namibia.

Concerns about the lack of transparency during the evaluation process, and suggestions that accreditation may be based on factors unrelated to the sustainability of the stock being certified, have deterred the Namibian authorities from supporting such schemes. For example, Namibia’s policy of sustainably harvesting its seal population is criticised by many animal rights groups, and it is considered likely that seal harvesting may affect the certification of other marine resource products.

5 CONCLUSION

The preceding pages have summarised some of the factors that have contributed to the decline of two of Namibia’s most economically important fish stocks during the past decade. These declines have occurred despite a reasonably good understanding of the biology of the fish and functioning of the ecosystem, and the implementation of a wide range of good management practices, including those enshrined in many of the international fisheries instruments. These are summarised in Table 3.

Of the main factors that resulted in excessive fishing of the Namibian orange roughy and sardine stocks in the 1990s, perhaps the most important was uncertainties concerning the state of each stock, resulting in management decisions which were insufficiently cautious to address the decline in the stocks. With better information it is quite possible that the authorities and fishing industry may have adopted different policies or taken different decisions, which may have reduced, if not prevented, the declines that these two stocks suffered.

For example, scientific recommendations to reduce fishing mortality of the sardine stock in the mid 1990s went unheeded because of the uncertainties in the assessments and therefore the strong pressure from the industry to keep TACs high was acceded to. It is suggested that if the scientific advice had been based on more certain results it may have been acted upon much earlier.

In orange roughy the cause of the decline in abundance on the fishing grounds is still unclear, with the obvious consequence that the authorities are unable to formulate any clear plans to enhance the recovery of the stocks.

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<th>Table 3. Factors related to decline of sardine and orange roughy</th>
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<td><strong>Bio-ecological</strong></td>
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<td>Shoaling makes vulnerable</td>
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<td>Shoaling gives perception of abundance</td>
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<tr>
<td><strong>Institutional-economic</strong></td>
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<td>Lack of knowledge</td>
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<td>Management reaction too slow</td>
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<td>Uncertainties</td>
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<td>Management strategy</td>
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<td>Secure rights</td>
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<td>Co-management</td>
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<td>Precautionary approach</td>
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<td>Value</td>
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<td>Excess capacity</td>
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<td>Excessive by-catch</td>
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<td><strong>Social</strong></td>
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<td>Pressure to maintain jobs</td>
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What is also clear from the above is that in both fisheries, these declines could have been minimised if the precautionary approach had been applied. In each case, while some signs indicated that the stocks were declining and that fishing mortality should be reduced, the assessments contained sufficient uncertainty that, due to the potential socio-economic importance of the stocks, scientific recommendations were ignored and fishing continued.

Finally, the overall conclusion of this case study has to question the applicability of conventional management systems, as used in Namibia and elsewhere. The Namibian bio-ecological system is relatively simple compared to most marine systems, while many of the institutional aspects are also uncomplicated and hence seemingly relatively easy to manage. This suggests that Namibia has been in the enviable position of having a greater chance of success with fisheries management than many others. The fact that Namibia has seen increases in the abundance of several fish stocks is encouraging, but the lack of success in sardine and orange roughy demonstrates that conventional fisheries management methods cannot guarantee success. While small incremental refinements to current management models are obviously desirable, a completely new approach may be necessary if the fisheries of the future are to be more successful than in the past.

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The six factors of unsustainability are mapped onto the four major components of an Ecosystem Approach to Fisheries (EAF). An analysis is given of which dimension(s) of sustainability are most responsive to each combination, whether the responses are likely to favour or impede improved sustainability of the fishery, and if the responses are expected to differ in the short and long term. Results are summarised, and justified with examples. In conducting this analysis a discussion is presented as to how uncertainty is affected by the EAF components, and the clarity with which the EAF component can actually guide decision-making is taken into account. This is done by raising Uncertainty to the level of another factor of Unsustainability. Finally, the potential of each responsive combination to offer some escape from the maze of unsustainability - where gains in one dimension are at the expense of losses in others - is considered.

1. INTRODUCTION

The Ecosystem Approach (EA) has been widely acknowledged to be an important step forward in fisheries management (FAO 2002a, Pikitch et al 2004). It has been embraced as a central component of marine policy instruments nationally and internationally, such as the Johannesburg Declaration (UN 2002), Reykjavik Declaration (FAO 2002b), Bergen Declaration (2001), and the EU Marine Strategy (EC 2003). These commitments suggest that the EA should help provide at least some solutions to the conundrum of a persistent trend towards unsustainability in fisheries (FAO 2004), despite strong commitments by governments to the principle of sustainability. Is that the case?

FAO (2002a) defines an EAF:

“An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic, and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecological meaningful boundaries”.

The many treatments of the EAF have four core concepts in common. These are as follows.

- Consider more fully the ways that the biotic and abiotic marine environment affects exploited resources (ecosystem inputs).
- Consider more fully the ways that fisheries affect the structure and function of marine ecosystems (fisheries outputs).
- Apply multiple uses planning to reconcile needs and objectives of all users with each other, and within the constraints posed by the ecosystem being used.
- Apply inclusive governance approaches which bring all users of the marine ecosystem together at meaningful geographic scales, and which are participatory when evaluating and selecting management strategies and tactics.
Throughout all four concepts a holistic view should be taken, such that the interactions among parts receive as much attention as the parts themselves.

In considering unsustainability of fisheries, it is important to focus on the multi-dimensional nature of sustainability. Although Charles (2001) points out the existence of four dimensions; ecological, economic, social, cultural, and institutional, this paper focuses on contrasting the biological and the social/economic dimensions. Many of the major impacts of an EAF will be expressed in contrasting ways along these axes. The prominence of governance issues in the EAF suggest that a more detailed treatment by social scientists possibly could refine differences among the social, economic, and institutional dimensions, but there is no reason to expect those differences would alter greatly trade-offs that have to be made between the ecological dimension of sustainability and the other dimensions.

The factors which contribute to the pervasiveness of unsustainability have been identified (FAO 2002b) as:

- Inappropriate Incentives
- High Demand for Limited Resources
- Complexity and Lack of Knowledge
- Poverty and Lack of Alternatives
- Lack of Effective Governance
- Externalities

Past investigations have determined that the pervasiveness of unsustainability can be traced in large part to the interaction of these factors with the multi-dimensionality of sustainability. Measures often can be identified which address any one of the factors if it is conspicuously unfavourable on one of the dimensions. However, in rectifying that pathology, conditions are made worse on other dimensions (FAO 2002b). Across many case histories, this lack of globally favourable options seems nearly universal, and progress requires redefining objectives on at least one of the dimensions of sustainability (FAO 2004). Sustainability has long been recognised as requiring societal choices, but not all options are equally viable. Unfortunately, the limits of ecosystems rarely can be redefined to accommodate intensive human uses, and social, political, and economic forces often make it challenging to redefine objectives regarding uses to make them inter-compatible and all achievable within the bounds of ecosystem limits.

In this paper I shall map the six factors of unsustainability onto the four major components of an EAF. I will analyse which dimension(s) of sustainability are most responsive to each combination, whether the responses are likely to favour or impede improved sustainability of the fishery, and if the responses are expected to differ in the short and long term. Results are summarised in Table 1, and justified with examples below. In conducting this analysis it is necessary discuss how uncertainty is affected by the EAF components, to take account of the clarity with which the EAF component can actually guide decision-making. This is done by raising Uncertainty to the level of another factor of Unsustainability. Finally, I will consider the potential of each responsive combination to offer some escape from the maze of unsustainability – which gains on one dimension are at the expense of losses on others.

2. CONSIDERING ENVIRONMENTAL FORCING IN FISHERIES

Many fisheries assessment methods are based on equilibrium assumptions about populations and ecosystems (Hilborn and Walters 1992, Quinn and Deriso 1999), and many of the basic tools in fisheries economics are also based on equilibrium assumptions about both fish supply and market conditions (Clark 1990). Nonetheless (at least on the biological side) practitioners have acknowledged these assumptions are made for practical reasons, not because they are believed. Significant scientific effort has been expended dealing with at least the most obvious non-equilibrium conditions; for example multispecies VPA to deal with predator-prey dynamics (Pope 1991, ICES 2002a), including environmental forcing in recruitment and growth (ICES 2002b, 2003a), and finding assessment tools
and management approaches which are robust to non-stationarity (ex. Butterworth and Punt 1999, Hilborn et al. 2002).

There are many ways that environmental forcing can affect stock dynamics and production. Environmental variation often has pattern of regimes at decadal and multi-decadal scales (Francis and Hare 1994, McKinnel et al. 2001, Conners et al. 2002). These regimes, in turn have important implications for stock productivity and sustainable management approaches (Rice 2001, Klyashtorin 2001, Chavez 2003). Some major oceanographic events, such as ENSOs (El Nino-Southern Oscillation) can affect stock dynamics throughout entire ocean basins or even globally (Polovina et al. 1996, Greathatch et al. 2004). Many Eastern Boundary Current and Boreal ecosystems appear to have a “wasp-waist” structure, with a key forage species at a central position in the food web and sensitive to strong, direct environmental forcing on its productivity (Rice 1995, Cury et al. 2003). Correspondingly, there are many calls to accommodate such environmental considerations in scientific advice on fisheries. How would dealing with such forcing affect the factors of sustainability?

Dealing with environmental forcing is going to have major impacts on Complexity and Lack of Knowledge, and the effects may be either positive or negative. The effect can be positive in that the true complexity of the ecosystem being exploited is more fully acknowledged. Taking a positive view assumes that the contribution of Complexity to unsustainability arose from dealing analytically with a simple representation of the fisheries production system and then basing management on the analytical results. Because the ecosystem being exploited was much more complex than the representation, the analyses were not wholly reliable and results of management rarely led to the expected results (ex. Harris 1990). Adding environmental forcing to the representation of production necessarily reduces the discrepancy between the analytical results and actual productivity of the system, although both are still probabilistic representations (ex. Curv and Roy 1989). The benefits can be large if the environmental forcing is strong.

The negative aspect of considering environmental forcing in an EAF is that the Lack of Knowledge is likely to be amplified. Single-species representations may oversimplify factors such as natural mortality by presenting them as constants. However treating them as dynamic life history parameters means that their functional forms must be represented analytically, and the parameters of the functional relationship estimated. This is not simple; after half a century of effort it is still not straightforward to model how recruitment depends on mature biomass. Additional terms for effects like water temperature or predator abundance can be added to those functions (ex. Swain and Sinclair 2000, Williams and Quinn 2000), but the underlying shape of the relationship is rarely known. Nonparametric density estimation methods offer a means to avoid this problem to a limited extent (Rice 1993). However, those methods highlight the general scarcity of data on how expected stock status or yield is related to ecosystem conditions. Within an EAF context, tasks as comparatively simple as improving the estimates of predation mortality on harvested North Sea fish required analysing tens of thousands of stomachs and several years of analytical work (Daan 1989, Pope 1991, Hislop 1997). There is a trade-off to be faced – the greater the improvement sought by addressing ecosystem Complexity directly within an EAF, the more chronic will be the limitations presented by Lack of Knowledge of what causes and organises the Complexity.

The above discussion of Complexity and Lack of Knowledge has focused on the Ecological dimension of sustainability. If environmental forcing in an EAF interprets the “environment” as the biotic and abiotic marine ecosystem, links to social and economic dimensions of sustainability are mostly indirect, and mediated by the state of the resource.

If “environmental forcing” is defined very broadly to include the state of human society as part of the “environment” then there are direct linkages as well. If a change in global oil prices, for example, is considered an “environmental forcer” then it affects the social and economic dimensions of sustainability directly. Such interpretations of “environmental forcing” are uncommon, however, and usually brought into planning and managing use of resources in other ways. If they are part of this
consideration, however, the same basic trade-off applies. There is a benefit on the Complexity side of the ledger, as dynamic social and economic systems are represented more realistically in the models used for planning and management. There is a directly reciprocal cost, however, for as the representations get more realistic the demands for knowledge and data escalate.

Consideration of environmental forcing also has major effects on how Uncertainty contributes to unsustainability. Conceptually, the effect should be strongly positive, because many sources of uncertainty are related to the environmental dynamics of the ecosystem. If we knew the shapes of the functional relationships between environmental forcers and stock productivities, and had the data to estimate the parameters of those relationships, two major sources of uncertainty (Rosenburg and Restrepo 1994, Patterson et al 2001) would be included directly in assessments. If we could forecast future states of nature, we could carry those relationships into planning and management of the fisheries.

The reality is different. We rarely know which relationships to use, can rarely estimate parameters with accuracy and precision, and even more rarely can predict future states of nature with confidence. Pragmatic alternatives are available. Multiple alternative representations can bracket the plausible ways that environmental factors may relate to the stock dynamics. This strategy is currently adopted to consider possible effect of both oceanographic conditions (Anon 2003, ICES 2004a) and seal predation (Shelton et al 1997, Bogstad et al. 2000, CSAS 2002) on cod stocks in Barents Sea, and Icelandic and Canadian waters. Give multiple plausible representations of a fisheries ecosystem, management approaches can be sought which are robust in the face of that uncertainty – strategies that are sustainable whichever relationship is correct (Smith et al 1999, Butterworth and Punt 1999).

The effects of these EAF strategies are often incorrectly presented to clients as ways to reduce uncertainty. With current knowledge we rarely remove uncertainty by adding complexity to the models. What we do is explain it better. We cannot make uncertainty go away, but scientists can include it more clearly in advice and managers and planners can accommodate it more fully in their work. This has potential to make a large positive contribution to sustainability on the ecological dimension, if management is risk averse.

In the medium to long term, even short term predictions of resource trajectories from environmental forcers can provide large benefits on the social and economic dimensions as well. Economic planners stress that any reduction in short-term uncertainty about yield can provide significant improvements to costs and profitability. For example, a management-year forecast of environmentally driven recruitment to the Australian Northern Prawn fishery is estimated to have a potential value to the market of well over a million dollars annually. Predictions of decadal-scale patterns of productivity could guide fleet investment strategies with comparable benefits to economic sustainability. Likewise, communities could plan for future good or lean times in their fisheries.

Overall, applying an EAF can only reduce the contribution of Uncertainty to unsustainability. How much it is reduced on the various dimensions depends on knowledge and complexity and on the scope to accommodate changes to harvesting levels. If there is little scope to reduce harvesting when the environmental conditions are unfavourable, then social and/or economic sustainability must suffer, at least in the short term, to obtain the gains in ecological sustainability which can result from addressing environmental forcing realistically.

Dealing with environmental forcing of stock dynamics would have a strong positive effect on Externalities, at least on the biological dimension of sustainability, simply by making the definition of the fishery and “resource” inclusive of many more parts of the ecosystem. Oceanographic conditions, habitat quality, and abundance of predators and prey of the target species are no longer Externalities. These are fundamental parts of the EAF.

On the social and economic dimensions of sustainable, dealing with environmental forcing can make a small to a great positive contribution to addressing Externalities. Considering the state and trajectory
of the ecosystem in an integrated way gives managers and economic planners better headlights for looking at expected fishery yield. Retrospective analyses of variance in stock productivity suggest that considering environmental influences on stock dynamics sometimes can provide fisheries managers with information which can help them intervene proactively (Sainsbury and Sissenwine, in press). This must be viewed in the context that forecasting accuracy of stock-environment relationships are always weaker than their goodness-of-fit to historic data sets, and requires scope to reduce harvesting in response to forecast reductions in productivity.

For the social and economic benefits of better “environmental headlights” to be large, managers must respond rapidly to warnings, and harvesters have to comply with the management actions. The track record of rapid response to science advice on harvest reductions is poor, unfortunately, even in the single-species framework85 (Rice 2003; ICES 2003b). There is little reason for optimism that the response by managers and the receptivity of industry to decisive management actions will suddenly be much higher when the catch reductions are advised on the basis of an environmental factor, rather than on the state of the exploited stock. Currently even the science advice often is only weakly directive when ecosystem considerations imply that catches should be reduced. For example, faced with a nearly complete absence of capelin in the usual feeding grounds for Icelandic cod, the science advisory response was a Management Consideration that “Due to the low abundance of capelin, an expected reduction in the growth of cod will lead to predicted landings and SSB in 2005 and 2006 being lower than otherwise expected. The exact extent of such a reduction cannot be estimated, but is expected to be in the range of 5-10 percent” (ICES 2004b). With evidence of substantial discarding of the very large 1996 year-class of North Sea plaice, scientific advice merely noted the retrospective pattern in the assessments was likely caused by the discards, and included special comments that “Because discards are not included in the assessment, the fishing mortality on juveniles is underestimated”, and “The high estimates of discards in recent years may be caused by a reduction in growth, which extends the time when the fish is undersized and subject to discarding” (p 266, ICES 2001a). Even the science advisory bodies are not placing enough trust in the environmental influences on stock dynamics to base strong advice on major observed patterns. Hence, in practice the consequences of considering environmental forcing on Externalities is likely to be at best weakly positive on the social and economic dimensions of sustainability.

Environmental forcing would be neutral with regard to Lack of Effective Governance and Inappropriate Incentives, because these have their roots in human institutions, not natural ecosystems. In the long term, how those human institutions respond to improved forecasting horizons can make sustainability either harder or easier to achieve on all three dimensions. Availability of forecasts cannot be assumed to change incentives or governance directly, but the forecasts would contribute to an environment where better planning can occur. If those opportunities can be taken, governance and incentives can both improve, first on social and economic dimensions and consequently on the biological one. On the other hand, if ineffective governance and inappropriate incentives are important contributors to unsustainability in a fishery, it is unlikely that the human components of the system can respond effectively to environmental forecasts.

At least as a first order effect, environmental forcing would also be neutral relative to Poverty and Lack of Alternatives, and High Demand for Limited Resources. Taking a holistic view in an EAF means one should acknowledge that there are second order ways that environmental forcers could affect these factors. For example, major climate-ocean events such as El Nino have many impacts of weather and terrestrial growing conditions (Hoerling and Kumar 2002, Neelin et al. 2003). These could cause the poorest people to depend even more strongly on ocean productivity as agriculture suffers from floods or droughts, or offer at least temporary alternatives to such dependence, depending on what part of the world is being considered (Neelin et al. 2003, Weilen n.d.). Similarly the

85 Note. Although the text discusses single-species management, unless specifically qualified, it should be assumed that the arguments are intended to apply to the target species of a mixed-species fishery as well. This is consistent with the concept of TROM – target-resource oriented management – FAO 2003, although that term has yet to become established in dialogue about fisheries science and management.
environmental forcing of stock dynamics will be expected to change supply of the targeted resource directly, but not demand. If the same environmental conditions change the supply of other ecosystem components (McKinnell et al. 1999, Rice 2002), the shift in composition of the resource base and concomitant harvesting opportunities may affect markets in many indirect ways. These can result in environmental forcing driving High Demand for Limited Resources and Improper Incentives in ways that make the factor either easier or harder to address.

Impacts on Demand and Incentives are affected by the degree to which demand can be shifted from one resource to another as abundance varies. There are limits to product substitutability (ex. Asche and Hannesson 2003). Moreover reviews of marine ecosystems consistently fail to find large biomasses of unexploited fisheries resources at which to redirect effort in response to stock declines (Garcia and Newton 1997, FAO 2002c). Thus pressures from both Incentives and Demands are likely to be exacerbated at least some of the time when environmental forcing causes stock declines.

3. CONSIDERING FISHERY EFFECTS ON THE ECOSYSTEM

Single-species fisheries management strives for sustainability of the target species. Adjustments to harvest levels are made on the basis of increases or decreases in the biomass and/or fishing mortality of the target species (e.g. ICES 2003b). Only when a target species plays a central role as food for many parts of the ecosystem is management likely to consider directly the status of species not being harvested. In such cases the accommodation can be as simple as allocating some biomass to support generalised needs of predators, or as sophisticated as applying harvest control rules based on monitoring the status of specific dependent predators (reference points in ICES 2003b, Ashford and Croxall 1998).

In the past decade much scientific attention has been directed at quantifying the ecosystem effects of fishing, and developing management approaches which ameliorate them when they are serious. Among the major types of detrimental ecosystem effects of fishing are:

- Unsustainable mortality on by-catch species
- Damage to benthic habitats and communities
- Community changes arising from depletion of forage populations (bottom-up)
- Community changes arising from depletion of predator populations (top-down)
- Community changes from altering the size composition of the exploited community

Evidence for each type of effect, and consequences of them for sustainability of marine communities and target species, are reviewed in Hall (1999) and Jennings and Kaiser (1998). Contemporary fisheries management policy statements all include a commitment to consider the effects of fishing on the ecosystem in management (summary in Rice, in press). How would dealing with the ecosystem effects of fishing address the factors of unsustainability?

Considering the effects of a fishery on the ecosystem will have substantial impacts on Complexity and Lack of Knowledge. The situation will be similar to that described for considering the effects of environmental forcing on the target species. By adopting an EAF one considers the linkages of the exploited species to the rest of the ecosystem, and the full scope of impacts of the fishery on ecosystem components. If a fishery had unsustainable effects on ecosystem components other than the target species, then the fisheries management approach was treating the production system in too simple a way. For example, the fishery may have damaged the habitat responsible for the production of the target species (Murawski et al. 2001) or changed community structure so that the ecological role of the target species has been filled by another species (Jennings et al. 1999, Rogers and Ellis 2000). An EAF will necessarily include the habitat and community relationship as a central part of management of the fishery.
This makes the complexity of the management system more similar to the complexity of the fish productivity system, and should have a positive effect on Complexity as a factor in unsustainability.

As with considering environmental forcing, however, the potential gains in addressing Complexity must be balanced against the increased need for Knowledge. Quantifying the ecosystem effects of fishing has often proven costly and difficult, and the interpretation of even intensive studies is disputed among experts (ICES 2000). Management measures intended to address one undesired consequence of fishing many cause other effects that are at least as serious (Dinsmore et al. 2003). On the output side of the ledger (ecosystem effects of fishing), just as with input side (environmental forcing), the greater the improvement sought by addressing ecosystem Complexity directly within an EAF, the more chronic will be the limitations presented by Lack of Knowledge. The balance will be case specific, but at least thinking about how the fishery is affecting the ecosystem is more likely to provide insights that contribute to sustainability than not considering the problem at all.

The situation will be similar on the social and economic dimensions of sustainability. If the benefits provided by a fishery are being eroded as the fishery degrades the productivity of the ecosystem supporting it, an EAF which ceases the erosion of the ecosystem should improve sustainability of the yields. Social and economic returns from the fishery should be more stable in the medium and long term. There are two problems getting to that point, however. The first is the familiar trade-off between Complexity and need for Knowledge, which is even more demanding on the social and economic dimensions. It is difficult enough to quantify how a fishery is altering the composition of fish and benthic communities. Translating those impacts into social and economic consequences is far more complex, requiring not just knowledge of the biological consequences of the direct ecosystem perturbations, but also what those biological consequences mean for future human uses of the ecosystem. The second problem is that even if we do not know exactly how to keep the ecosystem effects of fishing within sustainable boundaries, we know that in the overwhelming number of cases the direction will be to fish less, and perturb the system less. If there is little scope for reducing fisheries without immediate social displacements or economic loss in single-species management, then an EAF requiring greater reductions to reduce ecosystem effects of fishing will cause even greater short term social or economic unsustainability. The long term solution might be greater sustainability on all three dimensions of sustainability, but only after significant transition costs have been paid by someone, and the industry has adjusted to practices and harvest levels which disturb the ecosystem less.

Considering ecosystem effects of fishing will increase the contribution that Uncertainty makes to unsustainability. This differs from considering environmental forcing on stock dynamics. In that case, much of the uncertainty was about the status and yield from the exploited stock. In the output case, the uncertainty is about how the fishery is affecting ecosystem components. In some cases this may feed back on future yields from the target species, such as reducing either damage to essential fish habitat of the target species (Collie et al. 2000) or catch and discarding of undersized or illegal fish in a mixed fishery (Pastoors et al 2000, Williams 2002). Often, though, dealing with the effects will provide no benefits to the fishery – only the ecosystem.

In the ecosystem context there will be substantial uncertainty about what a fishery is actually doing to all parts of the ecosystem, for example:

- seafloor – spatial distribution of impacts, spatial distribution of fragile or sensitive features, recovery times;
- non-target species – by-catch rates in space and time and by species, sustainable mortality of by-catch species
- marine communities – impacts on biodiversity, alterations of trophic relationships (predators, prey, and competitor fields), disturbing size-based relationships.
Considering all these sources of uncertainty won’t necessarily provide benefits to the ecological dimension of sustainability. Rather, it may overwhelm the decision-making capacity of management institutions unless some procedures are followed to identify and focus on the highest risks, which will themselves still be uncertain (ICES 2001b, Rice and Rochet in press, Rochet and Rice in press).

Responding effectively to the greatest ecological uncertainties will necessarily mean reductions in harvest; probably substantial ones. Management of mixed-stock salmon fisheries, for example, found that protecting the weakest stocks requires foregoing significant catch in stocks of greater productivity (ICES 2003c), and the pattern is general (Musick 1999). As agencies designate increasing numbers of marine species as threatened or endangered (Musick 1998, IUCN 2003) the uncertainty about their by-catch rates in fisheries will go up, amplified by uncertainty about the mortality that they can sustain (CSAS 2004a). Dealing with uncertainty about species-at-risk requires precautionary decision-making (FAO 1996a, b), because extinction is unquestionably serious or irreversible harm. In light of this substantial uncertainty and risk aversion, substantial reductions in catches will be necessary to gain in ecological sustainability. This must increase risk of unsustainability on social or economic dimensions.

Not only does considering the ecosystem effects of fishing require catch reductions, it increases uncertainty about the planning environment for social and economic dimensions of fisheries. This increases the likelihood of negative effects on social or economic dimensions of sustainability, at least in the short term.

An increase in planning uncertainty will be true for several different aspects of the ecosystem effects of fisheries. The need to accommodate protection for species designated as at risk of extinction will be a key part of an EAF. Bodies authorised to designate species at risk are only beginning to look at marine fish. For example the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) had reviewed fewer than 15 species of marine fish for designation prior to 2000, but at present has over 100 species in some stage of formal review. In Europe, OSPAR is considering its first set of 11 marine species for protection as Threatened and/or Declining (OSPAR 2003). Regulations to avoid catch of these species or ensure their release alive could have major economic repercussions. For example in the Canadian case, there are estimates that over 125 million dollars of sockeye salmon catch might have to be foregone over the next four years, if two small sockeye stocks are formally listed under the Species at Risk Act. The situation presents industry with uncertainty about whether listing will occur, what new regulations will be implemented should the stocks be listed, and what the impact of the regulations would be on their operations.

Planning can also be made more uncertain by the desire to protect habitat from damage by fishing and to create marine protected areas in general (Sladek Nowlis and Roberts 1999, Roberts et al. 2002). There is substantial debate about the certainty and magnitude of long-term benefits from MPAs (Hilborn et al 2004), but in the short term even the consultative process leading to new designations increases the uncertainty about the social and economic dimensions of sustainability. Once implemented, uncertainty about the magnitude and timing of benefits will stay high for some time.

Considering the ecosystem effects of fishing as part of an EAF has a strong positive impact on the role of Externalities in unsustainability. As with the input side of the EAF, Externalities are reduced. An EAF makes unsustainable consequences of fishing, including but not restricted to consequences which feed back on future yields to the fishery, included in assessments and addressed in management. This should lead to a substantial reduction in what is considered “external” to the fishery and to improvements in the biological dimension of sustainability. As with input considerations, however, the benefits which may accrue must be viewed in the context of Complexity and Lack of Knowledge, and Uncertainty. Declaring the ecosystem effects of a fishery to be a part of the management problem and not an Externality, does not mean enough is known about those effects to increase sustainability quickly and decisively. Rather, the likely consequence will be a major call for greatly restricted harvests; restricted in some combination of amount, space, and time (e.g. Pikitch et al. 2004). That is going to increase pressure on the social and economic dimensions of sustainability, without a certainty of improved sustainability on the ecological one.
If we consider the human components of the ecosystem to be part of the EAF, one major effect on the social and economic dimensions of sustainability is that the effects of fishing on uses of marine ecosystems must be managed. For example, potential conflicts with ecotourism (Boncœur et al. 2004) would become part of the EAF, rather that viewing fishing and ecotourism as two separate planning and operating structures, each an externality to the other. There are many benefits from multiple use planning (v.Bodugen and Turner 2001, Sorensen 2002), and done well there could be substantial gains to sustainability on social and economic dimensions, and either neutral or beneficial effects on the ecological dimension. However, there is no certainty that conflicts between fisheries and other uses of the marine ecosystem would be resolved quickly and easily. Even conflicts among different fishing sectors, defined by gears, nations, or other factors, can prove very difficult to reconcile (Cochrane 2000, Cochrane and Payne 1998). Merely the act of defining the impacts of fishing on other economic activities to be part of the EAF management task, and not an Externality, does not ensure progress on reducing the impacts will be rapid and decisive.

Considering the ecosystem effects of fishing in a biological context will be largely neutral with regard to Lack of Effective Governance and Improper Incentives. The dimensions are largely orthogonal. However, it will be very difficult to deal with the effects of fishing on the ecosystem without EAF becoming involved in multiple-use planning. This will necessarily require a change in the governance approaches applied in managing fisheries. Indeed such changes are an explicit component of the EAF (FAO 2002a), and will be analysed below. From the perspective of costs and benefits of considering ecosystem effects of fishing however, an EAF provides a compelling reason to improve governance and incentives. If the consequences of fishing on other ecosystem components are considerations in managing a fishery, then groups concerned about those other ecosystem components necessarily become stakeholders in fisheries management processes. Incentives to avoid harm to those ecosystem components will be different from the incentives which foster unsustainable exploitation of the target species. One major difference is that the calculation of economic benefits of sustainable fishing can include benefits of improved performance of other industries than are affected by the ecosystem effects of fishing. Initially, this gives cause for substantial optimism.

This optimism needs to be tempered by the challenges to implementation, however. The reason that governance systems and incentive structures in fisheries often are ineffective is not because they were intended to function poorly. They often function poorly because the nature of many fisheries makes it hard to build and implement effective governance systems. The incentives which drive fisheries to overexploit and trade the long-term for the short term will not go away, just because an EAF says that fisheries management should consider the effects of fishing on the ecosystem. Even more complex governance systems will have to be created to accommodate more numerous and diverse participants. If incentives to forego harm to targeted resources function weakly, why should incentives to avoid harm to ecosystem components that are not used, at least by the fishers, function more effectively? Hence considering the ecosystem effects of fishing has the potential to diminish the contribution Inappropriate Incentives make to unsustainability of fisheries, and thereby can promote improvements in Governance. Achieving that potential is likely to even more elusive than has been success in building effective governance in single-species management approaches, and in instituting incentives which foster long-term sustainability of uses.

At least in the short term, considering ecosystem effects of fishing will be neutral with regard to Poverty and Lack of Alternatives. In the longer term there could be moderate improvements, if new economic opportunities arise from a healthier ecosystem expected if the impacts of fishing on other ecosystem components are reduced. This is a vague promise, however, and must be balanced by the likelihood that achieving the improvements in ecosystem health will be at the expense of reduced or greatly altered fishing opportunities and thus carry high transition costs. Science advisors have routinely advised on the direct benefits of improved yield in the medium term with lower fishing mortality on the target species, yet the transition costs to enjoying the benefits have deterred progress (e.g. ICES 2003b).
There is no reason to expect the transition costs will be any less of an impediment to progress towards a healthier ecosystem, when the benefits are described vaguely and will be received indirectly if at all. Gear modifications to reduce by-catch or habitat damage, although sometimes quite effective (Linnane et al 2000, Valdemarsen and Suuronen 2002) often require increased investment, whereas spatial management to protect specific habitat features may require increased travel or more concentrated fishing (Hilborn et al 2004). If participants are stuck in a fishery due to poverty, even small incremental costs to fishing might be a deterrent to adopting the modified fishing methods. Where Poverty is a key driver of unsustainability, addressing ecosystem effects of fishing will progress very slowly.

4. IMPROVED GOVERNANCE SYSTEMS FOR MULTIPLE USE PLANNING

Single-species fisheries management ignores the reality that many fisheries exploit multiple stocks, presenting two types of problems for sustainability. True mixed-stock fisheries often target several stocks simultaneously, with high risk of overfishing the more readily caught stocks while applying enough effort to take the full allowable catch of all stocks in the complex (ICES 2003b, Rice 2004). Even when individual fisheries target different species, by-catches of non-target species in one fishery may threaten the sustainability of harvests in the fisheries targeting that species (Alverson et al. 1994) or other ecosystem components (Furness 1998). Both problems can be addressed within existing management frameworks, but only if the industry sectors cooperate with each other, and with the management agencies.

In other cases, even different industries may conflict over space or use of a resource, for example the potential for conflicts between fisheries and offshore energy industries (e.g. McCarthy 2004, CSAS 2004b). Many states have established specific agencies to deal with the potential impacts of one industry on others, for example the Canadian Offshore Petroleum Panel in Canada with regard to conflicts between fisheries and offshore hydrocarbon undertakings. Again, however, these agencies are successful only to the degree that the different industries cooperate in their planning and their operations.

For both inter-industry and intra-industry conflicts, unsustainability of fisheries can arise from failure to plan well or failure to cooperate with implementing plans once they have been developed. This makes the EAF commitment to more integrated multiple-use planning a promising contribution to improved sustainability of fisheries. How is the promise reflected relative to the factors of unsustainability?

Integrated multi-use planning has the potential to produce substantial positive benefits for Poverty and Lack of Alternatives on the dimensions of social and economic sustainability. A central focus of integrated planning and multi-use management is to ensure that coastal residents have diverse opportunities for employment, and that needs of subsistence users are not compromised by commercial enterprises (Ömmer 1995, Walker et al. 2002). Where new or expanded opportunities for work can be identified, the number of alternatives for gaining a livelihood is increased. At a minimum, the integrated management should ensure other economic pursuits do not increase the poverty of the resident subsistence users, and may improve opportunities.

Such improvements on the social and economic dimensions should not be at the expense of reduced sustainability on the ecological dimension, as long as the ecological constraints of the ecosystem are respected during the integrated planning. However, a commitment to integrated management is not a guarantee that biological constraints on human activities will be respected in the planning and management. This has often not been the case in the simpler case of single-species planning and management, where fishing capacity routinely has expanded beyond that necessary to harvest the resource sustainably, in the face of pessimistic forecasts of future harvest availability (FAO 2001). It is a hope but not a demonstrated fact that conducting integrated management as part of an EAF will counter that tendency effectively.
The provision in EAF for integrated planning and multi-use management should have a substantial *positive* effect on Externalities. A central goal of integrated management is to minimise conflicts among different human activities in marine environment. This defines all the competing human uses as part of the fisheries management problem to be solved, and thus the multiple uses cease to be Externalities. If successful this aspect of an EAF should address both inter-industry and intra-industry aspects of unsustainability. The impacts of each fishery on the status of resources exploited by other fisheries become a part of integrated fisheries management, as do the impacts of other economic enterprises on a fishery. Thus the expanded scope and responsibilities of integrated management reduce the contribution of Externalities to the ecological dimension of unsustainability.

As with the other considerations however, to have benefits on the social and economic dimensions of sustainability requires that some scope exists for reduced or redistributed fishing harvests. If there is no scope for such reductions or redistributions, then transition costs are a deterrent to achieving an improved social or economic status in the longer term. Accommodating the needs of other resource users (or users of other overlapping resources) will involve displacing participants in at least some of the competing fisheries or economic pursuits. These displacements will have a social or economic cost, contributing to risk of increased unsustainability on those dimensions. For the transition costs not to be an impediment to progress, it will be necessary that the integrated management has identified new economic activities, as per the discussion under the Poverty and Lack of Alternatives theme.

Adoption of integrated planning and management should have a *positive* effect on the contribution of Complexity and Lack of Knowledge to unsustainability. Single-species fisheries management is oversimplified in assuming that all the fishing mortality is captured in the catch data from the fisheries (Myers and Quinn 2002, Richards *et al.* 1998) and in assuming that natural mortality and recruitment are unaffected by other human activities in the area occupied by the stock. Fisheries management based on those assumptions can fail, sometimes by a large amount, when they are false. For example, the North Sea plaice stock experienced a period of significant overfishing in the late 1990s, because yield estimates did not take account of the significant discarding of the very large 1996 year-class as juveniles (ICES 2002c). Lack of integrated planning of coastal activities has several times led to degradation of coastal habitats essential for fish production, to accommodate coastline developments involving the clearing of features such as mangrove stands (Ron and Jose 1999, Mumby *et al.* 2004).

Integrated fisheries management and integrated regional planning make the management problem closer to matching the complexity of the system and range of human activities being managed. Sharing of information that each industry or fishing sector has about its own operations and plans necessarily increases the information available to the managers and participants in each fishery. When separate industries share monitoring data, habitat inventories, etc, all sectors benefit from increased knowledge. Such sharing of information should allow effects of past discarding, for example, to be included in subsequent fisheries management decisions. Each of these changes is a first order reduction in the contribution of Complexity and Lack of Knowledge to unsustainability, on any or all of the dimensions, with little incremental operational cost, but potential transition costs where harvests have to be reduced to accommodate other uses of marine resources.

Adoption of integrated planning and management should also have a *positive* effect on the contribution of Uncertainty to unsustainability. Some uncertainty in single-species management can be attributed to lacking information about the impacts of other fisheries or other commercial activities on the harvests available from the target species (ex. Greenstreet *et al.* 1999, Cury *et al.* 2003). By moving to integrated fisheries management and regional planning, managers and participants in interacting activities should exchange more information about their planned activities (ex. Kimball 2001, Walker *et al.* 2002). This could result in a reduction of uncertainty on any or all of the ecological, social, and economic dimensions of sustainability. The degree to which uncertainty is reduced on each dimension depends on the degree of interaction of the fisheries or commercial enterprises, which can vary from modest to substantial.
Under the two ecological aspects of an EAF, it was argued that in taking an EAF would result in a case-by-case trade-off between reduction of Uncertainty and increase in Complexity and Lack of Knowledge. At the integrated planning forum, fisheries experts will want to know more and different kinds of information about the performance of other fleets or activities of other industries. This may be erroneously interpreted as a comparable trade-off. It is true that to obtain maximum ecological benefits from integrated planning and management, each industry and fishery will have to invest in collecting information that they might not collect for their own needs. This increases costs with potential negative effects on economic sustainability. For example, the observer program for monitoring halibut by-catch in the northeast Pacific groundfish trawl fisheries cost over US$ 300 per vessel-day through the 1990s. The research program to better understand the just the highest priority impacts of seismic exploration on Gulf of St. Lawrence snow crab fisheries costs US$ 200 000 annually. However, just the sharing of existing information by interacting fisheries or industry allows some movement forward on sustainability. How far forward they can move depends on the degree of interaction and, as discussed under Externalities, how much each sector is willing and able to accommodate the needs of other users. This will necessarily be case-specific, but just sharing information among industries may not require substantially increased investments in acquiring knowledge by any of them.

The adoption of more multiple-use planning will be largely neutral with regard to the contribution of High Demand and Inappropriate Incentives to unsustainability, at least in the short term. Neither of those factors would be expected to be affected directly, as they would continue to be created by forces outside even the expanded planning environment. In the longer term there could be positive effects, if the expanded planning horizon improved the number of economic opportunities of the region, diversified food supplies, or stabilized marketing of fisheries. Any of those improvements might allow the fishery to resist pressures to overexploit in the medium term (reduced effect of Inappropriate Incentives), or shift some of the demand for fish as either subsistence food or a source of currency to other products. Integrated planning may also lead to shared objectives with broader conservation values, and more incentives to pursue them. These effects could be strongly positive in reducing these two factors of unsustainability on economic and social dimensions, without increasing pressure towards unsustainability on the ecological dimension. However, those benefits only begin to be possible after effective integrated planning has been in place for some time, and alternative industries (including possibly agriculture and aquaculture) are operating successfully. That may not occur quickly.

5. IMPROVED GOVERNANCE SYSTEMS THROUGH STAKEHOLDER INCLUSIVENESS

However well-designed a fisheries management plan may be, its success in promoting sustainable fisheries depends on how well it is implemented. If fishers are not committed to the objectives of the plan, the ways that they actually operate may result in fisheries very different than the fisheries envisioned in the plan (Rice and Richards 1997). When participants in a fishery do not believe that the management authorities give appropriate attention to their needs or views, they are unlikely to cooperate with those authorities. Likewise, if they do not feel assessments produced by fisheries scientists accord with their experiences, they are unlikely to cooperate with fisheries management plans based on those assessments (Scott 1998, Felt et al. 1997, Jentoft 2000). The divergence between the actual fishery and the provisions of the plan can contribute substantially to ecological unsustainability in the short term, for the sake of maintaining harvests in the short term. Of course, as the resource is overharvested, social and economic sustainability will deteriorate in the medium and longer term.

Participatory governance is included as a cornerstone of an EAF specifically to address the role of Ineffective Governance in driving fisheries towards unsustainability. It is widely argued (Ommer 1995, Felt et al. 1997, Jentoft 2000, Nielsen 2003) that including stakeholders in the governance system increases its legitimacy in their eyes, and fishers are much more likely to comply with a management plan which they helped to develop. Experience has also shown that when fishers
participate in the assessment process, and see the information that they contribute reflected in the results, they give more credibility to the recommendations for management. In Canadian stock assessments, for example, invited participants from industry attend all full assessment meetings, and the stock status reports include a mandatory section entitled “Industry Perspective (CSAS website www.dfo-mpo/csas). By improving the correspondence between the actual fishery and the provisions of the fishery management plan, the inclusive governance systems can make some positive contributions to sustainability on the ecological dimension in the short term. Through improved stock status the inclusive governance can lead to substantial improvements to ecological, social and economic dimensions in the medium and longer term.

Improved Governance also makes a positive contribution to reducing unsustainability due to Complexity and Lack of Knowledge. The prosecution of a fishery is a complex social process (Finlayson 1994), and approaching it as a top-down governance process or without regulation at all both take an unrealistically simple approach to that complex process. By making the process more inclusive, developing the management plan and implementing it in the fishery is made more complex, even if only the fishing industry itself is brought into the process. Many jurisdictions view environmental groups as legitimate stakeholders in these processes; for example the US now has members of environmental groups on its Fishery Management Councils (Okey 2004); in Canada it is policy to invite members of ENGOs to the zonal Advisory Process meetings and in Europe the first EU Regional Fisheries Management Council has several ENGOs on the list of stakeholders. Inclusion of these viewpoints make the process itself even more complex; correspondingly driving the expert dialogue leading to the management plan to address much more of the true complexity of how the fishery operates within the ecosystem. This contributes to a greater chance of sustainability on the ecological dimension. Moreover, because those included are from the industries and communities most closely associated with the fishery, they will necessarily bring to the table their social and economic concerns as well, increasing the opportunity for gains on those dimensions as well.

In the case of inclusiveness of governance, the gains in sustainability due to dealing with Complexity are not necessarily offset to some degree by even greater Lack of Knowledge. Rather, each stakeholder group brings additional knowledge to the table – experiential knowledge (Stanley and Rice in press, Mackinson and Nøttestad 1998, McGoodwin et al. 2000) from those participating in the fishery and community leaders, and additional perspectives on risks and consequences which can be drawn out by members of environmental groups. The result is that more knowledge is available on all three dimensions of sustainability. The knowledge may still be far less that ideal for management, but it is greater than with specialist-only approaches. Transactions costs do increase, because meetings require more logistic support, but the cost is often small compared to the gains.

Adopting inclusive governance makes a substantial positive contribution to at least one aspect of uncertainty as well. Implementation uncertain can play a major role in unsustainability, reflecting the discrepancy between what the managers expected when the management plan was adopted and how the fishery really operates (Rosenberg and Restrepo 1994). If the inclusive processes do lead to a management plan with which the fishery will comply, the implementation uncertainty will be reduced greatly. These benefits can also be obtained without increases in the cost of missing knowledge. For example, the European Fisheries Ecosystem Project found that the work of social scientists in the project had greater impact that their investigations of the environmental forcers of North Sea fisheries, and impacts of the fishery on the ecosystem. Their contribution made it possible to identify a set of objectives endorsed by the fishing industry, government officers, and environmental groups. More importantly, industry provided clear and consistent information on management measures with which they would readily cooperate, and ones which would be unlikely to elicit cooperation. This information rarely coincided with the views of managers and scientists with regard to what management measures they would prefer, but retrospectively all agreed that many of the measures preferred by industry would be effective at moving towards the common objectives (see documents on www.efep.org).
There is a downside to the inclusive, participatory governance process, in that the greater the diversity of participants, the more difficult it is likely to be to achieve consensus at the meetings. In the CSAS processes, there has been about a 20 percent increase in the time needed for major assessment meetings, in order to obtain consensus on wording on conclusions once all peer review has been completed. At least four times in the past five years, meetings have adjourned without achieving consensus on a key issue. This should not be viewed as a failure of the inclusive process, however. Rather it is a clear demonstration that the information basis really is inadequate for a clear and consistent interpretation, and that uncertainty needs to be acknowledged in developing the management plan and prosecuting the fishery. The uncertainty has not been increased by the inclusive governance process. The uncertainty was always there, and the inclusive governance process provided valuable information where uncertainty and risk was high.

There is, of course, some interplay between the potential for gains in addressing uncertainty and gains in addressing complexity. The inclusive governance systems are high maintenance. For each inclusive zonal meeting sponsored by CSAS, we budget an additional US$25 000 for bringing in external participants (and honoraria and consulting fees are not paid), and major meetings may cost as much as five times that much. Hence where Poverty and Lack of Alternatives is a contributor to unsustainability, the overhead of inclusive governance systems will be a deterrent to effective implementation. If the governance can be brought close enough to the communities that meeting costs are not an issue, then inclusiveness may make some positive contribution to social and economic sustainability through allowing some degree of community planning for the consequence of fishery reductions. Such benefits are speculative and unlikely to be large, however, just because alternatives to fishing are unlikely to be available in the most pressing cases, so planners have few options to discuss.

The effect on the contribution of Externalities to unsustainability is similar to the other aspects of an EAF, and probably positive. By defining the “fisheries management” community more inclusively, fewer groups and perspectives are excluded from the process. This makes many social and economic aspects of the fishery not external, and must decrease the pressure towards unsustainability on these axes. As noted under uncertainties however, simply making a process more inclusive does not ensure that the process will reach better decisions quickly or at all in some cases. Although not studied systematically (at least to my knowledge) it seems likely that where the pressures towards social or economic unsustainability due to Externalities would be most intense, it is because the “external” pressures were both strong and oriented in directions away from sustainable uses. In those cases bringing those pressures into the management process is likely to make the dynamics of the inclusive processes difficult, and the points on which consensus can be established quite basic and cautious. The truly divisive issues, which often represent the greatest pressures towards unsustainable activities, would not be reconciled quickly. Where there is a history of difficult interactions, distrust is high, and participants are very cautious (ICES 2004). Hence progress towards sustainability could expect to be made, but not necessarily swiftly.

Inclusive governance cannot be expected to reduce excessive Demand for limited resources directly, but it may be able to alter the Incentives which drive a fishery towards unsustainability. This would require that “trust” and “belief” are themselves incentives to comply with fisheries management plans, or else that the inclusive governance processes had economic instruments available to it that would not be available to classic top-down management systems. In such cases the benefits would be from the increased economic instruments, and not directly from the inclusive governance component of the EAF. However, if inclusive governance systems create to incentives for participants to live up to their word given during the inclusive processes or provide access to economic instruments like certification, then this can become a major positive incentive towards sustainability on all three dimensions, at least in the medium term. Whether there are gains or losses in the short term on social and economic dimensions of sustainability depends on the size of the transition costs incurred in implementing the results of the process. An inclusive process is likely to be at least an effective tool for getting estimates of those transition costs at the stage when options are still being developed as would be a top-down process, and this might at least result in more moderate transition costs than would occur when there was a severe tension between the participants in the fishery and those managing it.
6. CONCLUSIONS

1. The greatest effects of considering environmental forcing and ecosystem effects of fishing will be on Complexity and Lack of Knowledge and Externalities (ecosystem), and be expressed more strongly on the biological dimension of sustainability. There will be a trade-off between addressing Complexity and Externalities better, and being more constrained by inadequate knowledge.

2. The greatest effects of multiple-use planning and inclusive governance will be Lack of Effective Governance, Externalities (social & economic system), and Poverty and Lack of Alternatives, and the first-order effects will be on social and economic sustainability. Tradeoffs of opportunities and constraints relative to the same factors are less apparent on for these factors.

3. Uncertainty will be increased when any of the components of an EAF are adopted. The increase will often be large, especially for considering environmental forcing and ecosystem effects of fishing.

4. Because of the increase in uncertainty, harvesting opportunities under an EAF are expected to be even more limited than under single-species management. If decision-making is not risk averse (precautionary) then benefits from trying to implement an EAF will be hard to obtain.

5. If different stakeholder groups distrust each other and interact poorly, then benefits from multi-use planning and inclusive governance under an EAF will be hard to obtain.

6. Even without considering increased uncertainty, addressing environmental forcing and ecosystem effects of fishing will require catch reductions – often large – much more often they will permit increased harvesting. Therefore it is likely that to obtain benefits on the ecological dimension of sustainability will require significant loss on the social or economic dimension, at least in the short and medium term.

7. Although in the short-term there are tradeoffs among dimensions, longer-term effects of an EAF could be improvements on all the dimensions of sustainability, but only if
   a. Management is risk averse to uncertainty
   b. Transition costs (often large) can be borne as harvesting is reduced, and
   c. Increased transaction costs of the governance system can be borne.
Table 1. Tabulation of likely short term and longer term effects of the four components of an Ecosystem Approach to fisheries on the ecological and social/economic dimensions of sustainability, disaggregated by the six factors of Unsustainability and Uncertainty

<table>
<thead>
<tr>
<th>Factor of Unsustainability</th>
<th>Time Frame</th>
<th>Ecological Dimension</th>
<th>Social &amp; Economic Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity &amp; Lack of Knowledge</td>
<td>Short Term</td>
<td>Positive – Complexity</td>
<td>Variable; Indirect relationships Mediated by state of resource</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative – Lack of Knowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Positive- gains depend on: Knowledge matching Complexity and use of Precautionary decision-making (Both unlikely to be large)</td>
<td>Positive – Improved planning horizons Negative – Requires large investments to gain knowledge. Any gains require scope to reduce harvests when environmental predictions suggest conditions are unfavourable.</td>
</tr>
<tr>
<td>Externalities</td>
<td>Short Term</td>
<td>Positive – More influences included as part of the management issue. Requires stronger science advice on these relationships.</td>
<td>Positive - More influences included as part of the management issue</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Any gains depend on management responding to more complex forecasts</td>
<td>Positive – but large gains require decisive management response to complex &amp; uncertain forecasts</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>Short Term</td>
<td>Positive – ecosystem treated more realistically. Often explained but NOT reduced</td>
<td>Positive – Improved risk forecasts Negative – Precaution requires greatly reduced harvesting</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Positive – ecosystem treated more realistically. May be reduced if knowledge increases to match complexity (unlikely)</td>
<td>Positive – Improved risk forecasts Negative – Precaution requires greatly reduced harvesting when faced with environmentally driven uncertainty</td>
</tr>
<tr>
<td>Lack of Effective Governance</td>
<td>Short Term</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Depends on how industry responses to forecasts. Gains least likely where needed most.</td>
<td>Could create more stable industry and communities, facilitating improved governance.</td>
</tr>
<tr>
<td>High Demand For Limited Resources</td>
<td>Short Term</td>
<td>Neutral</td>
<td>Neutral or negative impact of pessimistic predictions on markets.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Positive – if marketing plans for resource fluctuations Negative – if race for fish gets advance notice of constraints Either – Depending on how covarying parts of ecosystem increase or decrease ability to meet demands.</td>
<td>Positive - Some opportunity to plan for varying ability to supply markets Negative – If markets increase demand for resources when limitations expected. Either direction – many parts of ecosystem may fluctuate together, making alternative ways to meet demand either easier or harder (and case specific).</td>
</tr>
<tr>
<td>Factors of Unsustainability</td>
<td>Time Frame</td>
<td>Ecological Dimension</td>
<td>Social &amp; Economic Dimension</td>
</tr>
<tr>
<td>-----------------------------</td>
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</tr>
<tr>
<td>Inappropriate Incentives</td>
<td>Short Term</td>
<td>Neutral</td>
<td>Neutral or negative as race for fish increases when forecasts imply declines.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Depends on how industry responses to forecasts. Gains least likely where needed most.</td>
<td>Positive – improved planning horizon Thinking when resource deteriorations expected. Gains least likely where needed most.</td>
</tr>
<tr>
<td>Poverty and Lack of Alternatives</td>
<td>Short Term</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Indirect – mediated by response to human institutions to forecasts, and resource responses to human activities</td>
<td>Positive – improved planning horizon Negative – Many environmental drivers may drive poorest parts of population to greater dependence on the sea.</td>
</tr>
<tr>
<td>Complexity &amp; Lack of Knowledge</td>
<td>Short Term</td>
<td>Positive – Complexity closer to real problem Negative – Knowledge often not available to match complexity.</td>
<td>Negative – likely to require reductions or displacement of harvesting. Little knowledge of many economic links to ecosystem impacts.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Positive - gains depend on: Knowledge matching Complexity and use of Precautionary decision-making (Both hard to achieve)</td>
<td>Positive – Improved ecosystem status, more opportunities for sustainable uses. Negative – requires investments in knowledge. Has large transition costs.</td>
</tr>
<tr>
<td>Externalities</td>
<td>Short Term</td>
<td>Positive – All consequences included as part of the management issue</td>
<td>Positive – Inter-sector conflicts foreseen and managed. Negative – More complex planning required.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Any gains depend on management responding to more complex forecasts</td>
<td>Positive – Inter-sector conflicts foreseen and managed. Negative – More complex planning required.</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>Short Term</td>
<td>Large increases if management is risk averse</td>
<td>More uncertain; don’t know what issue will arise next. Precautionary harvesting needed, so catch reductions necessary.</td>
</tr>
<tr>
<td>Factors of Unsustainability</td>
<td>Time Frame</td>
<td>Ecological Dimension</td>
<td>Social &amp; Economic Dimension</td>
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<tr>
<td>-----------------------------</td>
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</tr>
<tr>
<td>Uncertainty</td>
<td>Long Term</td>
<td>Positive – More impacts foreseen, managed or mitigated. Negative – Complexity means Uncertainty will always be high; Knowledge will help</td>
<td>Negative - Highly precautionary harvested needed; Not possible to take some yields due to ecosystems impacts. Unstable planning horizons; Large investments needed in research and monitoring.</td>
</tr>
<tr>
<td></td>
<td>Short Term</td>
<td>Neutral or positive – Including other values in management may reduce major effects.</td>
<td>Positive – focuses attention on need for multi-use planning. Negative - Necessary governance systems made more complex (and realistic).</td>
</tr>
<tr>
<td>Lack of Effective Governance</td>
<td>Long Term</td>
<td>Large gains if governance responds to being in spotlight; No gains if governance remains weak.</td>
<td>Positive - Focus on multi-use payoffs may provide incentives for multi-sector planning and cooperation. Negative – minimum governance systems requires higher overhead.</td>
</tr>
<tr>
<td>High Demand For Limited Resources</td>
<td>Short Term</td>
<td>Little direct effect</td>
<td>Likely to be increased as harvesting opportunities limited further by need to reduce ecosystem effects of fishing.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Catch reductions to improve ecosystem quality, make demand pressures more severe. Benefits if eco-certification can make demand function constructively.</td>
<td>Can be amplified greatly if major ecosystem effects require major catch reductions. Possibility that eco-certification can make demand function constructively.</td>
</tr>
<tr>
<td>Inappropriate Incentives</td>
<td>Short Term</td>
<td>Positive - Legitimises many non-yield conservation incentives. Negative – Amplifies negative consequences of short-sighted activities.</td>
<td>Potential for improvements by giving additional participants legitimate role in decision-making about fisheries. Challenge because many benefits of dealing with ecosystem effects will not be incentives to the fishing industry itself.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Improves incentive structure but any gains require improved governance and have high transition costs</td>
<td>Positive - Potential for major overall gains by adding benefits in other industries to incentive structure for fisheries. Negative – fewer harvesting opportunities with more restrictions.</td>
</tr>
<tr>
<td>Factors of Unsustainability</td>
<td>Time Frame</td>
<td>Ecological Dimension</td>
<td>Social &amp; Economic Dimension</td>
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<td>-----------------------------</td>
</tr>
<tr>
<td>Poverty and Lack of Alternatives</td>
<td>Short Term</td>
<td>No direct link, unless immediate protection of valued ecosystem components, then user displacements w/o gains.</td>
<td>Neutral or negative – New restrictions and increased investments in gear. Poverty will slow progress.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Indirect effects – depend on response of social and economic system.</td>
<td>Positive - More stability in all activities using marine ecosystems. Negative - fewer harvesting opportunities with more restrictions. Higher costs to fishing.</td>
</tr>
<tr>
<td>Complexity &amp; Lack of Knowledge</td>
<td>Short Term</td>
<td>Improved. Better human uses due to increased information sharing and decreased competition among industries.</td>
<td>Complexity Improved. Interacting activities are planned and conducted together. Lack of knowledge – Increased as consequences of activities on other activities often poorly known. Gains due to opportunity for sharing information across industries.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Improved. Degree depends on degree of cooperation among industries. Can be large with good planning &amp; zoning of uses to most suitable areas.</td>
<td>Improved – degree depends on degree of cooperation among industries in sharing information and accommodating other uses. Some transition costs.</td>
</tr>
<tr>
<td>Externalities</td>
<td>Short Term</td>
<td>Positive. Direct conflicts that degrade ecosystem brought to decision forum.</td>
<td>Gains. All interacting uses made part of the management planning.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Possible major gains from considering impacts of each activity on other uses and ecosystem.</td>
<td>Gains from all interacting uses made part of the management planning. Decision-making made more complex. Large transition costs if little scope for harvest reductions.</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>Short Term</td>
<td>Improvement due to information sharing. Knowledge of impacts of other activities on fisheries</td>
<td>Improved due to more information sharing on common problems. Increases in Uncertainty due to demand for knowledge of consequences of each activity on other users and their needs.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Improvement due to information sharing and increased science &amp; monitoring capacity from combined industry resources.</td>
<td>Improved – more stable planning horizons as each user more aware of plans of interacting industries.</td>
</tr>
<tr>
<td>Lack of Effective Governance</td>
<td>Short Term</td>
<td>Some improvement as obvious conflicts that impact ecosystem are addressed.</td>
<td>Opportunity for improved governance through inclusiveness of multiple-use planning. Limited by trust that exists among interacting users.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Indirect. Impacts mediated by size and type of social and economic effects.</td>
<td>Great improvements if groups build trust and respect. Great stresses if there is little scope for compromise on multiple-use conflicts.</td>
</tr>
<tr>
<td>Factors of Unsustainability</td>
<td>Time Frame</td>
<td>Ecological Dimension</td>
<td>Social &amp; Economic Dimension</td>
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<tr>
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<td>----------------------------</td>
</tr>
<tr>
<td>High Demand For Limited Resources</td>
<td>Short Term</td>
<td>Neutral</td>
<td>Neutral on external demands. Possible opportunity for reductions in local demands if other food sources are part of planning.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Indirect. Impacts mediated by size and type of social and economic effects.</td>
<td>Neutral to some gain. External demands not affected by integrated management; local demands might be.</td>
</tr>
<tr>
<td>Inappropriate Incentives</td>
<td>Short Term</td>
<td>Neutral directly. Indirectly participants in integrated planning may have more conservation-oriented values.</td>
<td>Neutral to external incentives. Can create local opportunities that improve local incentive structure.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Indirect. Impacts mediated by size and type of social and economic effects.</td>
<td>Needs of other users can be represented as additional incentives to responsible behaviour.</td>
</tr>
<tr>
<td>Poverty and Lack of Alternatives</td>
<td>Short Term</td>
<td>Modest gains. Impacts of conflicts could be reduced and effort reduced.</td>
<td>Positive. Pressures from conflicting uses could be reduced and new opportunities found.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Declines unlikely. Gains mediated by improved economic &amp; social conditions reducing dependency on environment.</td>
<td>Potential for substantial gains if opportunities can be diversified. Transition costs likely.</td>
</tr>
<tr>
<td>Complexity &amp; Lack of Knowledge</td>
<td>Short Term</td>
<td>Gains – more perspectives in assessment and management process. Users contribute knowledge of ecosystem status and processes.</td>
<td>Gains by bringing existing social dynamics into the planning. Risk of loss due to more complex (possibly dysfunctional) decision-making with more stakeholders at the table.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Gains – more perspectives in assessment and management process. Users contribute knowledge of ecosystem status and processes. Less over-harvesting though better compliance</td>
<td>Gains – Complexity of governance matches complexity of behaviour. More buy-in to management makes planning and operations more stable. High transition costs if participants distrust each other, or do not share objectives.</td>
</tr>
<tr>
<td>Externalities</td>
<td>Short Term</td>
<td>Improved. Benefits from bringing more ecosystem values to the decision table.</td>
<td>Improvements – Inclusive governance brings in previously excluded parties. Transaction costs increase, possibly by large amount. Addressing previously external ecosystem values may require substantial catch reductions.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Benefits from bringing more ecosystem values to the decision. Gains depend on ability to bear transition costs and build trust.</td>
<td>Same as short term. Benefits depend on capacity to accommodate catch reductions demanded by participants with non-consumptive ecosystem values.</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>Short Term</td>
<td>Decrease in implementation uncertainty means fishery impacts on ecosystem closer to management plan expectations.</td>
<td>Less uncertainty about industry reaction to management plans. Dynamics of inclusive groups may be unpredictable in early stages</td>
</tr>
<tr>
<td>Factors of Unsustainability</td>
<td>Time Frame</td>
<td>Ecological Dimension</td>
<td>Social &amp; Economic Dimension</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Major decrease in implementation uncertainty</td>
<td>More stable planning and lower enforcement costs.</td>
</tr>
<tr>
<td>Lack of Effective Governance</td>
<td>Short Term</td>
<td>Gains due to improved compliance with management plans</td>
<td>Gains – lower enforcement costs, likely more orderly fishery. Higher transaction costs.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Gains mediated by degree of compliance and cooperation with common goals.</td>
<td>Gains – possibly large if governance leads to strong support for management plans and stable fishery. Possible permanent increase in transaction costs.</td>
</tr>
<tr>
<td>High Demand For Limited Resources</td>
<td>Short Term</td>
<td>No direct impact</td>
<td>Possible small benefits by focusing community attention on local demands</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Indirect impacts mediated by market responses</td>
<td>Little impact on long-term, external demands. Inclusive governance does help obtain eco-certification.</td>
</tr>
<tr>
<td>Inappropriate Incentives</td>
<td>Short Term</td>
<td>Some benefits from social incentives towards responsible behaviour.</td>
<td>May create new community-based incentives&gt; May allow access to new economic instruments.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Benefits from social incentives such as Code of Conduct</td>
<td>Can foster economic incentives such as eco-certification. Social incentives can come to be important.</td>
</tr>
<tr>
<td>Poverty and Lack of Alternatives</td>
<td>Short Term</td>
<td>Little effect</td>
<td>Poverty may be result of social dynamics that make empowerment of inclusive governance difficult. Poverty may make transaction costs hard to bear. Benefits possible if governance can be brought closer to substance users.</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>Unpredictable. Depends on degree of cooperation with management plans arising from the process.</td>
<td>Unpredictable. Depends on social dynamics of making governance work.</td>
</tr>
</tbody>
</table>
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TOWARD SUSTAINABLE AND RESILIENT FISHERIES: 
A FISHERY-SYSTEM APPROACH TO OVERCOMING THE FACTORS OF 
UNSUSTAINABILITY

by

Anthony Charles

Summary

This paper describes a Fishery-System Approach to broadening the scope of fishery management, to better incorporate crucial aspects from across the fishery system and beyond. The approach builds on and incorporates an Eco-System Approach, while adding a parallel on the human side of the fishery, the Livelihoods Approach. The Eco-System Approach looks at target fish species and fishing activity within the context of the ecosystem, while analogously, the Livelihoods Approach examines human involvement in the fishery within a larger context of households, communities and the socioeconomic environment. A Fishery-System Approach therefore helps to address a fundamental concern: We will never achieve fishery sustainability if we restrict attention solely to what goes on within the fishery. The paper (a) outlines how livelihood issues – relating to societal objectives, the post-harvest sector, fishery diversification, women in fisheries, and household decision making – interact with fishery management, (b) draws lessons from integrated coastal management, particularly in terms of fishery interactions with other sectors, and (c) explores the potential for a Fishery-System Approach to deal with such factors of unsustainability as poor governance, lack of secure rights, poverty and lack of alternatives, and an unbalanced treatment of sustainability components.

1. INTRODUCTION

Conventional fishery management practices, at least in industrialized fisheries, have focused on assessing individual fish stocks, on setting total allowable catches for each stock, on limiting effort of individual fleets, and so on. Such practices tended to neglect the state of the broader aquatic ecosystem, and are thus widely seen to have been too narrow in scope. Less noted is the reality that this narrowness was also reflected in treatment of the human side of the fishery. A focus on one species or stock at a time usually translated into a preoccupation with those catching that one species/stock, neglecting interactions with other fisheries as well as with the post-harvest sector, the fishing communities, and society at large.

Some moves toward the necessary broadening of perspective in fisheries can be observed, notably as nongovernmental organizations become more involved in examining the broader impacts of fishery decisions, and as governments enlarge their ocean interests beyond a preoccupation with fisheries, seeking to frame fishery challenges within an oceans and coastal context. Greater attention is being paid to the aquatic ecosystem, through an ‘ecosystem approach’, with the potential to produce important changes in fishery management, if the structure and dynamics of the ecosystem are now to be taken into account in fishery decision making.

The ecosystem approach also serves as a starting point for a more comprehensive Fishery-System Approach that encourages a broader look not just at ecosystems but at other components and interactions within the fishery system as well. This broader perspective on fisheries forms the basis of this paper. Of course, merely advocating a comprehensive approach to understanding and managing fisheries is of

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The views expressed in this paper are solely those of the author, Anthony Charles, Management Science/Environmental Studies, Saint Mary’s University, Halifax, Nova Scotia B3H3C3 Canada, t.charles@smu.ca.
limited usefulness, so the paper also provides some concrete ideas for changes to fishery management and policy, to better incorporate a Fishery-System Approach.

The discussion begins in the next section with an examination of fishery systems and their boundaries, scale and scope. This is followed in section 3 by a discussion of the two key components of a Fishery-System Approach – the ecosystem approach (illustrated through its application to marine protected areas) and the ‘livelihoods approach’ (with its links to fishery management) – along with related lessons from integrated coastal management. Section 4 applies a Fishery-System Approach in examining three identified factors of unsustainability: (1) poor governance, (2) a lack of secure fishery rights, and (3) unbalanced treatment of the components of fishery sustainability. Finally, the paper concludes in section 5 with some discussion on implementation realities. It should be noted that since this paper synthesizes a wide range of topics in a relatively short space, readers are referred to related analyses (e.g., Charles 2001, 2004) for further details.

2. DEFINING THE ‘BIGGER PICTURE’: FISHERY SYSTEMS

A narrow view of a fishery system is that of a specific fish stock and the ‘fleet’ (or set of fishers) exploiting it. Fishery management in such a scenario basically involves two steps: assess the stock, and manage the fleet. Such a perspective may be suited at times to a fishery on a single fish stock in the open ocean, and its accompanying industrial-scale fleet – but coastal, small-scale and/or tropical fisheries are typically multi-species, focused more on a community of people trying to make a living than on an ‘atomistic’ set of fishers exploiting a specific stock. In such cases, it is certainly as important to understand the human aspects of the system as the biological one. Thus, figuring out the fishery system can make or break the success of fishery management.

**Boundaries.** How can the boundaries of the system be set, and can they simultaneously reflect ecological, economic, socio-cultural, institutional and political considerations? If not, which factors are of greatest importance in setting the boundaries? Put another way, what is the balance between defining management units on the basis of human factors (to reflect, for example, the cohesive nature of a fishing community) and defining them to reflect biological stock units? In particular, how do we balance between the ‘natural’ delimitations of watersheds or coastal zones, on the one hand, and the boundaries of the system from the perspective of the local human populations?

**Scale.** The scale of a fishery system can vary greatly – from a small-scale fishery involving a coastal community and its local fishery resources, to a state or provincial fishery, a national system, or an even larger scale of regional multinational fishery organizations such as the European Union or the FAO’s Regional Fishery Bodies. When is it best to focus on a small scale and when should we look at the fishery as a larger system? Is it possible to be effective in managing at a scale different from that of the resource, or that of the harvesting activity? What happens when there are differences in the scales that are appropriate to deal with each component of a fishery – fish stocks, fishers, science, enforcement, policy, etc.?

In some cases, local solutions may be most effective, in the spirit of the subsidiarity approach (managing at the most local level possible). For example, consider a community-based fishery, harvesting a local, sedentary stock. The relevant system would seem naturally to comprise the fish stock and the environment in which they live, together with the fishers and their local community. However, while local management may seem a clear choice in such a case, ‘modern’ fishery management has often failed to embrace local solutions, preferring a broader geographical scale - provincial, state or national. Decisions are then made at this ‘higher’ level and applied uniformly to multiple local fisheries, despite the possibly large differences among them. In such a case, an adjustment to the management arrangements to bring decision making closer to the natural fishery unit would seem helpful. A similar need can arise from a biodiversity perspective, as we learn more about the genetic structure within fish stocks. For example, if there are found to be genetically distinct sub-stocks within what had been managed as a single fish stock unit, can we adjust the scale of management to allow for spatial heterogeneity, supporting biodiversity and diversity among fishing communities?
Often there are ‘cross-scale linkages’ that are needed – for example, if decentralized and/or local approaches to management are needed to account for local conditions, but the fish stocks range over larger geographical areas. In such a case, coordination across boundaries is needed. Consider a fishery involving a highly migratory stock, such as tuna, crossing national boundaries. While on the human side, the fishers of a specific nation and the national management system may form a cohesive unit, that may not be compatible with the biological reality of the stock. If, accordingly, the system is then defined largely based on natural conditions, the set of fishers and the management sub-system involved may need adjustment. In this case, such an adjustment leads to the type of fishery management in place for ‘internationalized’ large pelagic fisheries world-wide, and is in keeping with the subsidiarity approach of the European Union, in which fish stocks are assessed scientifically in the context of the relevant ecosystem, but catch quotas (TACs) set for the stock are sub-divided among the relevant countries, so each country is able to manage its own fishery.

Scope. The ‘scope’ of the fishery system is also crucial to determine. If fisheries are merely ‘fish in the sea, people in boats’, and research is just about the study and assessment of commercially-important species, and management efforts are directed solely at the harvesting process, we would be neglecting the pervasive interactions between the core of the fishery - fish and fishers - and all the other elements of the ecosystem and the human system. The key lies in seeking a reasonable comprehension of the interactions among relevant components of the fishery system, but in a cost-effective way. In other words, there is a need for balance – to achieve a multi-disciplinary and integrated understanding while not spending all available management funds attempting an exhaustive understanding of the fishery. This will be a recurring theme in the present paper.

Figure 1. (from Charles, 2001)
3. A FISHERY-SYSTEM APPROACH: MOVING TO THE ‘BIGGER PICTURE’

This section discusses several steps along the path of broadening our perspective of fishery systems. First is an exploration of how adoption of an ecosystem approach, e.g. through marine protected areas, leads logically to a further broadening to deal with the human dimensions of fisheries. Second, we look at the ‘Livelihoods Approach’ as a counterpart to the ecosystem approach on the human side of the fishery system. Third, examples of the interaction between a livelihoods approach and fishery management are explored. Fourth, we discuss how coastal management – with its focus on multiple resources, multiple uses and multiple objectives – provides lessons for the ‘bigger picture’ Fishery-System Approach.

3.1 The Ecosystem Approach and Marine Protected Areas

As noted earlier, the ecosystem approach (also referred to as ecosystem-based management) seeks to ensure that the ecosystem is taken into account in managing human involvement in fisheries. Larkin (1996: p.149) suggests that within the marine environment, an ecosystem approach has three essential components: “sustainable yield of products for human consumption and animal foods, maintenance of biodiversity, and protection from the effects of pollution and habitat degradation”. This marks a significant broadening beyond the ‘fish stock and fishing fleet’ sense of the fishery. The ecosystem approach has been the focus of considerable research attention in recent years, generating a range of conceptual, theoretical and practical studies [see, e.g., FAO (2003), Garcia et al. (2003) and references therein] – this work is largely beyond the scope of the present paper, but some fundamental points will be emphasized here.

A key manifestation of an Ecosystem Approach is the development and implementation of Marine Protected Areas (MPAs, or Marine Reserves). However, MPAs also reflect well the inability of a narrow view of fishery management to maximize fishery sustainability. This is because (1) MPAs typically involve more than a single fishery, and indeed more than the fishery sector itself, with implications for a range of ocean users such as tourism, aquaculture, industry and urban development, (2) the various players may well have different perceptions of the choices available, and indeed conflict can arise not only between ocean users but also between the need for acceptability and the need to meet scientific criteria in establishing MPAs. For example, it is possible that an ‘acceptable’ MPA may be small and far away from fishing grounds, while a scientifically ‘desirable’ MPA may be large and centred on the fishing grounds. Therefore, it is important to monitor the MPA to measure its success or failure in meeting its specified objectives, and to examine distributional considerations, such as how benefits and costs are distributed spatially, temporally, and across local, regional and national levels. There is also a need for consultation, design, implementation and monitoring of the MPA to occur using participatory processes.

These considerations in establishing MPAs reinforce a point made by Kay and Schneider (1994: p.38) about incorporating the human component of the fishery system into an ecosystem approach: “If we are truly to use an ecosystem approach… it means changing in a fundamental way how we govern ourselves, how we design and operate our decision-making processes and institutions, and how we approach the business of environmental science and management”. While it is helpful to envision such human considerations within an ecosystem approach, the reality is that most efforts to develop and implement ecosystem approaches are focused primarily on ecological aspects. There remains a need to integrate this with similar initiatives on the human side, and this leads into the next topic…

3.2 The ‘Livelihoods Approach’

Just as the ecosystem approach seeks a balance between the traditional emphasis on fish stocks and the broader context of where the fish live (the ecosystem), so too is there a need on the human side for an equivalent balancing – of a conventional emphasis on fishers and fishing fleets with the context of where those doing the fishing live, i.e. in fishing households, communities and the coastal economy. Indeed, effective fishery management requires us to understand when problems can be tackled internally to the
fishery and when, as Panayotou (1980: p.146) suggested, “the solutions to the problems of small-scale fishermen are to be found outside the fishing sector”.

A ‘bigger picture’ is needed to deal with inherent linkages between fisheries and human activities beyond the fishery system, especially in other coastal and marine sectors such as aquaculture and tourism, and in coastal communities. Furthermore, as needs for more protein, income and livelihoods from fisheries come up against limits on sustainable fish harvests globally, it becomes crucial to seek to maximize the benefits to society produced from each fish caught, which in turn requires attention to all elements of the fishery system. All of this points to the need to incorporate linkages between the fishery itself, and the corresponding fishing households and communities, the post-harvest sector and the broader socioeconomic environment surrounding the fishery.

This provides a motivation for what may represent an equivalent of the ecosystem approach on the human side, namely a Livelihoods Approach. This perspective, also referred to as a ‘sustainable livelihoods approach’, has its own extensive theory largely beyond the scope of this paper – see, e.g., Ellis (2000), Allison and Ellis (2001) and references therein. The key of a Livelihoods Approach is to broaden fishery discussions beyond fishing and ‘fishery jobs’ per se to emphasize the entirety of individual, household or community sources of well-being and livelihood (income), and in particular how individuals, households and communities develop ‘portfolios’ of livelihood sources.

This is a crucial matter, since livelihood diversity (or economic diversity at the scale of a community or region) is often fundamental to achieving sustainability in fisheries. When fishers and communities have few if any economic alternatives, it will be very difficult to institute effective fishery management. For example, noted fishery economist Ian Smith (1981: p.22) pointed out that policies to deal with over-exploitation and over-capacity by attempting to reduce the number of fishers are likely to aggravate problems posed by a lack of employment alternatives since “Management programmes fail to deal adequately with fishermen who are displaced”. Smith noted that in the absence of non-fishery economic alternatives, such rationalization may fail either because (a) it is politically infeasible, due to adverse impacts on those dependent on the fishery, or (b) it is practically infeasible, since fishers removed from the fishery and without other options will do whatever necessary, including illegal fishing, to maintain their livelihood. It must be noted as well that such policies may also lead to declines in sustainability through inequitable resource allocation and social dislocation. For such reasons, a lack of economic alternatives beyond the fishery must be considered as important a problem as over-exploited stocks and over-capacity in the fleets, despite receiving by far the least attention of these three problems. Indeed, it might be argued that this lack of attention is among the most glaring examples of an overly-narrow approach and how it can lead to fishery unsustainability.

Figure 2.
A Livelihoods Approach fits – along with an Ecosystem Approach – within the context of an overall Fishery-System Approach, incorporating a range of factors revolving around the fishery, and the various interactions of these with the fish harvesting sector. These factors include:

- Demographic: population and population trends, migration, age and gender structure, etc.;
- socio-cultural: community objectives, gender roles, social stratification, social cohesion, etc.;
- economic: income and its distribution, degree of fishery dependence, types of markets, etc.;
- institutional: community organization, community infrastructure, involvement of women, etc.;
- marine Infrastructure: wharves, marketplaces, etc.;
- community Infrastructure: schools, churches, meeting places, cultural facilities, etc.;
- relevant Non-fishing Activities: boat building and repair, agriculture, tourism, industry, etc.

Within this broadened perspective, it is useful to examine interactions between the fishery and its socioeconomic environment. How do local fishery objectives relate to broader regional and national policy goals? How does the local institutional structure interact with institutions, legal arrangements, legislation and policy frameworks at national and/or sub-national levels? How do demographic aspects of the fishery interact with external influences, such as national population and migration trends? How do aspects of society, culture, history and tradition impact on fishery decision making? How does the fishery economy interact with the economic structure at regional, national levels?

3.3 The Livelihoods Approach and Fishery Management

The following are some examples of how a Livelihoods Approach, and the ‘bigger picture’ inherent within a Fishery-System Approach, interact directly with fishery management.

- **Diversifying for Resilience.** A livelihoods approach recognizes that each fishery participant needs to generate their livelihood one way or another, and resilience is enhanced if those livelihoods can be achieved from a diversity of sources, rather than having each individual relying on just one fish stock or set of stocks. Within the fishery, it is therefore useful to encourage multi-species fishing, in which fishers utilize a range of fish resources, and avoid policies that lead to specialization of fishers in single-species fisheries. Diversifying across sources of fish lets the individual fisher reduce risks, and at the same time, gives management greater flexibility to reduce harvesting of particularly vulnerable stocks. Still focusing on fishers but looking beyond the fishery per se, the existence of ‘occupational pluralism’ – fishers holding other jobs during non-fishing times – is to be encouraged so that fishers avoid total reliance on fishing for their income. This reduces the pressure they would otherwise face to obtain a livelihood entirely from the fishery, and thus also reduces pressure on the fish stocks. Encouraging such multiple sources of livelihood for fishers, and by implication, discouraging excessive specialization in the fishery, may boost the system’s overall resilience.

- **Post-Harvest.** From a livelihoods perspective, at the household or community scale, fishing and the post-harvest sector are often complementary. Attention to the processing sector within the context of fishery management can thus help improve livelihoods of fishing households without increasing catches. For example, better fish processing can transform fish into more manageable and marketable forms, making distribution easier and reducing spoilage, thus contributing value added to the fish landed by fishers, and potentially increasing prices paid to those fishers. Processing can also produce significant benefits to the fishery by creating employment in fishery-based regions, providing more diversified household income sources, and generally increasing the value of the fishery to coastal communities and to society. Finally, processing can produce conservation benefits, such as reduced waste through better utilization of by-catch, which in turn can relieve pressure on the resource base. Post-harvest marketing and distribution channels can also have impacts on fisheries and livelihoods – for example, if fish caught in
developing nations are diverted from local markets to those in Northern countries, and/or from use as food fish to use as fish meal in salmon and shrimp farms, this could result in lower availability for local nutritional needs.

- **Societal Objectives.** Broadening the perspective on fishery systems through a livelihoods approach provides a better framework to account for costs and benefits of management, relative to society’s objectives. For example, consider a fishery involving isolated communities with few alternative employment options, where the fishery is the ‘engine’ of the coastal economy. In such a situation, if fishers have no job alternatives, then the social opportunity cost of labour – the true cost to society of having a fisher working in the fishery, measured by what that person could otherwise have been doing in the economy – is essentially zero. There is no social cost to keeping the fishers in the fishery. Indeed, the social cost of labour may even be negative, so rather than being a cost to be minimized, the employment of fishers is a positive ‘good’. This could happen if (a) the loss of fishers from the fishery leads, through a multiplier effect, to an economic loss to the regional economy, or (b) if social costs rise as unemployment rises, due for example to increased crime and/or decreased health and welfare levels. Both of these possibilities can be analysed through a Livelihoods Approach. In any case, a Livelihoods Approach facilitates a more complete analysis. In particular, it highlights where private decisions may not fit with society’s objectives. For example, from the private perspective of a fishing vessel owner, there is an incentive to minimize the use of labour since employing a crew member implies a positive labour cost, given by the wage level (i.e., the private cost of labour). In the scenario described above, even though such a private incentive may be individually ‘rational’, its consequences may be undesirable from society’s perspective.

- **Household Decision-making.** Choices made at the level of fishing households can have major conservation impacts. Consider for example the extent to which a fishing household involves family members in the fishing enterprise. Doing so could lead to greater fishing intensity by a profit-maximizer (since costs of fishing are lower by using family members) or lower fishing intensity in the case of a satisficer (since a sufficient household income will have been more rapidly obtained). Furthermore, in many cases, household members not involved in harvesting may be highly involved on the post-harvest side, perhaps working in processing plants (in an industrial setting) or marketing and distributing the catch within the community and beyond (for those in an artisanal context). Depending on the motivations of the household, this may reduce pressure on the resource. Finally, if those in the household hold jobs entirely outside the fishery system, this could have the effect of stabilizing family income and reducing the risk of major loss if a disaster in the fishery were to occur (such as an unexpected stock collapse). All these considerations can be usefully examined within a livelihoods approach.

- **Women in Fisheries.** The case has been made often that fishery management can be more effective if it pays more attention to the role of women in fisheries. Studies indicate that women are active participants in many fishery systems, certainly in fishing households but also in fishing itself, in post-harvest components (such as processing in industrial contexts, and marketing in artisanal settings), and in the community’s fishing planning (e.g., Nadel-Klein and Davis 1988). In particular, Ruddle (1994) highlights the role of women in the building up and holding of fishery and marine environmental knowledge within the community. FAO (1984) long ago concluded that “Fisheries development programs should recognize that women often play an important role in fishing communities”. The role women play in fishing households, fishing communities and fishing enterprises – essentially, in generating livelihoods – is important to understand if fishery management is to avoid missing a key element of the system.

### 3.4 Learning from Coastal Management

Combining into fishery management both an ecosystem approach and a livelihoods approach requires us to deal with all the various components and interactions within the fishery system, and for this, it is helpful to draw on ideas and approaches found in Integrated Coastal Management (and the related
integrated watershed management). Such integrated approaches are characterized by a multiplicity of resources (e.g., soil, water, vegetation, fish stocks, etc.) and of habitats (e.g., open ocean, estuaries, fresh vs. salt water, wetlands, beaches, etc.), as well as a range of environmental variables (such as changes in the water temperature, turbidity and acidity, chemical pollutants and flows of fresh and sea water).

On the people side, integrated coastal management deals with interactions among multiple coastal uses (such as forestry, oil and gas, offshore mining, coastal agriculture, shipping, and tourism, as well as fisheries) and among multiple stakeholders (including coastal communities, industries, and so on), interactions among people and ecosystems, and among multiple levels of government. Typically, this utilizes processes for participatory decision making and conflict resolution, and calls for a wide range of information on characteristics of the shoreline, the immediate hinterland, the inshore and offshore waters, the local climate and currents, the ecosystem in question (estuaries, reefs, etc.), the natural resource in question, and the human community (cultural, economic, social).

Coastal management typically provides a balance in the attention paid to natural and human systems and dynamics. This contrasts with the conventional approach to fishery management alluded to above, in which a focus on a single species or stock at a time usually translates into attention only to those catching that one species/stock, to the neglect of interactions with other fisheries and those in the post-harvest sector, the fishing communities, and society at large, who rely on the fishery one way or another. An effort to incorporate into fishery management this perspective of coastal management would, then, address the point made many years ago by Orbach (1980: p.150):

“...The human component of a fishery involves more than fishermen themselves, that is, others besides those who harvest the resource from its habitat. These harvesters are only a small part of the total set of people involved in fisheries. For every commercial fisherman, for example, there are three sets of people who are equally a part of the human dimension of his activity: his family and ‘community’ in the social or political sense; the people in the boatyards, supply stores, and service facilities who are both integral to and dependent upon the harvesting activity; and the distributors, marketers, and consumers who create the demand for his product”.

Integrated coastal management thus illustrates a broader-based approach, incorporating components of the fishery within a wider context. It is also a useful framework within which to look at economic diversification in fishery-dependent coastal areas. This may well be the single most important ingredient in the pursuit of sustainable, resilient fisheries, relieving pressure on the resource base by creating sustainable economic activity outside the fishery sector. From the perspective of the individual, this enhances the range of available livelihood choices, tending to make it more attractive for those so-inclined to leave the fishery, and reducing economic incentives for others to enter. A key route to this end lies in supporting indigenously-created employment alternatives within the local region or community, utilizing local comparative advantages in ocean-related activity. Economic diversification can help increase fishery resilience, as well as community and socioeconomic sustainability (Charles and Herrera 1994) – it is not a simple task, but can draw on both a livelihoods approach and integrated coastal management mechanisms.

4. DEALING WITH THE FACTORS OF UNSUSTAINABILITY THROUGH A FISHERY-SYSTEM APPROACH

This section examines how a Fishery-System Approach, and the corresponding livelihoods approach and ecosystem approach, can help counter three key Factors of Unsustainability.

4.1 “Poor Governance”

The need for effective ‘governance’ in fisheries is clear, and in particular, the need for effective management institutions is crucial given that, in the past, poor institutional arrangements in many fisheries led to disastrous conservation failures. An ineffective management institution will be unable to overcome the many economic incentives that run counter to societal objectives in the fishery. A Fishery-
System Approach, and its component livelihoods approach, provide a wider framework to explore governance options. In particular, once fishing households and communities are included in discussions of fishery management, attention is naturally drawn to the potential for community-based management.

In fisheries, community-based management is rooted in the idea that fishers and other residents of coastal communities, living closest geographically to the resources of the sea, should have a large degree of responsibility for and control over managing those resources. It implies participation in decision-making on a range of aspects of marine stewardship and fishery management (see, e.g., Charles 2001; Pinkerton 1999; Wiber et al. 2004). Community-based management is particularly compatible with a livelihoods approach, in that the geographically-based emphasis allows for inclusion of multiple sources of livelihood, within and beyond the fishery. Essentially a form of co-management, community-based management is most appropriate when the fishery interacts broadly with a community in a particular location, and deals with a multiplicity of societal objectives. The idea, then, is to devolve management authority in part to the local level, held within a suitable management body of resource users, organizations and community representatives.

While on the one hand, such an arrangement is conducive to incorporating livelihood considerations into fishery management, on the other hand, community-based management would itself be aided by adoption of a Fishery-System Approach, since the latter (1) has widespread participation in the local management process, and (2) looks beyond the fishery, to provide knowledge of and connections with non-fishery marine resource users and institutions in the communities involved.

4.2 “Absence of Secure Rights”

Whenever a fishery is managed by restricting who can have access to the fishery, how much fishing activity (fishing effort) individual participants are allowed, or how much catch each can take, those with such entitlements are said to hold use rights – ‘the rights to use’, as recognized or assigned by the relevant management authority. There is a considerable literature emphasizing the problems that arise in the absence of secure use rights in fisheries. I have written elsewhere (Charles 2001, 2002a) on the importance of both use rights and management rights – the rights to be involved in decision making about fishery management. Crucial as well is the recognition that the need for clear rights must be accompanied by an equal emphasis on responsibilities, as reflected in the FAO Code of Conduct for Responsible Fishing.

A Fishery-System Approach does not resolve the absence of clearly-defined and secure rights, but it does provide a suitably broad framework within which to assess fishery rights. This is important because there are no simple ‘cook-book’ formulas for determining suitable rights, and great harm can come from an inappropriate rights system. It is crucial to assess whether suitable use rights already exist in a given fishery, and if not (or if current rights are ineffective), to exercise great care in developing an appropriate rights system. Perhaps the key requirement, prior to implementing a rights system, is to know what fishery objectives are being pursued. For example, rights are often advocated as a means to reduce fishery over-capacity, but the introduction of rights linked to capacity reduction is rarely if ever carried out systematically, with the aim of moving toward a specified desired fishery configuration. Such an overly-narrow approach, one that ignores the full extent of the fishery system, can be harmful to one or more components of sustainability and resilience (Charles 2001).

4.3 “Unbalanced Treatment of the Four Components of Sustainability”

This Factor of Unsustainability is particularly well addressed by a Fishery-System Approach, since this approach is inherently so broad as to make it impossible to pursue a narrow view of sustainability. As stated in reports of previous workshops on Factors of Unsustainability, “the modern concept of sustainability” includes ecological, social, economic and institutional components (see also Charles 1994, 2001). This reflects an evolution from an original preoccupation with ‘sustainable yield’ to a multi-dimensional perspective based on maintaining or enhancing multiple ‘sustainability components’. This is compatible with both the ecosystem approach, which looks broadly at ecological matters and thus
at ecological sustainability, and the livelihoods approach, which incorporates individuals, households and communities – and thus addresses socioeconomic and community sustainability. It is important as well to recognize a need for management to work simultaneously toward both sustainability and resilience in the fishery system. The concept of resilience (Holling 1973) refers to the capability of ecosystems, human systems (such as fishing communities) and management systems to absorb unexpected shocks and perturbations without collapsing, self-destructing or otherwise entering an intrinsically undesirable state (Berkes and Folke 1998). In a fishery, then, we can envision resilient management institutions, resilient fishing communities, a resilient economic structure in the fishery, and a resilient ecosystem in which the fish live. In other words, resilience relates to the entire fishery system and beyond the fishery as well, with resilience-enhancing strategies best considered within a Fishery-System Approach.

In exploring fishery policy and management measures that will move us in the right direction, toward a balanced treatment of sustainability and resilience, it seems crucial to overcome two fundamental problems that have become ingrained in many fishery management systems (Charles 2001, 2004):

- **The Illusion of Certainty.** Despite the pervasive and well-documented uncertainties inherent in fisheries, some management systems tend to downplay major elements of uncertainty, so that far from recognizing and working within the bounds of this uncertainty, management approaches may create an ‘illusion of certainty’ (e.g., applying management tools highly sensitive to uncertainty) that leads to the opposite result.

- **The Fallacy of Controllability.** The fishery is a good example of a system that can be only partially, and imperfectly, controlled. This reality is unfortunately far from universally recognized. Instead, we often see in the fishery a fallacy of controllability, reflecting a sense that more can be known, and more controlled, in fisheries than can be realistically expected.

Dealing with these challenges requires a recognition that complexities and uncertainties inherent in fishery systems make it risky to rely on management methods that are sensitive to highly uncertain variables or which depend on high levels of controllability. The change in fishery management and policy this implies is one I have characterized as a shift toward robust management (Charles 2001, 2002b, 2004) – management designed to achieve reasonable success in meeting societal objectives, even if (a) we have an imperfect knowledge of the fishery (notably the status of the resources), its environment and the processes of change over time, and/or (b) the actual capability to control fishing activity, notably given unexpected changes in nature’s course, is highly imperfect. As with ‘sustainability’ or ‘resilience’, robust management is not a simple goal to achieve, but rather one to strive for – in other words, we should aim for more sustainability and resilience in fisheries, and simultaneously seek out more robust approaches in fishery management.

5. **CONCLUSIONS: IMPLEMENTING A NEW APPROACH**

How are we to deal with the Factors of Unsustainability in fisheries? There are, of course, important actions that can be taken to address specific concerns internal to the fishery. This paper, however, has argued that in addition, it is crucial to deal with the ‘bigger picture’:

> **We will never achieve fishery sustainability if we restrict attention solely to what goes on within the fishery.**

This is apparent from the fact that three of the six original Factors of Unsustainability identified in Gréboval (2002) go beyond the fishery per se, i.e. (a) poverty and lack of alternatives, (b) high demand for limited resources, and (c) interactions of the fishery sector with other sectors. Indeed, it can be argued that a failure to take a broad enough perspective on fishery problems – i.e., “An overly narrow approach to fishery problems” – is itself a significant Factor of Unsustainability in fisheries.
A Fishery-System Approach has been outlined here as a mechanism to adopt a ‘bigger picture’ in understanding and managing fisheries, one that looks beyond conventional ‘fish and fleet’ thinking. This builds on and incorporates the Eco-System Approach (‘ecosystem-based management’) and adds a parallel on the human side of the fishery, the Livelihoods Approach. The first of these looks at target fish species and fishing activity within the context of the ecosystem, and in an equivalent manner, the Livelihoods Approach looks at human elements in the fishery within a larger context of households, communities and the socioeconomic environment. Overall, then, a Fishery-System Approach allows us to encompass relevant factors affecting and interacting with fishery management from across the fishery system and beyond.

As described earlier, a concrete example of this arises with respect to marine protected areas. MPA development and implementation certainly requires an ecosystem approach, but it also requires an understanding of the ‘big picture’ from the human side – relating to non-fishery marine uses, distributional impacts of MPAs among households and coastal communities, approaches to integrated management, conflict resolution, and more. In other words, a Fishery-System Approach is needed. This paper also explored the potential of a Fishery-System Approach to contribute to ameliorating three of the identified Factors of Unsustainability in fisheries – poor governance, absence of secure rights, and unbalanced treatment of the four components of sustainability.

The need to look at fisheries as systems has been advocated for years, but how can a ‘big picture’ Fishery-System Approach be implemented in practice? First, it can build on the momentum toward the Eco-system Approach in fishery and ocean management, essentially expanding ‘ecosystem-based’ thinking into ‘fishery system based’ thinking. At the same time, a Fishery-System Approach can draw lessons from Integrated Coastal Management (and watershed management) in terms of understanding human-environment interactions, institutional linkages, multi-use conflicts, multi-stakeholder governance structures and the like. Thus implementation of a Fishery-System Approach might take place by linking ‘back’ to the widely-supported Eco-system Approach and ‘forward’ to the similarly well-accepted approach of Integrated Management.

Comprehensive adoption of a Fishery-System Approach will, on the one hand, ensure that we take into account impacts of the broader fishery and coastal system on fishery management, and at the same time, ensure that the broader consequences of management actions are assessed. While clearly there is no single solution to overcome all the Factors of Unsustainability, a Fishery-System Approach may well be an important mechanism to move in the direction of improved fishery sustainability and resilience.

ACKNOWLEDGEMENTS

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A SIMPLE FRAMEWORK FOR PROACTIVE MANAGEMENT TO MITIGATE UNSUSTAINABILITY IN FISHERIES: ESTIMATING RISKS OF EXCEEDING LIMIT REFERENCE POINTS OF BIO-ECOLOGIC, ECONOMIC AND SOCIAL INDICATORS

by

J.C. Seijo

Summary

The complexities of managing a marine fishery involving high exclusion costs, and high information and enforcement costs, are presented together with a set of mitigating strategies to deal with them. Designing intelligent management plans for marine fisheries require assessing fishery performance over time through the use of sustainability indicators; limit reference points (LRPs) and the corresponding control law to generate proactively management strategies when estimated risks are perceived as too high by the decision-maker. To account for natural variability and other sources of uncertainty, estimates of risks of exceeding LRPs are needed to re-evaluate periodically the fishery and establish new reference points and corresponding management strategies. This paper concentrates on this aspect of the precautionary management process through the use of a simple framework to deal with unsustainability factors affecting fishery performance over time. It presents a classification of bio-ecologic, economic/social and institutional indicators of critical unsustainability factors previously identified. The major steps used in the application of the Monte Carlo method to estimate the risks of exceeding limit reference points are introduced. The need for considering data collection, advanced modelling and risk analysis for the use of sustainability indicators and reference points within the ecosystem based fishery management approach (EBFM), is also discussed.

1. INTRODUCTION

The complexities of managing a marine fisheries, involving a high exclusion cost good (sensu Schmid, 2004), and high information and enforcement costs are presented together with a set of mitigating strategies to deal with them. In addition, following the recognition that “unsustainability occurs in a fishery system when it is agreed that there is an unacceptable high risk that the fishery system is currently or will be in some predefined undesired state. The risk may be aggravated by natural variability. Desirable states, in terms of both human and ecosystem well-being, are defined by society and may change over time” (Swan and Gnéboval, 2004:p.18). This paper concentrates in providing a simple framework for specifying sustainability indicators and corresponding reference points of fishery subsystems as an aid to decision-making of management efforts aiming at mitigating unsustainability of marine fisheries. It is furthered argued that to become useful for management purpose, efforts should be made to estimate current values of indicators and the corresponding probabilities of exceeding their limit reference points, i.e. the risks of exceeding pre-determined LRPs.

To facilitate this communication, factors affecting sustainability can be looked at by following the four components of the framework suggested by Charles (2001): (i) bio-ecological, (ii) social, (iii) economic, and (iv) institutional dimensions of fishery systems.

87 The views expressed in this paper are solely those of the author, J.C. Seijo, Universidad Marista de Mérida, Periférico Norte Tablaje 13941 Carretera Mérida-Progreso, Mérida 97300, Yucatán, México, jseijo@marista.edu.mx.

88 Keywords: Precautionary management, unsustainability factors in fisheries, limit and target reference points, bio-ecologic, socio-economic, and institutional indicators, risk, uncertainty.
In order to estimate the risks of exceeding unacceptable levels in any of the above mentioned components in the paper a simple structure of sustainability dimension, indicators, reference points, and risks of exceeding them is proposed.

In the Bangkok and Mauritius meetings organized by FAO in 2002 and 2003, the unsustainability of fisheries was attributed to six main factors (Swan and Gréboval, 2004):

i) Lack of solid governance structures
ii) Fishery complexities, incomplete knowledge and the associated uncertainties
iii) Inadequate incentives and subsidies that stimulate overcapacity
iv) Stock fluctuations due to natural causes
v) Growing demand of limited fish resources
vi) Poverty and lack of alternatives for coastal development

This paper concentrates on factors i), ii) and iii).

2. **LACK OF GOVERNANCE STRUCTURES: HIGH INFORMATION, ENFORCEMENT AND EXCLUSION COSTS**

In this section the major socio-economic factors affecting fishing capacity are discussed together with the difficulties of controlling access to domestic and international fleets. The current schemes of property right allocation are presented with a brief description of the corresponding strengths and weaknesses. The types of subsidies present in many fisheries today are discussed with respect to their impacts in fostering effort expansion over time and resource depletion. A set of factors mitigating the expansion of fishing capacity are also discussed.

To further understand management constraints, we now discuss the basic economic assumptions underlying the optimal allocation of natural resources, and the inherent characteristics of fisheries that prevent markets, under unrestricted access, from optimally allocating fishery resources. Although current literature invokes the allocation of property rights as a solution, even in fisheries where rights have been allocated, the un-sustainability syndrome tends to remain. This leads us to ask what conditions are not being met which are not allowing the market to optimally allocate fish resources once individual property rights have been established?

2.1 **Some basic assumptions underlying sustainable allocation of fish resources**

It is generally agreed that to ensure optimal allocation of natural resources, non-attenuated property rights should be in place. Those rights must be (Randall, 1981, Schmid, 1978; Seijo et al. 1998):

- Completely specified, including the restrictions on them, and the penalties that will result from the violation of common rules.
- Exclusive, so that persons holding these rights are responsible for any penalties resulting from infringing rules established governing harvesting of the resource.
- Transferable, in order to ensure the rights enter the hands of those who will convey them to their highest use value.
- Effectively enforced, because a non-policed right becomes an empty right.

In fisheries, the basic assumptions of the neoclassic market model mentioned above are usually violated. As we saw earlier in this document, overexploitation, overcapacity, and unsustainability are a syndrome common to many important fisheries. Fishery resources in fact have inherent characteristics that distinguish them from other natural renewable resources and require further discussion in order to understand the importance of short and long-term exploitation patterns (Seijo et al. 1998).
2.2 Obstacles to property right allocation

The violation of the basic assumptions of *exclusivity and low information and enforcement costs*, are serious obstacles to effective property rights allocation. The inherently high exclusion and transaction costs characteristic of fish resources require us to look beyond the simple solution of providing for “proper allocation of individual rights”. Self-policing and questions related to numbers of fishers are discussed below as ways of mitigating these obstacles.

The allocation of resources between stakeholders is the problem area where progress is most urgently required, both nationally and internationally. Deliberate and unwitting free rider behaviour is discussed, defined as the participation on the harvest, without participation in the costs and constraints imposed by management of the stock. The roles of information on fish conservation and self-policing are presented as mitigating factors.

2.3 High exclusion costs in fisheries

An inherent characteristic of exploited fish stocks is the high cost of excluding unauthorised fishers from exploiting the resource, and enforcing regulatory compliance on those authorised to fish. The mobility and migratory nature of most fish resources, combined with high uncertainty as to stock magnitude, means that an individual fisher is unlikely to benefit from postponing capture of a fish with the expectation of taking it at a larger and more valuable size later, since others are likely to have caught it in the meantime; that is, unless all or most fishers also agree to abstain (Eckert, 1979). Consequently, each fisher tends to maintain a high rate of harvesting, and thus generates high exclusion costs to the other fishermen who tend to behave likewise.

Mitigating factors. Traditional approaches to avoiding high exclusion costs involve institutional structures such as: (i) resource privatisation through allocation of individual transferable quotas (ITQs); (ii) State intervention to regulate size and age composition of the catch, and the level of fishing effort, (iii) implementation of community-based management systems (Berkes, 1989) or (iv) mixed strategies based on a combination of the above schemes (Seijo, 1993; Castilla and Defeo 2001).

2.4 The social trap and free rider behaviour in fisheries

Without an agreement to limit catches, the main result of a single fisher’s reduced catch rate is to lower the extraction cost of other fishers without necessarily increasing his own benefits. Using Shelling’s (1978) terminology, this constitutes a social trap, because the micro-motives of an individual fisher in the short-run are not consistent with the macro-results he and other fishers desire in the long run. The short-run micro-motives consist of catching as many fish as possible in order to increase individual marginal benefits, while the long-run desired macro-results may involve achieving the maximum economic yield. Uncertainty as to future stock availability in the face of the unsustainability of resources we were discussing earlier, determines that long-run results are usually dominated by short-run marginal benefits. Allowing for temporal fluctuations in resource productivity and preferences of resource use, a sustainable yield from a fishery will be an attainable only when the number of fishers is limited, and they act in concert to implement some form of effort regulation. However, if the group is large, a fisher may be an unintentional free rider or non-contributing user. This type of individual usually occurs when there is no voluntary collective action by the majority of community members to prevent resource depletion, and also when uncertainty exists as to stock abundance (which is the usual case).

Mitigating factor. The size of the fisher community exploiting a resource is relevant to avoiding this social trap. When the group is small, exclusion costs are not necessarily lower, but the non-contributing user can be more easily identified (Olson, 1965; Schmid, 2004).
2.5 High transaction costs

Marine fisheries involve high transaction costs, which also diminish the efficiency of resource allocation over time. Transactions costs in most fisheries involve costs of information, enforcement or policing.

**High Information costs.** The complexity of fishery management is increased by the major uncertainties inherent in natural systems, as well as by a range of other biological, social, political and economic factors requiring a precautionary approach to fisheries management (Hilborn and Peterman, 1996; Defeo and Seijo, 1998). These increase the probability of non-contributing users emerging, and also deplete stocks and dissipate economic rent. Efficient fisheries management implies high information costs, but interdisciplinary research in biology, ecology, statistics and socio-economics is hampered by academic fragmentation.

Unfortunately, an overall increase in fishing intensity is not typically accompanied by a corresponding increase in scientific and fishery information. To the contrary, as Maximum Sustainable Yield conditions are approached, the need for more accurate and real time information increases, precisely at a time when system variance is increasing due to less regular recruitment and a higher probability of ecosystem change. Thus effort overshoot, increases in harvesting costs, and the elimination of economic rent from the fishery, are almost inevitable consequences of fishing near MSY conditions.

**High Enforcement costs.** Fisheries management involves high enforcement or policing costs if management schemes are implemented and property rights allocated and policed. For oceanic (and many shelf fisheries) the areas to be policed are extensive and conventional patrol vessel operations are ineffective and costly. Under these circumstances, a non-enforceable right becomes an empty right.

**Mitigating factors.** Some strategies for mitigating the effects of high exclusion costs and high information and enforcement costs are summarized in Table 1. Strategies are differentiated for varying degrees of resource mobility.

<table>
<thead>
<tr>
<th>Stock mobility</th>
<th>Exclusion costs</th>
<th>Information costs</th>
<th>Enforcement costs</th>
</tr>
</thead>
</table>
| Sedentary or low mobility   | Establish Individual transferable grounds (ITGs,) or leases (Seijo, 1993).      | Costs of stock assessment and bio-economic analysis are shared between those deriving resource rent and the government. | Emphasis on self policing  
Co-management with Government |
|                             | Assess the effectiveness of using individual transferable quotas (ITQs)         |                                                                                  |                                                                                  |
| Mobile (Transboundary or shared stocks) | Limited entry agreed bilaterally or multilaterally with allocation of a shared TACs | Bilateral/multilateral cooperation between parties and standardized data collection and stock assessment is essential, and coordinated MCS functions | Bilateral/multilateral cooperation in management and enforcement of common or harmonized regulations |
| Highly migratory (High seas)| • Harvest quotas are established by the Commission  
• Members of the Commission establish rules for entry to the fishery, and arranges negotiations on resource allocations | Data collection and stock assessment are organized by the Commission. Use of satellite tracking schemes allows location of vessel fishing areas. Remote telemetry of fishing operations allows for more efficient MCS operations | Resource Commission members share enforcement costs proportional to annual harvest by individual countries |
In addition to the above, market distortions are present in most world fisheries, and may foster the overcapacity problem. Principal among these distortions worth mentioning is the presence of subsidies.

2.6 Imbalances caused by subsidies

In addition to the factors mentioned above which underlie the overcapacity problem, there is a growing awareness by governments and industry of the negative influence of subsidies on international trade, the environment and sustainable development, (Milazzo 2000).

Among subsidies fostering increases in fishing capacity the following seem to be critical (Seijo 2001):

- Grants for the construction of new vessels, traps, aggregating devices, etc.;
- grants for the modernisation of current fleets;
- referential credits and tax treatments for (i) and (ii);
- reduced price or tax breaks for purchased inputs (e.g. Fuel, bait, and ice);
- market price supports.

The impact of subsidies on sustainability acts mostly through the dynamics of fleet capacity and fishing effort and it is therefore fundamentally important to estimate impacts on cost-reduction and vessel profit margins, recognizing that at the margin, a subsidy allows profitable operation at lower stock levels than without subsidies.

Mitigating strategies: The fact that subsidies artificially inflate profits of artisanal and industrial fleets at low stock sizes has its serious conservation implications, and efforts should be made to eliminate them. Two scenarios occur: (i) vessel owners were granted subsidies at the start of the fishery to promote development, and (ii) subsidies arrived later to “alleviate” short-run crises in fisheries sectors. The rationale for the first scenario has now ceased, since close to 70 percent of global stocks are fully or overexploited (FAO, 2000). If the second scenario applies, government is effectively perpetuating a social trap by artificially encouraging capacity to remain in the fishery, even though harvest returns cannot pay for variable costs of fishing, such as fuel, ice, etc. The elimination of subsidies would, to many fisheries, result in negative net revenues leading, in some cases, to substantial reductions in short-run effort for those vessels which are not covering their trip or daily variable costs.

2.7 Stock fluctuations due to natural causes

Concerning the last identified factor of unsustainability, it should be mentioned that still it is not always taken into account that apart from fishing, stocks also fluctuate in the short and long run due to natural causes. As pointed out in Caddy and Seijo (In press), for pelagic resources, major stock fluctuations occurred even prior to human exploitation (Soutar and Isaacs 1974). These fluctuations have been best documented in relation to the ENSO climatic phenomenon, especially as it affects production of small pelagics in the eastern Pacific (e.g. Lluch-Belda et al. 1989) but occurs for other resources, and elsewhere (Cushing 1982). Similar climatic forcing factors have been affecting marine production systems on the global level (Kawasaki 1992, Klyashtorin 2001), and long-term fluctuations will be reinforced by climate change (Kelly 1983). Thus, although ‘decadal’ periodicities are frequently mentioned in the fisheries literature (e.g. Zwanenberg et al. 2002), Klystron (2001) suggests that natural cycles in productivity of around 50–60 years duration are likely to be dominant.

Coastal fishery resources are also vulnerable to other human activities that may affect critical habitats and/or biological processes (e.g. De Leila Moreno et al. 2000). In fact, the role of environmental change has become more evident in recent years as fisheries data series of all but the longest-established fisheries exceed a half century in duration, but our ability to discriminate between natural environmental changes, the effects of fishing, and other human activities seems to remain poor.
Considering the above mentioned human and natural factors of stock variability, proactive fisheries management should then take into account the probabilities of exceeding biologic, economic and social limit reference points with alternative management strategies under consideration and decide accordingly.

2.8 Proactive management: indicators, reference points and risks

The development of management plans for marine living resources require systematic integration of aspects of the resource biology and ecology with the economic and social factors that determine fishers’ behaviour over time (Anderson, 1981; Seiko et al. 1998; Cochrane, 2002).

An indicator, as suggested by García (1996b), “is a variable, a pointer, an index of a complex phenomena. Its fluctuations reveal the variations in components of the ecosystem, the resource or the sector. When consider together, the position and trend of the indicator in relation to the criteria indicate the present state and dynamics of the system”. Fisheries indicators are taken here to be variables derived from monitoring a fishery, which can assume discrete values conveying information believed to be relevant to the proper management of exploitation of the resource. Reference points are considered to be discrete values of these indicators, which have been agreed to represent situations calling for pre-negotiated management action. A set of fishery indicators and the reference points they can assume should be assembled into a control law which forms a feedback loop between incoming information on the fishery and the corresponding management response.

Fishery indicators should be able to provide information for assessing the biologic, economic and social performance of the fishery, and as an element of the management plan they should become an input for establishing, over time, new reference points and corresponding management strategies to achieve them. Indicators can be quite simple in conception, and can be based on semi-quantitative or even qualitative information. They may need to be tuned in the light of events. They have to be integrated fully into the management system. They should be sensitive indicators with the capacity of measuring dynamic change.

It should be pointed out that earlier reference points proposed by scientists have been used primarily as Target Reference Points (TRPs), but owing to problems caused by overshooting TRPs, there has been a perceived need for reference points that help to avoid situations that are dangerous to the resource, and hence, to fishery sustainability. These have been referred to as Limit Reference Points (LRPs), and represent fishery sustainability threshold reference points (See Caddy and Mahon (1995), Die and Caddy (1997) and Seijo and Caddy (2000)).

The use of limit reference points as constraints for resource administration represents an important step in the management process. Indicators for fishery performance are an integral part of fisheries management plans providing dynamic signs of the relative position of such indicators with respect to the predetermined reference points. It has also been recognised that wise use of fish resources over time should incorporate the inherent risk and uncertainty of fishery systems (García, 1996a; Hilborn and Peterman 1996; FAO 1996).

Using the level, change and structure framework proposed by García (1996a) and Seijo and Caddy (2000), a set of sustainability indicators are suggested in Table 2.
Table 2. Level, change, and structure indicators of fishery sustainability dimensions. Adapted from Seijo and Caddy (2000)

<table>
<thead>
<tr>
<th>Sustainability dimension</th>
<th>Level indicators</th>
<th>Change indicators</th>
<th>Structure indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bio-ecological</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Recruitment</td>
<td>Seasonal recruitment</td>
<td>Recruitment trends (inter-annual)</td>
<td>Spatial distribution of recruitment, biomass, spawners and juveniles.</td>
</tr>
<tr>
<td>• Biomass</td>
<td>Current Bt/B∞</td>
<td>Trend in Bt/B∞ ratio</td>
<td>Age and space specific total mortality</td>
</tr>
<tr>
<td>• Spawning biomass</td>
<td>Current B∞/B</td>
<td>Trends in B∞/B ratio</td>
<td>Spatial biodiversity</td>
</tr>
<tr>
<td>• Total mortality rate</td>
<td>Current level of Zs</td>
<td>Changes in Zs</td>
<td>Spatial distribution of community structure</td>
</tr>
<tr>
<td>• Biodiversity</td>
<td>Biodiversity index</td>
<td>Changes in biodiversity index</td>
<td></td>
</tr>
<tr>
<td><strong>Community Structure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Recruitement</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>• Biomass</td>
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<td></td>
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<tr>
<td>• Spawning biomass</td>
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<tr>
<td>• Total mortality rate</td>
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<tr>
<td>• Biodiversity</td>
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<tr>
<td><strong>Economic and social</strong></td>
<td></td>
<td></td>
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<tr>
<td>• Plant &amp; fleet</td>
<td>Current fishery investment rate</td>
<td>Trends in fishery investment (vessel, engine, fishing gear, navigation technology)</td>
<td>Age composition of the fleets</td>
</tr>
<tr>
<td>investments</td>
<td>Catchability &amp; selectivity</td>
<td>Changes in selectivity</td>
<td>Fleet specific fishing power</td>
</tr>
<tr>
<td>• Fishing power</td>
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<td></td>
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<tr>
<td>• Fishing effort</td>
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<tr>
<td>• Yield</td>
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<tr>
<td>• Costs</td>
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<tr>
<td>• Revenues</td>
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<td>• Rent</td>
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<td>• Employment</td>
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</tr>
<tr>
<td>• Food security</td>
<td></td>
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<td></td>
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<tr>
<td><strong>Institutional</strong></td>
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<td></td>
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<tr>
<td>• Enforcement</td>
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<tr>
<td>• Rights allocation</td>
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<tr>
<td>• Benefit/cost of fishery regulation</td>
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<tr>
<td>• Community based</td>
<td></td>
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<tr>
<td>management</td>
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</table>

Unit cost of effort
Variable costs over catch rate
Transfer costs over total costs
Trends in costs of fishing
Changes in transfer costs from port to fishing grounds
Fleet specific unit cost of effort.
Once the fishery sustainability indicators have been established with their corresponding limit reference points, the next step involves estimating the probabilities of exceeding these LRPs.

### 2.9 Monte Carlo analysis: risks of exceeding limit reference points

Given a probability density function with known parameters, Monte Carlo analysis allows introducing the uncertainty associated with natural variations and imperfect knowledge about the fishery system being assessed through sustainability indicators. The process consists of an iterative calculation of the performance variables, where in each trial a new value for the unknown parameter is generated with the specified probability density function. Naturally, we will get as many outputs as trials to be intended. The major steps used in the application of the Monte Carlo method to estimate the risks of exceeding reference points are the following:

i) Undertake a biological, ecological and economic assessment of the fishery.
ii) Specify sustainability indicators for the fishery.
iii) Specify the limit reference points for such indicators.
iv) Design mathematical model for the fishery.
v) Estimate parameters for model equations.
vi) Build a spreadsheet to undertake a dynamic analysis of the fishery.
vii) Use a simple risk analysis tool.
viii) Select the uncertain biological, ecological and economic parameters.
ix) Specify the probability density function that best fits the observations of the parameter in question.
x) Run the Monte Carlo simulation.
xii) Estimate the area under the distribution curve that exceeds the pre-specified limit reference points.

This last step of the process is in essence the estimation of the risk of exceeding the specified limit reference point. The results are obtained for as many LRPs as specified in the Monte Carlo analysis.

In Table 3, a simple illustration of bio-ecologic, economic and social sustainability indicators and limit reference points are presented with the corresponding risks of exceeding LRPs under different management decisions. It should be pointed out that target reference points (TRPs) could also be included if considered appropriate. Nevertheless, for the purpose of this paper, namely the estimation of risks of exceeding limit reference points in fishery systems, only the former was considered.

In this simple illustration the fishery decision maker is able to identify the possible changes in risks of exceeding limit reference points of sustainability indicators in an artisanal fishery with two alternative number of boat licences to be authorized for the fishery: $D_1 = 610$, and $D_2 = 525$.

By choosing $D_2$, the risks of exceeding the LRPs of the biologic and economic sustainability indicators are substantially reduced. The risk of falling below the LRP for fishery direct employment increases from 14 percent to 18 percent. Nevertheless, it should be pointed out that the decision-maker choice will also be a function of his/her attitude towards risk (Shotton, 1995; Shotton and Francis, 1997).

Each fishery should identify the bio-ecologic, socio-economic, and institutional indicators that are critical for the species being produced and the ecosystem in which they live. The desired (TRPs) and undesired (LRPs) discrete values of these indicators should therefore be defined by decision – makers with the aid of specialists in the specific marine species.
Table 3. A simple illustration of fishery sustainability indicators and corresponding estimation of risks of exceeding limit reference points with alternative management strategies.

<table>
<thead>
<tr>
<th>Indicators of Fishery dimension</th>
<th>Limit reference point (LRP)</th>
<th>Risk of exceeding LRP with decision $D_1 = 610$ boats</th>
<th>Risk of exceeding LRP with decision $D_2 = 525$ boats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biologic</td>
<td>LRP = 0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current over initial biomass of target species: $B_t/B_\infty$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic</td>
<td>LRP = 2500 (US$/boat/year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>LRP = 2000 (fishers)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.10 Some suggestions for the use of indicators and limit reference points to aid management

Given the inherent uncertainty and non-linearity of the fishery system, direct application of control theory using one or two indicators and their appropriate reference points, is unlikely to be fully effective outside developed country situations. Indicators used for fisheries management should be multiple, robust and easily understood, ideally with an adequate dynamic range and reproducibility (Seijo and Caddy, 2000). Some suggestions for the use of indicators and reference points are presented as follows:

- They can be simple in conception, and perhaps assembled into composite indices through use of questionnaires.
- They should have a degree of redundancy but, where possible, not all depend on the same basic information source.
A 'traffic light' approach has been proposed by Caddy (1998) whereby a series of simple indicators are used in combination with reference points defined to 'fire' at roughly the same level of exploitation or population risk. The number of indicators moving from 'green' (safe) to 'red' (dangerous) conditions can be used to trigger management responses aimed at reducing effort/catches in a manner progressive with the degree of perceived risk to the system. Such a system is easy to comprehend, provides a basis for a control system if it can be agreed to by stakeholders, and is easy for them to perceive and use in the same manner as forest fire warning indicators.

They should where possible reflect events in all sectors, ecological to socio-economic judgements should be made as to the critical (TRP and LRP) values for such indicators where the system changes from Red to Green or vice versa, in the traffic-light analogy.

These LRP/TRP values will need tuning in the light of experience so that to the extent possible, they respond at roughly similar stock levels, but may be sensitive to different types of risk.

These indicators and their LRP s will need to be built into a management control system so that a response to alternative management strategies.

There may have to be three sets of composite indices to facilitate interpretation and management response: (i) a basic set of indices that measure the state of the resource, (ii) a set of indices that reflect socio-economic changes, which is, however, not allowed to override the resource system when resource indices show a level of high risk, and finally, (iii) environmental indicators that represents the effect of natural or anthropogenic changes on the ecosystem affecting the resource and its users.

Unfavourable changes in the resource biology and ecology, which is expressed in a composite index of resource health, can be modulated upwards or downwards by the environmental module within precautionary limits. While the economic and social subsystem (e.g. yield, rent, employment, contribution to food security, etc.) will only be allowed to modify the resource module towards higher exploitation if the biomass, spawning stock size or physical/biotic environment is suitable for a temporarily more risk-prone management strategy. Feedback mechanisms are expected to occur between the resource module and socio-economic module where fishers, as resource users, react to resource abundance in space and time. We believe all three subsystems can be accommodated into a more formal system such as those mentioned above.

2.11 Ecosystem dimension of fishery indicators: some recent suggestions

In order for the fishery indicators to be meaningful they should explicitly account for the ecosystem in which they occur. The concept of ecosystem based fishery management (EBFM) has the overall objective of sustaining healthy marine ecosystems and the fisheries they support and therefore calls for reversing the order of management priorities starting from the ecosystem and then moving to target species (Sinclair and Valdimarsson, 2003). In their recent contribution in Science (Pikitch et al., 2004) suggest that EBFM “…should (i) avoid degradation of ecosystems, as measured by indicators of environmental quality and system status; (ii) minimize the risk of irreversible change to natural assemblages of species and ecosystem processes; (iii) obtain and maintain long-term socio-economic benefits without compromising the ecosystem, and (iv) generate knowledge of ecosystem processes sufficient to understand the likely consequences of human actions”. Two of the major recommendations provided by the 14 distinguished authors of the mentioned above paper, indicate that:

• “…we need to develop community and system level standards, reference points and control rules similar to single species decision criteria”. 
“New analytical models and management tools will be needed as well. Multispecies and ecotrophic models must be refined and expanded to better account for system-level uncertainties, to derive system-level reference points, and to evaluate the ecosystem-level consequences of proposed EBFM actions”.

Before specifying ecosystem indicators and reference points, as pointed out by Sainsbury and Sumalia (2003), there are two basic questions to answer: (i) Is there a need for explicit reference points for the ecosystem, such as food web dynamics, ecological community structure and biodiversity, or are species-based reference points sufficient? (ii) If ecosystem reference points are needed, should they be based on properties of the undisturbed coastal ecosystem? There seems to be an additional question: How to proceed in the absence of baseline studies of early stages of coastal development? Again, the use of advanced dynamic models and techniques for their parameter estimation in data limited situations seem to be a future research priority in this field. Because of the inherent uncertainty of the “original status” of ecosystem habitat and community structure, these modelling efforts should be stochastic in nature. The potential and associated complexities of conducting risk analysis for ecosystem base management are discussed by Butterworth and Punt (2003).

2.12 Spatial dimension in fisheries indicators

Fishers respond spatially with different degrees of correlation to resource distribution when allocating over space and time their fishing intensity. Different fleets (e.g. artisanal and industrial) have different friction of distance and consequently their response to the spatially generated quasi-rent in previous fishing trips could result in non-proportional allocation of effort in subsequent fishing days (Seijo et al. 1994). Changes in transfer costs from different ports of origin to alternative fishing grounds are an important spatial indicator of changes in resource abundance in space and time. This aspect should be accounted for when assessing fisheries targeting short-lived species where seasonality in the spatial distribution of resource and fishing intensity are relevant. The same consideration holds when targeting sedentary resources with heterogeneous patchy distribution over space. In this respect, bio-economic indicators should be disaggregated over space and time to provide meaningful information to decision-makers (Caddy & Seijo, 1998; Seijo et al., 2004). Concerning ecosystem based fishery management, Pikitch et al. (2004), suggest that advanced models for EBFM should incorporate spatial structure and dynamic environmental processes, to properly account for changes in habitat and ecosystem function in the context dynamic fluctuations.

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DISCUSSION PAPER 13

THREE ISSUES OF SUSTAINABILITY IN FISHERIES

by

Rögnvaldur Hannesson

Summary

This paper discusses three issues of sustainability. First, in growing economies it will be difficult to maintain the incomes of fishermen on par with other groups unless the number of fishermen declines, due to the limits nature imposes on the total catches of fish. Secondly, environmental variations make it difficult to sustain catches from specific stocks at an even level over long periods. Since the fluctuations in different stocks are not perfectly correlated, and are sometimes negatively correlated, it may nevertheless be possible to sustain incomes from fishing despite dramatic declines in individual stocks. Third, specific and temporary subsidies in controlled fisheries may promote sustainability of incomes and reduce fleet overcapacity. These points are illustrated by examples drawn from the history of the Norwegian fisheries in the latter part of the last century.

1. INTRODUCTION

Let me begin with a story that has nothing to do with fish. Early in the last century some people in Norway became concerned that there would be a shortage of high quality wood for skis. Ash trees were planted to ensure adequate supplies (the ash tree is good for making skis). The trees have long since reached maturity but are still standing. The market for wooden skis is not what it used to be. The last time an athlete set a world record on wooden skis was in the early 1970s. Since then skis of synthetic materials have taken over.

The story illustrates that whatever meaning sustainability has it is not a process that repeats itself in an identical fashion over and over again. Conditions change and require new solutions. Some of these changes are of our own making, like changes in technology which make some materials obsolete and others precious. Other changes are caused by natural forces beyond our control and occur on different time scales. The resulting adjustment problems can be acute and cyclical or incremental and trendlike. The fisheries offer examples of both. Some fish stocks have collapsed suddenly, while others have gradually diminished. Sometimes there have been technological leaps, such as the introduction of the sonar and the power block in the purse seine fisheries in Iceland and Norway in the 1960s. At other times technological progress occurs gradually. The markets for some products have eroded or disappeared (seal skins, whale oil), while the markets for others have expanded.

This note addresses three issues pertaining to sustainability or non-sustainability in fisheries. First, what are the challenges posed by economic growth? In a growing economy, the growth of incomes in sectors where technological progress is for some reason impeded will lag behind. In purely technological terms the fishing industry seems anything but hampered in the development of productivity. The industry is, however, subject to limitations in productivity growth imposed by nature.

Not only is the ability of nature to support fish stocks limited, it varies over time for reasons that have nothing to do with fisheries. As a result, the abundance of fish stocks varies for reasons other than fishing and on time scales that may differ from one stock to another. This natural variability of fish stocks makes it difficult to sustain fisheries at even levels over long periods for individual fish stocks. If, however, we

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89 The views in this paper are solely those of the author, Rögnvaldur Hannesson, Center for Fisheries Economics, The Norwegian School of Economics and Business Administration, Helleveien 30, N-5045 Bergen, rognvaldur.hannesson@nhh.no.
are concerned with sustaining incomes, or utilizing the productivity of nature in a sustainable way albeit in the form of different types of fish, there is less reason to focus on individual stocks, as the variations in the yield from different stocks are not perfectly correlated and sometimes inversely correlated. The variability of fish stocks, and how “new” stocks come to replace “old” ones, is the second issue to be addressed.

Finally, there is the issue of subsidies. Subsidies are generally acknowledged to make fisheries less sustainable. This, however, depends critically on the management regime applied. Usually the explicit or implicit assumption has been that there is little or no management. If, on the other hand, there are controls of some kind, subsidies can be explicitly targeted to improve rather than impair sustainability, provided they are made contingent and temporary.

The history of the Norwegian fisheries in the latter part of the last century illustrates these three points. In this note I shall provide an overview of the development of the Norwegian fisheries since the early 1960s, and in some cases since 1950, with these issues in mind.

2. ECONOMIC GROWTH AND ECONOMIC SUSTAINABILITY OF FISHERIES

Economic growth poses its own challenges to the sustainability of fishing. Sustained economic growth has brought a sustained increase in labour income, partly in terms of monetary income per hour worked, and partly through less time worked in order to obtain any given income. This poses no problem in the sectors where the productivity of labour increases and which are the engines of economic growth. Not only are these industries able to sustain higher wages, but the productivity increases occurring in these industries are the very drivers of the wage increases accompanying economic growth, enabling labour to share in its fruits.

Even in a growing economy there are some sectors where labour productivity does not rise. These sectors are up against some real constraints of a technological nature which preclude or limit increases in productivity. These sectors are typically service sectors involving intensive use of labour where better technology has a limited impact on the output or cannot be substituted for the use of labour. It takes a surgeon to operate a patient, and there is limited help in providing him with two knives instead of one. My Fair Lady does not become more enjoyable if the actors sing twice as fast or cut out Professor Higgins. The problem is exacerbated by the fact that the demand for such services increases as countries become richer. The result is raising prices (or higher subsidies) for such services, enabling the surgeons or the actors to enjoy rising salaries on par with those who work in industries where increases in productivity sustain rising incomes.

The fisheries sector has some things in common with the sectors where productivity rises due to technological improvement, but also some things in common with the sectors where there are severe impediments to increases in productivity. The technological advances that have occurred in the fisheries over the last decades are well known. We now have fish finding equipment, mechanical devices to haul nets that in days past were pulled by hand, and even computer controlled hand lines which jig and pull up the line when enough fish have been hooked. This has enormously increased the fishing power of boats. This is sometimes seen as a part of the problem in world fisheries because the limited productivity of nature ultimately constrains the amount of fish that can be hauled out of the sea, no matter how advanced the technology is.

The limitation to advances in productivity imposed by Mother Nature is what the fisheries sector has in common with those sectors of the economy where there are technological limitations to productivity increases. Unfortunately, inadequate government regulations and the absence of property rights to fish stocks or use rights in fishing have often enticed the industry to engage in a self-defeating attempt to increase the output of fish despite the limits imposed by nature. Under those circumstances, technological advances exacerbate the problem rather than provide the opportunity to raise incomes and contribute to overall economic growth.
Rising prices of fish or increased government subsidies are not feasible solutions to the problems of productivity growth in fisheries. Producers of fish in a growing economy are not able to raise the prices of fish as much as they might need in order to maintain their wages, because their fish is sold in competition with other fish and other types of food from other sources. Subsidies to theatre performances probably have few harmful effects while subsidies to fisheries are likely to accelerate the depletion of fish stocks, although this depends critically on the kind of regulatory regime in place, as we shall see below.

There is only one way out of this dilemma, and that is to reduce the number of people employed in fishing. With the amount of fish being roughly constant and given by nature, a reduction in the number of people employed would make it possible to increase the incomes of those who remain and keep up with the rise in incomes elsewhere in the economy. For this to be possible one or both of two things must happen: either fishermen have to be provided with more capital equipment in order to increase their productivity, or productivity must increase through better technology. As has already been mentioned, the fishing industry the world over has experienced impressive improvement in technology.

Figures 1 and 2 illustrate these points. Figure 1 shows the value of the catches of fish in Norway, in constant value of money, and the number of fishermen since 1950. The value of the fish catches roughly doubled from 1950 to 2000 while the gross domestic product of Norway, in constant value of money, increased more than sixfold over that period.\textsuperscript{90} Without a drastic decline in the number of fishermen their incomes could not possibly have increased on par with other groups in Norway. In fact their number declined by 80 percent and their revenues per capita rose tenfold (Figure 2). This does not necessarily mean that their personal incomes rose tenfold as well; fishing costs may have risen even faster than the revenues, but it is certainly likely that their incomes have kept pace with the rest of society, and perhaps done better than that.

\begin{figure}[h]
\begin{center}
\includegraphics[width=\textwidth]{figure1}
\end{center}
\caption{Number of fishermen (full-time and part-time) and the value of the fish catches in Norway}
\textit{Source: Statistics Norway: Fishery Statistics}
\end{figure}

The fact that the value of the catch has roughly doubled since 1950 contradicts the above assumption that the production of fish cannot be increased because the productivity of nature is fully utilized. The increase in the value of catches is due to the fishing of previously unexploited or only lightly exploited stocks, as we shall return to below. It is not due to a rising price of fish relative to other goods. Since 1963, the earliest year for which an index of ex-vessel fish prices is available, this price index has varied between 70 and 125 percent of the consumer price index with a common base year (1994) and was

\textsuperscript{90} Calculated from historical statistics available on the website of Statistics Norway (www.ssb.no).
highest in 1963, while in 1998 and 1999 it was about seven percent higher than the consumer price index. But even if the limited productivity of nature has not been a strictly binding constraint over the entire period considered there is a point at which it will become so, and that point may already have been reached.

Figure 2. The value of the catch per fisherman (full-time and part-time) in Norway

*Source: Statistics Norway: Fishery Statistics*

Figure 3. Indices of catch value, capital stock, labor, and resources available, in the Norwegian Fisheries

*Sources: Statistics Norway and (stocks) ICES. For definition of the index of resources, see Appendix.*

How has it been possible not just to maintain but to increase the value of catches despite a dramatic fall in the use of labour? Is it due to substitution of capital for labour, increased availability of resources, or what? Figure 3 provides an answer to that. The figure shows the development of total catch value, use of
labour, the stock of capital, and the availability of resources, since 1960. The input of labour has fallen relentlessly, as already noted. The stock of capital increased, especially after 1970, and peaked in the late 1980s at about twice its 1963 value. In the late 1990s it was, however, not much greater than forty years earlier, and the availability of resources was lower in the 1990s than in 1961. The increased productivity of labour thus is not due to a greater availability of resources, and it is to a lesser extent than one might expect due to a substitution of capital for labour. Instead it is mainly due to a better technology; it is due to the fact that each crone invested in fishing equipment today buys much better equipment than the equivalent amount of money did forty years ago. This will not surprise anyone with some knowledge of the fishing industry, and it will not surprise anyone familiar with the theory of economic growth, which identifies technological progress as the only factor able to sustain economic growth per capita in the long run. The build-up of capital alone quickly runs into diminishing returns, but it is a more intriguing question whether the realization of technological progress does in fact require investment in new equipment replacing the old and outdated one.

The resource availability index warrants some comments in its own right. This index is a weighted sum of indices of abundance for different stocks, the weights being the value shares in the landings from these stocks, at fixed (1999) prices. Note that it may take some time for the stock index to show signs of overexploitation, because it may take some time for the stocks themselves to decline as a result of overexploitation; it is the long term trend that matters. The increased catches in the mid-1990s despite a fall in the resource availability index could prove unsustainable precisely for that reason, and catches did indeed fall in the late 1990s. (For further details on the index, see Appendix.)

3. STOCK FLUCTUATIONS AND SUSTAINABILITY

The stock index discussed above is a weighted sum of indices of several stocks. It is important to note that it has been possible, by switching to previously lightly exploited or unexploited stocks, to avoid as large variations in the value of fish landings as have occurred for single, important stocks. One such case is the switch that occurred from herring to capelin after the collapse of the Atlantic-Scandian and North Sea herring stocks in the early 1970s. Both these fisheries were conducted by the same boats. As Figure 4 shows, the catches of Barents Sea capelin replaced the catches of Norwegian spring spawning herring in the 1970s and early 1980s. In part this may amount to exploiting the productivity of nature in different ways. The growth conditions for Barents Sea capelin probably improved after the collapse of the Norwegian spring spawning herring, making it possible to catch more of this fish than before. A similar effect may be observed for Arctic shrimp and the Arcto-Norwegian cod. The stock and catches of shrimp fluctuate in a way contrary to the Arcto-Norwegian cod, smoothing the variations in the total value of landings (Figure 5). This last effect is reminiscent of what has happened at Newfoundland. The much noted collapse of the Northern cod has been accompanied by an increased and not decreased value of landings, due to increased landings of high valued crab whose growth conditions have improved simultaneously with and perhaps as a result of the cod collapse (Figure 6).

These last comments raise the question what are sustainable fisheries really about? Are we trying to sustain revenues from fishing? If so, perhaps we need not worry too much about temporary collapses in individual stocks; all stocks do not collapse simultaneously, and when one stock goes down another goes up and compensates for the revenue loss from the first. And if we are trying to sustain individual stocks we should be prepared for unpleasant surprises. Fish stocks fluctuate partly for environmental reasons that we can do absolutely nothing about but have to live with as best we can. The collapses of the Atlantic-Scandian herring is generally believed to have been triggered by overfishing, but it coincided with an unfavourable (for the herring) change in the oceanographic regime (Figure 7). Similar arguments

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91 The time series for the resource availability starts in 1961, but the indices for the other three, labor, capital and catch value, do not change much from 1960 to 1961.

92 Atlantic-Scandian herring is a term used for several probably interrelated herring stocks in the Northeast Atlantic, the most important of which is the Norwegian spring spawning herring. This is apparently the only stock that survived the debacle of the late 1960s. The spring spawning herring stocks at Iceland and the Faeroe Islands have apparently disappeared (Vilhjalmsson, 1997).
have been advanced for the Northern cod. This is not to say that overfishing was no part of the problem; it may, as stated, have precipitated and/or deepened the collapse and delayed a recovery of the stocks (an event that is yet to happen for the Northern cod).

Figure 4. Stock and Norwegian landings of Atlanto-Scandian herring and Barents Sea capelin

Source: ICES.
Figure 5. Stock and Norwegian catches of Northeast Arctic cod and Barents Sea shrimp

Source: ICES
Figure 6. Quantity and value of fish catches in Newfoundland

Source: Canada Fisheries and Oceans

Figure 7. Spawning stock biomass of Atlanto-Scandian (Norwegian spring spawning) herring and 19-years moving average of temperature in the Barents Sea (the Kola section)

Source: Toresen and Østvedt (2000)

4. SUBSIDIES AND SUSTAINABILITY

Over the years, fisheries subsidies have acquired a bad reputation, both among economists and others. Theory is unambiguous on the consequences of subsidies in open access fisheries; they will increase fleet capacity and fishing effort and aggravate the depletion of fish stocks. But not all fisheries are open access fisheries; more and more fisheries are subject to some control; either fish quotas or restrictions on the activities of the fishing fleet.
The consequences of subsidies are less obvious under such control regimes. If these controls are tight enough the effects of subsidies on fishing capacity and the decimation of fish stocks could be small. Subsidies explicitly given to reducing fishing capacity could in fact reduce overcapacity and possibly also overfishing. Subsidies to decommissioning of fishing vessels would not be very effective if the money could be diverted to investment in new vessels, or if they cause industry players to be less risk averse, in the expectation that they will always be bailed out. But provided the controls are tight enough and the message that this is a once and for all thing gets across; such subsidies could be effective in reducing the overcapacity of fleets. Whether they are otherwise a wise use of the taxpayer’s money is another issue which will not be addressed here.

The Norwegian government was for a number of years rather generous with subsidies to its fishing industry, so let us take a look at the consequences. An analysis of the effect on fish stocks remains to be done but it is straightforward to provide an overall picture of the effect on investment, man-years of work, and the value added in the industry. These are shown in Figures 8–10. It is not unreasonable to expect a continued program of subsidies that nevertheless may vary from one year to the next to affect investment and employment with some time delay, and that the effects will be stronger the longer the subsidy program lasts. The figures comparing subsidies, investment and change in employment (Figures 8 and 9) therefore show three-year moving averages. For subsidies and investment there appears to be, if anything, a negative correlation. For employment change and subsidies there appears to be some positive correlation up to about 1990, but after that the subsidy program was virtually abolished. This leads to the conclusion that the subsidies had some affect on employment, i.e., slowing down the reduction in employment, but little or no effect on investment. The latter effect is indeed surprising. There were some controls of investment in fishing boats in Norway up until the 1980s, in the form of controls on loans from the Government Bank for Fisheries, but it was nevertheless possible to finance the building of fishing boats through private banks.

Figure 8. Fisheries subsidies and investment in fishing equipment in Norway

Source: Statistics Norway
Figure 9. Fisheries subsidies and change in man-years of labour in Norway’s fisheries

*Source: Statistics Norway*

Figure 10 compares subsidies and the value added in the fishing industry. For a brief period in the 1970s and the early 1980s the fisheries subsidies reached the ridiculous level of about 90 percent of value added in the industry. In this period there was also a positive relationship between the subsidies and value added in the industry. As the subsidies were wound down there was for some years a weak relationship between the subsidies and the total value added, but in the 1990s the value added has increased handsomely despite the fact that the subsidies have virtually disappeared. One should of course be careful about drawing the conclusion that the value added in the industry (which includes a part of the subsidies) varies inversely with the level of subsidies, but what this shows is that it is quite possible to abolish subsidies and to improve the economic conditions in the industry within a relatively brief period of time.

*Figure 10. Subsidies and value added in the fisheries of Norway*

*Source: Statistics Norway*
5. DECOMMISSIONING OF FISHING VESSELS

One reason why there is little or no detectable relationship between the level of subsidies and the investment in the industry could be that from the late 1970s a substantial amount of the subsidies was given to decommissioning of fishing vessels. In the period 1979–95 over one billion kroner was granted to decommissioning and structural adjustments involving destruction of fishing vessels, selling vessels to buyers in foreign countries, or removing them from specific fisheries. Over the same period the total amount of subsidies was more than ten times as large (over 13 billion kroner), so the share of decommissioning in the total was not overly large. The decommissioning subsidies were nevertheless quite effective in improving the profitability of the purse seine fleet, which received about half of the total. For other fisheries where these measures were applied the effect on profitability is less clear, but the decommissioning subsidies did achieve some reduction in fleet capacity there as well.

The reasons why the decommissioning subsidies were effective in the purse seine fishery are several. One is that this fishery is controlled by individual vessel quotas and the total catch by overall quotas. Therefore, a larger capacity of the fishing fleet does not automatically mean greater effort and larger fish catches, but it can be argued that a large excess capacity of the fishing fleet will put a pressure on the authorities to increase fish quotas and improve vessel utilization and profits in the short term. Conversely, in a situation like this, vessel decommissioning does not mean less fishing effort and fish catches but a better utilization of the fishing fleet and higher profits.

Another reason why the decommissioning subsidies worked was that the fleet was controlled through fishing concessions specifying the cargo capacity of each individual vessel. It was not possible, therefore, to use the decommissioning subsidies to buy a new or a larger boat unless an equivalent boat was removed from the fishery. Those who scrapped or sold their boats out of the fishery were allowed to sell their concessions to other boatowners. This made it possible to replace small vessels with larger and more effective ones, without changing the total capacity of the fleet measured in cargo capacity. By buying the concession capacity of a small boat and adding to one’s own, a boatorwner could acquire a larger boat. Since the vessel quotas were determined on the basis of the vessel’s concession capacity, it was possible to increase one’s share of the total permitted catch by buying an additional concession for cargo capacity and acquire a larger vessel. Although the vessel quota did not increase in proportion to the increase in cargo capacity, purchasing a concession was still profitable, as the costs did not increase in proportion with the size of the vessel. Another factor that contributed to increasing the quota shares of the vessels was that the government withdrew the concessions of some of the boats it bought for decommissioning, thereby reducing the total cargo capacity of the fleet.

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93 The smallest vessels (less than 90 feet length or 1500 hl cargo capacity) do not need concessions. The share of this fleet in the total catch is, however, small.
94 In 1996 the rules were changed, and it is now possible to retain, for 13 or 18 years, a certain share of the quota allocation of a vessel bought for scrapping or removal from the fishery.
Figures 11–14 illustrate how this worked. First, let us take a look at the structural changes and the total capacity of the fleet. The number of the smallest boats fell quite rapidly after the decommissioning program was initiated in 1979 while the number of the largest type of vessels has increased (Figure 11). The total capacity of the fleet, measured in volume (hectolitres) of cargo capacity, also fell rapidly over the ten year period 1979–89 and has since stayed relatively constant after that, due to withdrawal of licenses of retired boats (Figure 12).
The effect on profitability was not immediate. As Figure 13 shows, the “wage potential” per boat of the purse seine fleet languished at a rather low level until about 1990, after the main structural adjustment had taken place. The “wage potential” is a measure of profitability; it is the remainder after all costs except labour costs have been subtracted from revenues. Ideally it should be calculated as per man-year.

95 “Wage potential” is the difference between revenue and all costs except labor costs and thus expresses the maximum income that could be paid to labor. It can be taken as a measure of profitability in a way similar to the return on capital when capital owners can claim what is left after all costs have been paid except capital costs. The reason for using this here is that this is longest time series readily available for the profitability of the fleet.
and compared with the wage rate in other industries, but data on man-years expended on the fishing fleet are not readily available. It can be stated, however, that the largest purse seiners do not require many more people than the smaller ones, which is one reason for their greater profitability.

Figure 14 indicates why it took so long for the decommissioning program to bear fruit in terms of improved profitability. The total catches of pelagic fish, the species taken by the purse seiners, declined both in quantity and value from the late 1970s to the late 1980s. The structural adjustment therefore did not initially do much better than compensate for a decline that the fleet would have suffered if its size and structure had remained the same. After 1990 the total catches of pelagic fish have increased handsomely, both in quantity and value. The wage potential per boat has increased in a similar fashion; the concession system has effectively barred investment in new fishing boats unless others of a corresponding size are removed.

6. CONCLUSION

What are the lessons we can learn from the Norwegian experience? The overall picture is one not just of a sustainable fishing industry but of an industry that grew over the latter part of the 20th century. The growth was, however, largely confined to just a few years in the 1960s, and since then we have seen alternating periods of decline and recovery. Major structural changes took place in the industry in the latter half of the 20th century, and there was a strong and largely uninterrupted decline in employment. Without that decline the industry would not have been able to hold its own vis-à-vis other industries in a growing economy with a strong increase in productivity and labor income.

The challenges that the ongoing rise in productivity and wages in the rest of the economy posed for the fishing industry appeared in the mid-1950s and became increasingly difficult as the years went by. This is what gave rise to the fisheries subsidies; these were originally intended to tidy the industry over temporary problems, but instead they became institutionalized and quasi-permanent. The subsidies did not offer any long term solution to the profitability problems of the industry, instead they became more aggravated. The broader lesson to be learned from this is that subsidies are in no way a solution to the problems of productivity that beset a fishing industry caught between the demands for rising incomes in a growing economy and the limited productivity of nature. Needless to say, subsidies may maintain incomes, as long as the taxpayers put up with them, but they do not solve the problems of the industry; on the contrary they most likely prevent or slow down the structural changes necessary. The fishing industry survives by selling its products in competition with other industries producing food, including fishing industries in other countries, and in order to do so it must stay competitive. This can be a challenge for fishing industries in economies with rising incomes and fish resources that are fully used.

That said, if we look for deleterious effects of the fisheries subsidies in Norway, we find less than we would expect. There is some evidence that they slowed down the decline in employment in the industry. This was undoubtedly intended, but whether that was well taken is another story. The effect on investment is less clear than one might think. To some extent this latter effect may be due to the fact that the subsidies were in part directed towards reducing the fishing fleet. This was effective in some fisheries. The precondition was a reasonable control over the entry of vessels. This control probably was the reason why the subsidies had less harmful effects than one would have expected. The effect of the subsidies on the fish stocks remains to be investigated, however. This task is made difficult by the fact that Norway shares virtually all its stocks with the neighbouring countries, and so what happens to the stocks depends only partly on what Norway does on its own.

Another thing we have seen is how depleted stocks were replaced by other, previously less exploited stocks. The herring fishery was replaced by the capelin fishery and the mackerel fishery. Perhaps this was fortuitous. Will there be other stocks to go to if the present ones collapse? We do not know, but probably not. The collapse of the herring stocks was in all probability caused by overfishing, made possible by a technological leap in fishing. The management structure to take advantage of that 96 The Norwegian fisheries subsidies are discussed at greater length in Hannesson (1996).
technological improvement rather than to let it wreak havoc with the stocks was simply not in place at the time; this was a decade or so before the exclusive economic zones came into being, and even if the Northeast Atlantic Fisheries Commissions already existed at the time the willingness to reign in the herring fishery was not there until the stocks had virtually collapsed. It can be argued that the herring collapses were a necessary learning process, and in that case probably a costly one. Even so, disputes over herring and other pelagic stocks in the Northeast Atlantic are still a fact; agreements on the Norwegian spring spawning herring are in the habit of breaking down, and no agreement has been reached for the blue whiting fishery. These failures are not just due to the fact that these stocks migrate between the economic zones of different countries, they are also, and probably to a greater extent, caused by the fact that these stocks can also be caught in what is left of the open sea outside 200 miles. It is difficult to overestimate the importance of the exclusive economic zone for reaching agreements on fisheries management. Indeed it can be argued that a further extension of that zone and the associated closure of all loopholes is the most pressing reform at the international level to improve fisheries management.

The herring collapse coincided with a marked change in ocean temperatures in the Northeast Atlantic, just as the collapse of the Northern cod coincided with a fall in the temperature on the Grand Banks. While there seems little doubt that both stocks were overfished, the adverse climatic changes are likely to have contributed to the collapse. Herring has in any case always been a capricious fish; herring booms and busts have occurred throughout history, and given the primitive technology of the past it is difficult to find other reasons than climate change or other environmental effects beyond human control. More generally, we have to live with the fact that fish stocks fluctuate for reasons that have nothing to do with human activities. In the face of such variations it will in many if not most cases be impossible to maintain a steady catch from individual stocks, except at ridiculously low levels. What, then, does sustainable fishing mean? That the existence of stocks not be endangered by fishing? That we maintain the revenues obtainable from any given ecosystem (if we can delimit any such in a meaningful way) by changing the utilization of stocks as the natural conditions vary? Or is it a convenient slogan for those who would preserve the oceans as pristine wilderness and send the fishermen packing?
APPENDIX

THE RESOURCE INDEX

The resource index has been calculated by summing the indices of the levels of the most important fish stocks exploited by the Norwegian fishing fleet, weighted by the share of these stocks in the value of landings for these stocks each year at 1999 prices. The stocks included are the following: Northeast Arctic cod, Northeast Arctic haddock, Northeast Arctic saithe, Northeast Arctic capelin, Norwegian spring spawning herring, Redfish (sebastes marinus and sebastes mentella), Greenland halibut, Northeast Arctic shrimp, blue whiting, mackerel, and North Sea herring. These stocks probably cover about 80 percent of the value of the Norwegian fish landings, but it is a bit difficult to tell exactly, because the landings from one particular stock are not always equal to the landings of that particular species, as more than one stock of a given species are sometimes fished (Northeast arctic cod versus North Sea cod, Barents Sea capelin versus Icelandic capelin, Barents Sea shrimp versus Greenland shrimp, etc.).

For some of the stocks (redfish, blue whiting, capelin, Greenland halibut and shrimp) the time series do not cover the entire period. The main reason for this is that these stocks were only lightly or not at all exploited early on in the period considered. The resource index therefore jumps upwards in the year the stock figures become available. The implication is that extending fisheries to previously lightly exploited resources means an extension of the resource base, even if the stocks as such existed prior to that. The indices for the capelin and shrimp stocks have been smoothed to reflect the gradual developments of this fishery over the period prior to the appearance of the stock estimates (1965–72 for capelin, 1970–81 for shrimp). The stock figures for mackerel 1961–71 reflect only North Sea mackerel).

REFERENCES


DISCUSSION PAPER 14

THE UNSUSTAINABLE EXPLOITATION OF INLAND FISHERIES RESOURCES IN CAMBODIA

by

Srun Lim Song, Lieng Sopha, Ing Try, Heng Sotharith

Summary

There were more than 500 fish species found in the inland water of Cambodia amongst more than 1 200 species that have found in the Mekong River Basin. The recent estimate of freshwater fish production in Cambodia was 300 000–450 000 tonnes per year with an estimated price at landing sites of US$ 150–225 million. It ranks fourth among the World's top in terms of total inland fish production, but it ranks first among the world’s top in terms of fish consumption per capita.

Fish play a major role not only in the diet, but also in the economy of the Cambodian people. A household survey carried out in 1995-96 suggests that the average fish consumption rate of 4.2 million people in central Cambodia is 67 kg/capita/year. Small-scale fisheries (family and rice field fisheries) production contributes more than 55 percent of total catch. It is highly significant for food security in the country, especially for the rural poor. While, the marine catch contributes about 12 – 15 percent of the total fish production annually, due to Cambodia possesses a short coastline, about 435 km only.

The recent increase of fishing effort of the middle scale and family scale fisheries has lead to increase fishing pressure on wild fish stock and increase the practice of illegal fishing method, particularly electro – fishing and small-mesh size net (mosquito net), which leads to serious decline of fisheries resources. The decrease in number of fish spawners has resulted in the decline in fish productivity.

The changes of flow regime in the Mekong River floodplains may change the physical, chemical and ecological quality of river from upstream to down stream. The form and function of the rivers have changed in respond to the dam construction and canalization of the river or tributary. The human settlement has caused also the changes of land use. This has disruption the seasonal pattern of fish migration for feeding and reproduction.

1. INTRODUCTION

Cambodia is a small and compact tropical country, located in Southeast Asia between Lao PDR, Vietnam, Thailand and the Gulf of Thailand. The population is about 13.4 million at a growth rate of 2.4 percent per annum. Agriculture is the major occupation and the backbone of the country’s economy. About 85 percent of the population is rural dwellers. Cambodia remains one of the poorest countries in the world, it ranked 130th on the Human Resource Index (2002), out of 137 countries: around 40 percent of the population lives below the poverty line. The level of education, health, gender equity and life expectancy remain relatively low and are improving gradually after more than two decades of internal unrest that ended in 1998. So the needs for social and economic development are an urgent and critical matter.

Rice and fish are the basic diets of Cambodian people and more than 70 percent of the animal protein intake derives from fish especially for the rural poors. Fish consumption of rural dwellers living in the floodplain around the Great Lake is estimated at 75.6 kg/person/year while those living in the fish deficit

97 The views expressed in this paper are solely those of the authors, Srun Lim Song, Director of Inland Fisheries Research and Development Institute; Lieng Sopha, Deputy Director of Inland Fisheries Research and Development Institute; Ing Try, Deputy Director of Fisheries Department; Heng Sotharith, Chief of Exploitation Office, Department of Fisheries.
areas such as Prey Veng and Svay Rieng provinces is 22 – 40 kg/person/year (Gregory, 1997). The national average fish consumption is in the range of 30 – 40 kg/person/year, while the optimum level is about 48.5 kg.

Fish play a major role not only in the diet, but also in the economy of the Cambodian people. So far, because there is no proper statistical system set-up particularly for small-scale fisheries and aquaculture, it has resulted in the negligence of the important contribution from the capture fisheries to livelihood of the poor. On the other hand, aquaculture is widely seen as the principal revenue to fill the supply-demand gap, especially in those areas remote from the main capture fisheries, and also contributes to reduction of pressure from wild catch.

This paper is intended to assist FAO in examining the efficiency of fisheries instruments and other measures to address factors of unsustainability and overexploitation affecting inland fisheries in Cambodia.

2. **FISHERIES STATUS IN CAMBODIA**

Cambodia is rich in water resources and varieties of fish habitats. The Mekong, Tonle Sap and Bassac Rivers and many of their tributaries, numerous lakes and the Tonle Sap Great Lake and the floodplain comprise a wide range of different habitat types, from marshes/swamps, shrub lands, grasslands, flooded forest to rice fields. The flooded forest covers largest area after rice field and it is likely that the flooded forest has a largest potential contribution to fish production. The availability of habitat is influenced by flood regime of the Mekong River. This has resulted in changes of the extent of the floodplains of the Lake. The centre of the Tonle Sap Lake is largely open water that serves as important refuges for fish in the dry season while the lateral zone is dry. It is reported that fish production in the Tonle Sap Great Lake is about 139 – 190 kg/ha/year (Lieng, and Van Zalinge, 2002).

The large flood plains and extensive wetland areas surrounding the Great Lake are both highly valuable and very vulnerable. The high biodiversity and biological productivity allow these areas to offer a broad variety of livelihood opportunities to a large number of inhabitants. More than 500 fish species have been found in the Mekong River area of Cambodia (Rainboth, 1996).

The landing-site value of the total inland fish production is estimated (based on landing prices) between 150 to US$ 250 million (Van Zalinge et al., 1999). Following updated calculations of the market value of fish production in the Lower Mekong River Basin, freshwater capture fisheries of Cambodia would contribute more than US$ 300 million (Jensen, 2000). The Department of Fisheries generated US$1.9 million in 1998 (DoF, 1999).
Table 1. Cambodia’s Fish Catch and Aquaculture Production, 1985 – 2003

<table>
<thead>
<tr>
<th>Year</th>
<th>Inland (tonnes)</th>
<th>Marine (tonnes)</th>
<th>Aquaculture (tonnes)</th>
<th>Total (tonnes)</th>
<th>Value (US$ Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>56,400</td>
<td>11,178</td>
<td>3,000</td>
<td>70,578</td>
<td>84.30</td>
</tr>
<tr>
<td>1986</td>
<td>64,181</td>
<td>7,247</td>
<td>2,200</td>
<td>73,628</td>
<td>76.90</td>
</tr>
<tr>
<td>1987</td>
<td>62,154</td>
<td>17,417</td>
<td>2,500</td>
<td>82,071</td>
<td>108.70</td>
</tr>
<tr>
<td>1988</td>
<td>61,200</td>
<td>21,000</td>
<td>4,600</td>
<td>86,800</td>
<td>121.70</td>
</tr>
<tr>
<td>1989</td>
<td>50,500</td>
<td>26,050</td>
<td>5,380</td>
<td>82,088</td>
<td>130.50</td>
</tr>
<tr>
<td>1990</td>
<td>65,100</td>
<td>39,900</td>
<td>6,400</td>
<td>111,400</td>
<td>187.90</td>
</tr>
<tr>
<td>1991</td>
<td>74,700</td>
<td>36,400</td>
<td>6,700</td>
<td>117,800</td>
<td>165.20</td>
</tr>
<tr>
<td>1992</td>
<td>68,900</td>
<td>33,700</td>
<td>8,550</td>
<td>111,150</td>
<td>155.10</td>
</tr>
<tr>
<td>1993</td>
<td>67,900</td>
<td>33,100</td>
<td>7,900</td>
<td>108,900</td>
<td>151.90</td>
</tr>
<tr>
<td>1994</td>
<td>65,000</td>
<td>30,000</td>
<td>8,200</td>
<td>103,200</td>
<td>140.60</td>
</tr>
<tr>
<td>1995</td>
<td>72,500</td>
<td>30,500</td>
<td>9,510</td>
<td>112,510</td>
<td>147.60</td>
</tr>
<tr>
<td>1996</td>
<td>63,510</td>
<td>31,200</td>
<td>9,600</td>
<td>104,310</td>
<td>138.90</td>
</tr>
<tr>
<td>1997</td>
<td>73,000</td>
<td>29,800</td>
<td>11,800</td>
<td>114,600</td>
<td>140.80</td>
</tr>
<tr>
<td>1998</td>
<td>75,700</td>
<td>32,200</td>
<td>14,100</td>
<td>122,000</td>
<td>152.10</td>
</tr>
<tr>
<td>1999</td>
<td>231,000*</td>
<td>38,100</td>
<td>15,000</td>
<td>284,100</td>
<td>142.05**</td>
</tr>
<tr>
<td>2000</td>
<td>245,600*</td>
<td>36,000</td>
<td>14,430</td>
<td>296,030</td>
<td>148.02**</td>
</tr>
<tr>
<td>2001</td>
<td>385,000*</td>
<td>42,000</td>
<td>17,500</td>
<td>444,500</td>
<td>222.25**</td>
</tr>
<tr>
<td>2002</td>
<td>360,300*</td>
<td>45,850</td>
<td>18,200</td>
<td>424,350</td>
<td>212.25**</td>
</tr>
<tr>
<td>2003</td>
<td>308,750*</td>
<td>54,750</td>
<td>26,300</td>
<td>389,800</td>
<td>194.90**</td>
</tr>
</tbody>
</table>

Source: Fisheries Department (2002); Lim Song S. et al. (2004)

* Total production, including rice-field fisheries, small-scale, medium and large-scale fishing. Before 1999 the rice-field fisheries and small-scale fishing were not included.
** Estimation of average price of fish US$ 0.50/kg, derived from DOF (1999 – 2003) and personal communication (1999 – 2003).

The importance of the fishery is still under valued. Figures are usually underestimated because secondary and tertiary occupations in fisheries are not revealed. The national census for example only records the main occupation. This approach somehow obscures the essence of subsistence production in Cambodia, where agriculture and fisheries are tightly intertwined as the main components. Even in areas not adjacent to permanent water bodies or streams, fisheries in the form of rice field fisheries play an important role in subsistence production. For example, a household survey of 5,117 households conducted in eight inland provinces along the main water bodies and inundated areas found that for 10.5 percent of the households, fishing was the primary occupation. Yet 34.1 percent of households that did not cite fishing as their primary occupation reported a part-time involvement in fisheries (Ahmed et al. 1998). A limited farming systems study in regular rice farming areas reveals that 13 percent of farm labour requirements are spent in fishing activities. However, more than 18 percent of the value of their subsistence production comes from fishing (CIAP 1997).

However, with the increasing population pressure and owing to various causes production from capture fisheries has been showing a decline, resulting in the reduced availability of fish for consumption in most parts of the country. In order to overcome this shortage of fish supply, with the involvement of a number of non-government organizations (NGOs), international organizations and other projects, small-scale aquaculture has been promoting in different parts of the country and this activity is helping farmers in rural areas to grow fish both for family consumption and also generating their income.
3. **FISHERIES CONTRIBUTION TO THE NATIONAL ECONOMY**

According to the Cambodian fishery law, the small-scale fishery or family fishery is a fishery for subsistence living only and can take place year round in the family and open-access areas (excluding fishing lots, fish sanctuary, and flooded forest). Small-scale fishing implies all kinds of small-size fishing gears which can be operated by one or two persons, such as short gill nets, cast nets, scoop nets, shrimp scoop nets, hand push nets, small bamboo trap, short hook lines, single hook lines, spear, etc (Touch Seang Tana, 2002).

Rice field fisheries are subsistence fisheries for rural farmers. A study has been conducted on rice field fisheries and was found to be a socio-economic importance for the rural poor in rural Svay Rieng Province (Touch Seang Tana, 1993).

Fishing-related employment is very important for rural livelihood. The household survey of fishing dependent communes in 1995 conducted in eight provinces around the Tonle Sap Lake and the southern floodplain with the total population of 2.4 million people or 453 000 households indicated that 10.5 percent of the households fishing or related activity was a primary occupation and another 34.1 percent were part-time engaged (Ahmed et al. 1998).

Most of the household (about 87 percent) was involved in family fishing activity and nine percent carries middle-scale fishing. Only about four percent of the households involved in large-scale fishing (Ahmed et al. 1998). The family fisheries are often held in rice field or nearby water bodies, canal, swamp or small lakes.

The average annual catch per household for middle-scale and family fishing was 3 319 Kg and 647 Kg, respectively. Nearly 40 percent of the fish catch was consumed within the communes. In addition to the food and employment, fishing provides cash to local fishers. With this fishing and other source of income they could earn cash of around US$ 380 per year (Ahmed et. al. 1999).

The Management of Freshwater Captures Fisheries of Cambodia of MRC/Danida/ DoF Project has set up a more scientific system of data collection since 1994 – 1997. It is based on the stratified sampling (by species, by gear and district) and frame survey information on fishing gear in order to get a more realistic idea of the size of fisheries (Van Zalinge et al., 1996; Diep et al., 1998). Their data for the annual inland water catch from 1994 to 1998 varied from 280 000 to 445 000 tonnes as the result of large-scale commercial fishing (fishing lots and Dai), middle-scale fishing (mobile gear), small-scale and rice field fisheries are shown in Table 2.
Table 2. Range of annual inland catches in the year from 1994 to 1997

<table>
<thead>
<tr>
<th>Type of fisheries</th>
<th>Annual catch ranges (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large-scale fisheries</td>
<td></td>
</tr>
<tr>
<td>– Fishing lots¹</td>
<td>25,000 – 75,000</td>
</tr>
<tr>
<td>– Dai (bag nets)²</td>
<td>10,000 – 20,000</td>
</tr>
<tr>
<td>Middle-scale fisheries³</td>
<td>85,000 – 100,000</td>
</tr>
<tr>
<td>Family-scale fisheries³</td>
<td>115,000 – 140,000</td>
</tr>
<tr>
<td>Rice field fisheries⁴</td>
<td>45,000 – 110,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>280,000 – 445,000</strong></td>
</tr>
</tbody>
</table>

*Source: Ahmed, et al. 1998, and Diep et al., 1998*

1. Range reflects uncertainty in actual catch levels
2. Range shows approx. minimum and maximum values since 1994-98
3. Based on socio-economic survey data extrapolated to entire country
4. Approx. 1.8 million ha x likely range of fish yield: 25 – 62 kg/ha

The large-scale inland fisheries, the fishing lots and Dai fisheries are now limited and are managed as government concessions. The system predates the French colonial time. The largest reduction took place in 2001 apparently as a reaction to the mounting conflicts over access to fishing grounds between lot managers and fisher communities. About 56 percent of fishing lots were abolished and placed under community fisheries management. So far, there are 339 communities has been established, but they are not experienced in handling management and moreover appropriate laws have not been adopted yet.

4. FISHERY REFORM

In Cambodia, the fishing lot management system is based on the generation as much as possible of the resources-rent while ecological and geographical environment are changing and the population is growing. Indeed, in each of the fishing lot, there were some open-access areas for family fishing. But during recent years lot leaseholders have deprived local communities from access to those areas and sometimes the lot armed guards confiscated fishing nets, traps, rowing boats of subsistence fishers. Some fatal incidents have been occurring in this conflict of interests (Nao Thuok, 2001).

Table 3. Number of fishing lots remained after the reform

<table>
<thead>
<tr>
<th>Fishing lot</th>
<th>Existed</th>
<th>Abolished</th>
<th>Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Lake-stream (Lacustrine)</td>
<td>135</td>
<td>53</td>
<td>82</td>
</tr>
<tr>
<td>– Bagnet (Dai fishing)</td>
<td>69</td>
<td>03</td>
<td>66</td>
</tr>
<tr>
<td>– White Lady Bagnet</td>
<td>08</td>
<td>00</td>
<td>08</td>
</tr>
<tr>
<td>– Prawn Bagnet</td>
<td>13</td>
<td>00</td>
<td>13</td>
</tr>
<tr>
<td>– Sand bank (Riverine)</td>
<td>20</td>
<td>20</td>
<td>00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>239</strong></td>
<td><strong>76</strong></td>
<td><strong>163</strong></td>
</tr>
</tbody>
</table>

*Source: Nao Thuok 2001*
In this context, local people used to come to Phnom Penh to protest in front of the National Assembly claiming that they were deprived from access to fishing grounds where they used to fish. On the other hand, lot holders sub-lease portions of the lot to other sub-sub-lessees for more profits.

Responding to this situation, Samdach Hun Sen, Prime-Minister of Cambodian Government ordered the Ministry of Agriculture, Forestry and Fisheries (MAFF) to revise the fishing lot management before April 2001. He recommended that:

1. the lot area be reduced by 30 percent;
2. the lots worth less than 30 million Riels (Cambodian currency) be abolished and kept for subsistence fishing; and
3. community fisheries be organized around the area set aside for communities to cooperatively manage the resources for sustainability purposes.

In general, the area set aside for local communities resulted from the fisheries is 536 302 ha or 56.23 percent of the total lot area of 953 740 ha in 12 provinces. Thus the lot area remained after the reform is 417 438 ha (Nao Thuok, 2001).

In addition to the release of 56.23 percent of the fishing concession, the government has decided the exemption of fishing fee from all middle-scale fishing by issuing the sub-decree No. 24 of 19 Feb. 2001 to help alleviating pressures on middle-scale fishing (Nao Thuok, 2001). Following the government policy on fisheries reform, the MAFF has approved the establishment of a new “Community Fisheries Development Office” to facilitate and coordinate the urgent need in organizing and coordinating the organization of community fisheries.

At present, the Department of Fisheries in collaboration with various NGOs and local authorities has established country-wide 339 communities fisheries in order to implement the Royal Government policy in fishery management and to guarantee equitable distribution of benefits from fisheries resources among small-scale fishers and ensuring the sustainable management, development, utilization and conservation of fisheries resources for the generation to come.

5. **FISHERY POLICY**

The Department of Fisheries is in the process of drafting the Ten Year Fisheries Management Plan and is undergoing stakeholder’s consultation soon. On the other hand, with technical assistance of the ADB, the first ever Five Year Tonle Sap Fisheries Management Plan has been produced and will serve as the basis for the development of the Tonle Sap fisheries.

In the new Political Platform of the Royal Government of the third legislature pertaining to natural resource management, it was clearly mentioned that the fisheries sector reform will be undertaken by in-depth researches to transfer some of the fishing lots whose concession contracts have expired into Fish Sanctuaries, thereby help increasing natural fish stock and conserve endangered species. Community-based fishing lots will be expanded and aquaculture promoted to respond to the increasing needs for fish as well as reduce the pressure on the natural fisheries resources.

In the Fisheries Management and Development Plan, the fisheries policy is:

- to ensure the sustainable management and utilization of the fisheries resources to secure food for the people and to alleviate poverty;
- to promote and encourage aquaculture development by all means especially small-scale aquaculture in rural areas as a means of protein supply and supplement existing levels and forms of production;
• to promote community fisheries for local participation in fisheries management and secure a sustainable livelihood for farmers in terms of social, economic and nutritional benefits;
• to protect and conserve critical habitats and manage sustainably and restore the endangered species;
• to provide quality service to all client and training of the fisheries staff to understand and think of the fishing industry;
• to promote fisheries extension at all level; and
• to encourage investment in fisheries sector and improve the basic infrastructure for fisheries development especially for post harvest handling and processing.

6. FACTORS RELATED TO UNSUSTAINABLE MANAGEMENT IN INLAND FISHERIES

The recent increase of fishing effort of the middle scale and family scale fishery may have been caused by improper access to the lake and fishing grounds and the possible influx of internally displaced persons and refugees. The increase of population leads to the increase of number of fishers, therefore giving high fishing pressure and conflicts between small-scale fishers and fishing lots. Some of the refugees and displaced people have little alternative employment. It is easy to take-up fishing as low required capital investment and the fishing gears are easy to produce. The increase in number of fishers has lead to the decline of fish catch per fisher. Fishers living in the nearby fishing lots have turned to illegally exploit the richer resources of these lots. This has given the rise to conflicts between the lot owners and small-scale fishers.

The electro-cute and small mesh size nets (mosquito net) are illegally fishing gears which have been practiced everywhere in Cambodian water bodies recently. A large number of local fishers used this gear commonly, since it is cheap and available at all locations. These types of fishing practice are prohibited by law/regulation and it is the most serious destructive method that is very much harmful to all types of living aquatic resources. Recently, the fish production declined due to this practice.

Aquaculture of high carnivorous species such as snakehead fish (*Channa micropeltes*) and (*Channa Striata*) also caused a critical problem. The farmers usually collected small fish to feed the snakehead, even during the closing season (fish spawning and nursing season during June–October). Therefore, the aquaculture development of high carnivorous species seems to be encouraging farmers to practice illegal fishing methods, which causes high
fishing pressure and contributes to unsustainable utilization and management of fisheries resources, eventually leading to decline wild fish productivity.

Small-scale fisheries suffer many problems covering the degradation of fish habitat and the increasing number of fishers leading to the increasing pressure on the aquatic resources, fish habitat, decline in fish catch per fisher and causing competition among natural resource users. The area of the fishing grounds is very limited for the increasing demand and number of fishers. The population growth may cause an impact on biodiversity and other aquatic resources.

The change in water quality (pollution) and quantity of water also causes problems for living aquatic resources as result of storage in dams and abstraction for irrigation. The pollution may occur due to the development of industrialization and urbanization. Flood controls will result in the lesser inundation of floodplains. The change of the time of flood may also cause it to be out of phase with natural occurring cycles of fish reproduction, especially in longitudinal migrants. The cumulative effect of water regulatory works will result in the reduction in the average peak flows and the changes of the occurrence. The extent of the flooding is positively related to fish productivity (Van Zalinge et al., 1998).

The construction of barriers (dams, weir, and diversion) may cause a disturbance and change the physical shape of water bodies and act as a barrier to fish migration. The negative consequences of the deforestation, inappropriate agriculture, road construction, hydropower and other forms of development are already evident. The major concern is the loss of riparian vegetation cover, and particular, the rapid loss of flooded forest, which provide crucial aquatic habitat for fishes.

The catch rates per fisher have declined because the increase in population and number of fishers has outstripped the increase in catch (Van Zalinge et al., 2000). If fishing pressure were to increase further, the total catch probably could not increase and the catch rate per fish may continue to decline. However, the situation is more complicated for the multiple species fisheries.

The decline of the catch rate of the small-scale fishers has led to conflicts between small and large-scale fishers. The large-scale fishers, especially in the fishing lots, occupy the productive and rich fishing grounds in the flooded forest. The rapid increase in the number of fishers, and limited fishing grounds, has caused an over crowded number of fishers in the open-access areas. Small-scale fishers often poach fish in the productive fishing ground in the fishing lots. The fishing lot operators use armed guards to protect their lots. In addition, small-scale fishers also often complain that the lot boundaries have been violated and lot holders want larger areas, so that they can fish more. Upon these issues the government has abolished more than 56 percent of the fishing lots for community fisheries to fish and manage by themselves. The small conflicts are still occurring in some areas, but the scale has been brought down to local levels.

### Table 4. Tonle Sap Lake region: Changes in population size and fish catch between 1940 (Chevey and Le Poulain) and 1995/96 (MRC/DoF) data

<table>
<thead>
<tr>
<th>Period</th>
<th>Population</th>
<th>Fishing inhabitants (11.2 percent of total pop.)</th>
<th>Increase in population</th>
<th>Great Lake fish production (tonnes)</th>
<th>Increase in fish catch</th>
<th>Fish catch/fishing inhabitant/year (kg)</th>
<th>Decline in catch/fisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940's</td>
<td>3.2 million</td>
<td>0.36 million</td>
<td>125 000</td>
<td>347</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>10.7 million</td>
<td>1.20 million</td>
<td>235 000</td>
<td>1.9 x</td>
<td>196</td>
<td>44 percent</td>
<td></td>
</tr>
</tbody>
</table>
The practice of illegal fishing methods leads to conflicts as some people gain an advantage over others by breaking the law and causing serious decline of fish spawners. The use of explosives, especially in the deep channels of the upper Mekong in Kratie and Stung Treng provinces, is particularly distinctive as it targets spawning populations sheltering there during the dry season (Van Zalinge et al. 2000). This is done mainly by fishers under armed protection, but also by villagers on their own initiative. The decrease in the number of fish spawners have resulted in the decline in fish productivity, particularly of the large species that requires some years to reach maturity maybe hardly escape from fishing and getting the chance to reproduce.

Environmental risks and degradation of the natural resource base are an important threat to aquaculture development and fisheries. Aquaculture is affected by natural disasters, aquatic animal diseases, possibly by introductions of exotics, loss of genetic diversity through poor genetic resource management strategies and water pollution.

7. CONCLUSION

Inland fisheries are very important for livelihood needs. They are significant to food security, as it is hardly possible for the rural poor to find other cheap and affordable alternatives. Fish is an important source of nutrients. In addition to the contribution of the fisheries to food, it also provides income generation to government and especially to the family economy of the rural dwellers.

The Cambodian inland floodplain fisheries are economically most important, where they presently contribute 7–13 percent to the GDP. Fish and rice are the basis of the food security in the country. Export of fish and fish products to the neighbouring countries is one of the main businesses for many fish traders, particularly to Thailand and Vietnam. The seasonal inundation of the large floodplains, for instance the Tonle Sap Great Lake, provides very rich fish resources. Fish yields in the Tonle Sap floodplain area range from 139–190 kg/ha per year (Lieng and Van Zalinge 2002). Fisheries provide employment to the rural people, full and part–time fishing. However, fish catch per fisher have gone down very much. Catches are dominated by smaller short-lived species.

However, the inland fisheries suffer the unsustainable exploitation through habitat changes, and degradation of the resources. The fisheries suffer from high fishing pressure as the increase of human population causing competition in harvesting fish resources and irresponsible fishing practices.

The levels of the exploitation of the resources are very high and at the same time, most of the rural population is low-income and poor. Because the flooding regime and the state of the natural environment are the main factors that determine the survival rate and productivity of the fisheries resources, the condition of the fish habitat may be deteriorating. Alteration of the river system still continues. The increasing construction of rural infrastructure and irrigation works, some of which create barriers, prevent fish from migrating to large areas of the floodplain for spawning and feeding. These issues which cause unsustainable utilization of the aquatic resources need to be analyzed and solutions need to be sought using the best scientific information available. Careful planning and implementation and coordination participated by all stakeholders from government official, planners, decision makers to community and local authority.

8. RECOMMENDATION

Fisheries resources can retain a role of contributing great economic importance to Cambodia, if their habitat and the resources themselves are kept healthy. Law enforcement needs to be further strengthened. Other economic development activity will contribute to the improvement of fisheries management by providing other job opportunities, releasing the pressure on the wild fish stock.

Before introduction of flood controls, irrigation schemes, and other water-related structures, there is a need to carefully study the impact on fisheries, including by fisheries biologists. There is also a need to be careful with the introduction of pesticides and waste disposal, because they are sources of pollution
and cause change to fish habitat quality. Direct habitat destruction for conversion to rice fields and settlements is not helpful either.

Fisheries should be considered a high priority in the decision-making processes on such issues as land tenure, dam building, and irrigation. The habitat improvement will be very costly and require high expertise and study, therefore habitat protection is the important strategy, and should be implemented before the habitat has seriously deteriorated. Migratory routes must be kept free, as most white migratory fish species need to seasonally migrate between different habitats for their major spawning feeding grounds.

We also need outside interventions, for example rural credit on agro-industries will attract people out of fisheries and decrease open-access pressure on the resources and ensuing conflicts. Awareness needs to be made to increase understanding of the importance of fish resources, protection of fish habitat and refuge and protection of spawners to increase fish productivities.

The alternative employment opportunities such as the promotion of aquaculture development in the Cambodian floodplain and Tonle Sap area will help solve the problem of overexploitation and provide an important contribution to the food security and family income in the country and is the source for most of the large fish exports from the country.

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DISCUSSION PAPER 15

KERALA’S MARINE FISHERY: EVOLVING TOWARDS UNSUSTAINABILITY

A PERSONAL STATEMENT SPANNING THREE DECADES

by

John Kurien

Summary

This paper is written in the style of a personal statement sketching my involvement in the fisheries sector of Kerala State, India over a span of three decades. Initially this involvement was as a professional helping small-scale fishers to organize village level marketing cooperatives. Later the involvement changed to one of a researcher and policy adviser dealing contemporaneously at the local, national and the international realms. By adopting a schematized diachronic narrative, an attempt is made to provide a glimpse into the manner in which the fishery became unsustainable. It also tries to sketch the inter-related hurdles which come in the way of moving (back/forward?) to sustainability.

1. INTRODUCTION

Kerala State is situated in a narrow strip of land at the south-western tip of India. It is the only state in India where the political boundaries are co-terminus with well marked physical boundaries. High hills called the Western Ghats – largely a tropical rain forest, reaching a height of 1 500 m – mark the eastern border. About 100 – 120 km away on the west is the bountiful Arabian Sea which laps Kerala’s 600 km coastline. The state has a population of 30 million. It is one of most densely populated regions in India with a population density of 750 per sq. km. The state has 44 rivers which criss-cross it from east to west. That’s one river every 15 km. This plentiful water transport from the tropical forests makes a substantial contribution to coastal primary productivity. The bountiful marine fishery resources of Kerala are in large part due to this. The lush green vegetation dominated by tall swaying coconut palms, plentiful inland fresh-water resources and placid lagoons that lazily meander landwards from the river mouths, are also hallmarks of the state. Tourism flyers call Kerala ‘God’s Own Country’. It has been rated as one of National Geographic’s ‘top 20 must-visit’ destinations. The local language of the state is Malayalam. The inhabitants are called Keralites. Those who speak Malayalam, and hence trace their ancestry to Kerala, are known as Malayalees irrespective of whether they now reside in India or abroad.

In global political discourse the state shot into prominence in 1957. Keralites voted in the world’s first democratically elected communist party to power that year. Later, in the mid-1970s, the social development literature became replete with mentions of Kerala State for establishing a very high quality of life despite a very low per capita income. Kerala’s human development achievements of high literacy, low infant mortality, high life expectancy and sex-ratio favouring women match those of many developed countries. Politics is finely balanced in the state. After about two decades of unstable governance between 1957 and 1979, the political parties coalesced into two popular coalitions composed of parties representing various interest groups. Ideologically they were positioned at different points on the political spectrum. One – the Left Democratic Front (LDF) – was led by the communists and the other – the United Democratic Front (UDF) – by a centrist party. Each of the fronts accounted for about 45 percent of the popular vote. The electorate was in million, voter turnout was invariably

98 The views expressed in this paper are solely those of the author, John Kurien, Fellow, Centre for Development Studies, Trivandrum India, john.kurien@vsnl.com.

99 This was initially brought to international attention by a study prepared by the Centre for Development Studies in 1975 (UN, 1975). Thereafter many economists, including Amartya Sen have dealt at length with the factors that explained the outcomes of Kerala’s development experience in comparative perspective. In popular writing, the Booker Prize novel “God of Small Things” by Arundathi Roy has spread the news!
above 75 percent and every vote counted. Consequently, elections were very keenly fought and seats in parliament were won or lost by very small margins of a few hundred or thousand votes. Most socio-economic issues invariably got highly politicized. Every segment of the population was keenly attuned to political issues. Between 1957 and 1981 however, there were two exceptions – the marine fisherfolk inhabiting the coastal tract and the tribals in the Ghats. These two communities, spread along the two geographic fringes of the state accounted for three – four percent of the population of the state.

2. KERALA’S FISHERIES

Kerala is India’s most well-known fishery state. The coastal waters have been known for their high primary productivity. Shoaling pelagic species like oil sardines and mackerels and demersal species like prawns have made Kerala a major fish consuming and fish exporting state. The region also has the distinction of playing host to the world’s first development project called the Indo-Norwegian Project for Fisheries Community Development (INP for short). It was undertaken under a joint agreement between the United Nations, the Government of Norway and the Government of India. (See Kurien, 1985) The INP commenced work in 1953. This project was intended essentially to upgrade the existing fishery sector and improve the standard of living of the fishing community in three villages. It however became the unintended catalyst for launching the whole of Kerala’s fisheries into a new western-oriented export drive.100 Anchoring the fish economy to the new international market laid the seeds for a lopsided development – the existing beach based artisanal fishery was ignored as being traditional, unscientific and resistant to change. A totally new modern superstructure, based on harbour-based mechanized trawlers, with a single-specie orientation (shrimp) was actively promoted. When the INP started in 1953 there were around 38 000 active marine fishermen. Today (2004) there are 190 000. Spread over 220 villages along the coastline, with their family members they can form a human chain along the 600 km coast of the state.

Fishing communities in Kerala have tribal origins. They later were incorporated into the Hindu caste hierarchy and placed at the bottom of it. In the 8–9th century many communities in the northern region of the state were converted to Islam and in the 15th century a large number in the southern regions were converted to Christianity. Caste and religion were the defining identities of fishing communities in Kerala.

2.1 Getting involved in Kerala’s fisheries

I am a Malayalee. But I was born and educated outside Kerala. Not even in my wildest dreams had I wished to go to Kerala to study or work. One sweltering hot morning in May of 1973 I found myself in a little Christian fishing village called Marianad near Trivandrum, the capital city of Kerala State. It was basically a courtesy call to meet community workers who had been living in this village. The visit resulted in a drastic change in my life. The community workers and the fishermen in the village entreated me to stay and help them organize fish marketing in their newly formed cooperative. Accepting the offer meant giving up a well paid but unsatisfying job as a business manager in industry. Being young and idealistic I took their request as a personal challenge.

Coming from an urban, upper class background I was appalled by the stark poverty of the fisherfolk. Most of them lived on the sea front in tiny huts thatched with the dry platted leaves of the coconut palm so ubiquitous in Kerala. Dark-bodied muscular men, frail women and pot-bellied children were the most common sight. The majority of the population was illiterate. The thumb impression or a squiggly sign of the cross was their signature. The health and sanitary conditions were appalling. I was then not aware of

100 Several species of fish was being exported internationally from this region for many centuries. The big markets were in Southeast Asia and the UK. There is record of fish manure from the region being sold in Japan, Argentina in the 19th century.
Kerala state’s high human development achievements. If I was, given the stark reality that lay before my eyes, I would have grossly suspected the claim.\(^{101}\) (See ‘The Outlier Thesis’ below, section 16.)

The only real wealth of the community was their phenomenal knowledge of the sea and its resources and their modest collection of fishing equipment. Their fishing craft called a *kattu-maram* (literally: tied tree) was a raft made from four logs of lightwood. It was propelled by a triangular cotton sail and paddles made from bamboo. They had a variety of fishing gear – several types of cotton gillnets; boat seines; hooks and line sets; traps. Despite their vast knowledge of the resources of the bountiful sea, to which they had unhampered access, why were they so poor? Finding practical ways to overcome the hurdles to their socio-economic conditions was my immediate mission.

### 2.2 Constituting the right of first sale

I had observed that fishermen were price takers on every front. This was not only for all the inputs which they purchased, but also for fish, the only output of their hard labour. This state of affairs was a result of the overlapping of the credit and/or land market with the output market. This led to varieties of exploitative ‘bondage’. Financiers who had advanced loans to fishers laid priority claim to their fish – at prices which were rather arbitrarily fixed. Landlords, who permitted fishers to stay on their land adjacent to the sea, took advantage of this to stake control over the right to sell the fish. I observed that the financiers did not collect interest nor did landlords collect any rent. Both found the control over fish more profitable.

To change this iniquitous situation and make it favourable to the fishers was the big challenge. In due course, the collective resolve of the fishers to take control over their fish sales and resist any undue pressures from merchant-financiers and landlord-merchants resulted in a mini-revolution in the village.\(^{102}\) Two able auctioneers from the village were willing to stand by the fishermen. The support and advice from the community organizers and myself provided the set-up for a regulated auctioning system controlled by the fishers’ cooperative. By this collective action the fishers established two things: (1) their right and freedom to sell the produce of their labour and (2) within the context of the free play of market forces, through the adoption of an open auctioning system, they established a fair first-sale price for their fish. The Marianad Cooperative was singled out in Kerala State’s official annual ‘Economic Review’ as the model for the state to get fishermen out of the clutches of unreasonable middlemen, merchants and landlords.

### 2.3 Toying with appropriate technology

Fishing with a kattumaram can lead to extreme drudgery of labour. The raft has severe space constraints thereby putting limits to the amount of gear and fish that it can carry. This was one of the important causes for the low physical productivity of the fishers and consequently their low incomes even after gaining control over their fish. However, the kattumaram has several advantages – it does not sink, it is inexpensive; it is easy to maintain and has remained unchanged in form for perhaps over a millennium. These attributes made it difficult to replace with a comparable alternative. Motorising the kattumaram was one option. Fitting a Japanese outboard motor to this rope lashed raft proved easier than one first imagined. A pilot project with four engines was initiated in 1974 by the Marianad Cooperative. It was undertaken with the cooperation of the Government of India, the Government of Kerala and the Yamaha Company of Japan.\(^{103}\) Training was given to the fishermen and data was maintained on the costs and

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\(^{101}\) It was after two decades that I wrote challenging the universality of the Kerala human development experience by showing how and why fishing communities were ‘outliers’ (Kurien, 1995).

\(^{102}\) What began as a few fishermen confronting a landlord-financier-merchant all wrapped in one, turned out as a major challenge to the socio-economic status quo on the coast. This move of the fishermen to form a cooperative was opposed tooth and nail by the church, the politicians and the police on different grounds. I give details of these events in a paper published by the FAO/BOBP (See Kurien, 1980).

\(^{103}\) India had a very restrictive import regime and any technological artefact could be imported only under very strict controls.
earnings to assess the technical and economic viability of the enterprise. A year later the project folded up. The fishermen were not convinced that the additional costs and technical snags were commensurate with the benefits of being able to fish a bit deeper at sea and return a bit earlier to land. They abandoned the venture for the moment. In an evaluation of this experiment I called it ‘a technology blend a bit ahead of its time’. However, it took just a decade to be proved wrong.

2.4 Discovering data fallacies

The technology experiment spurred the need for data on socio-economic and technological aspects of fisheries in Kerala. A chance meeting with the state’s chief fishery planner in 1975 turned out to be momentous for understanding the gap between planners, their policy advice and the real life of the people. A statistical appendix in a planning document that he showed me stated the number of kattumarams in Kerala to be 3,760. This was a surprise. In my village alone there were over 400 and in the district there were at least 40 larger fishing villages where fishermen used only kattumarams. If such bloomers were the basis of planning for fisheries development it was hardly surprising that fishermen remained poor. On his part the planner made a visit to the village. He was also convinced of the need to discover and revamp such errors in the system. This chance encounter with ‘statistics for planning’ and the experience of monitoring the experiment with the outboard engines provided the basis of a future path-breaking study that would situate Kerala’s artisanal fisheries in proper perspective (see below).

2.5 Forming a marketing network

The ‘right of first sale’ operations of the Marianad Cooperative were a great success. Delinking of the sale of the fish from the credit and the land markets, led to a boost in the incomes of the fishermen. The idea of the venture caught the imagination of many fishermen from neighbouring and distant villages. They came to visit and learn. Soon a network of cooperatives was formed. The economic viability of the network became greatly enhanced with the fishermen’s control over the species which were exported – initially shrimp and then cuttle-fish. Equally important was the credit provided by the cooperative to the members. This was directed to buy more fishing gear that yielded more fish to be marketed. From the enhanced income, the Cooperative set aside a small saving fund for each fisherman. This was pooled and then circulated again as credit. This virtuous cycle – credit – production-marketing – savings expanded rapidly with growing fish sales and infectious enthusiasm. By 1980 the network of cooperatives expanded and was ambitiously named the South Indian Federation of Fishermen Societies (SIFFS), to become an apex body of small-scale fishers’ cooperatives.

2.6 Showing small-scale fisheries to be economically sustainable

Arising from the above interventions and the ‘discoveries’ about data fallacies, one logical step was to provide hard data to establish the significance and the viability of the traditional, artisanal, small-scale fishery of Kerala State. The official government policy from 1960 to 1980 was to support the modern, mechanized, trawler-fishing sector which arose as an offshoot of the INP. It was given official encouragement and financial support in the form of subsidies because of its export orientation. A mechanised trawler and its gear cost over ten times the investment required for any one of the 22 craft-gear combinations identified in the small-scale artisanal fishery. The official thinking was that all those currently involved in artisanal small-scale fisheries would either gradually upgrade themselves to using mechanised crafts or just wither away. Neither happened. Even after over two decades of this approach,

104 My association with this person, who had worked as economist with the INP, grew into a very fruitful collaboration of over two decades. We combined our efforts to influence policy makers and inform and educate the various stakeholders in the fishery – particularly the small-scale fishermen.

105 The idea of micro-finance much ahead of its time!

106 Today (2004) SIFFS has about 5,000 members and a sales turnover of over US$ 5 million. After over two decades this is a very small coverage. However, being a genuine people’s organisation it will only expand at the pace at which fishermen, on their own volition, join its fold.
as much as 80 percent of the marine fish harvest came from the small-scale, artisanal sector. In fact, even about half the exportable harvest was their contribution.

Then came the unexpected opportunity – the possibility of a collaborative study with the FAO’s Bay of Bengal Programme (BOBP) to conduct a pioneering study of costs and earnings across Kerala over the period of a whole year (1980/81). The study was conducted with the participation of the fishing community in the preparation, data collection and analysis.107 This was its hallmark. The results of this study had far reaching implications. It revealed that from an economic and a social perspective, the profitability of the small-scale, artisanal sector far outweighed that of the mechanized sector. The policy implications of the findings were, to say the least, disturbing to many policy makers. It questioned their existing rationale of total official neglect of the artisanal fishery. It showed that investments made in this sector would yield more fish, generate much needed income and employment among the poorer sections of the population, and even contribute to more foreign exchange. What better mix of outcomes!108

3. THE FISHERMEN’S STRUGGLES: THE MAKING OF A SOCIO-ECOLOGICAL MOVEMENT

The costs and earnings study became a crucial document in the hands of the fast emerging artisanal fishermen’s movement in the state. They had been agitating since 1980 about the increasing encroachment of mechanized trawlers into their fishing realms. They had perceived a decline in their fish catch109 and quickly attributed it to the ‘anti-Mother Nature’ activities of trawlers. They demanded a three-month monsoon trawl ban on the grounds that this was the breeding season for many fishes and that incessant bottom trawling during this three-month period was resulting in ecosystem overfishing. Together with this they demanded greater attention from the state in matters of education of their children and social security protection for themselves and their families particularly in time of accidents and old age. The costs and earnings study helped the fishermen to highlight the state’s neglect of the viable artisanal sector at the expense of mechanized trawler sector that was actually ruining the resource. The FAO stamp on the study gave it high credibility and prevented it from being dismissed as unscientific or unduly biased.

Another notable feature of this rising social movement among the fishermen was the gradual negation of old identities of caste and religion which were the basis for all collective action by fishing communities hitherto. This resulted in a fair share of tensions partly because of the emergence of a new breed of leaders, several from outside the fishing communities, who spoke a different vocabulary. The need for a greater class identity and a focus on the specific nature of fishery problems slowly became the underlying trait of the new movement.

The validity of the movement’s conclusions regarding trawling and resource depletion was contested by the scientific establishment who implicitly claimed to have monopoly over the scientific knowledge of the sea and its resources. They questioned the correlation being made by the fishermen between trawling and declining fish production. In the monsoon months, the question: where do the fish lay their eggs, became a heated political issue in Kerala State! There was a clear polarization in Kerala society. A section of politicians, fishery bureaucrats and fishery scientists supported the position that bottom trawling for shrimp was benign to the marine ecosystem. They were thus in tacit support of the trawlers and the export processing industry. Another section of politicians, the avid fish consumers, environmentalists, and several NGO activists were in empathy with the views of the militant fishermen’s

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107 This was possible because the study was conducted by the NGO that my colleagues from Marianad village and I had set up. Our long association with the fishing communities in the state ensured their wholehearted participation. We called it ‘movement-oriented research’. This also accounted for greater credibility and accuracy of the data generated.

108 This study (Kurien and Willmann, 1982) was the first of its kind undertaken in a small-scale fishery using continuous real time monitoring of data over a full period of one year. It helped to highlight the great diversity of fishing techniques.

109 Fish production dropped from the peak of 490 000 tonnes in 1974 to 274 000 tonnes in 1980.
movement. In a state familiar with only revolutionary class upsurges among the agrarian communities, this new ‘socio-ecological movement’ arising from a marginalized community, without the involvement of traditional politicians, provided a new dimension to collective action. (See Kurien, 1992).

3.1. The state reshapes its role

The first response of the state to the movement was to promulgate the Kerala Marine Fisheries Regulation (KMFR) Act in 1980. Basically it set out to zone the territorial sea within its jurisdiction (22 km of the coastline) into a zone reserved exclusively for the artisanal fishing units (up to 10 km from the coast) in which trawlers were forbidden to fish. An Expert Commission composed of government bureaucrats and state scientists was constituted to examine the merits of a trawl ban. These actions by the state brought the fishermen’s movement to a temporary halt in 1981. However, considering that there was no enforcement mechanism, the ingress of trawlers continued. This then became the basis for reviving the movement in 1982 and 1983.

The monsoon of 1984 brought a renewed tempo to the movement. The lethargy of the government to address the issues being raised and ineffective enforcement of the KMFR Act was the main irritant. Dissatisfaction spread across the whole coastline of the state. Fishermen cutting across religious affiliation joined to support the independent trade union which was being formed to take up the cause of the artisanal fishermen. In a state where political parties dominated all forms of secular collective action, the impressive mobilization capacity of this ‘non-party’ formation was unprecedented. It became a potential threat to all political parties.

The experienced chief minister of the state leading the UDF from 1981 realized the full implication of the fishermen’s demands. He did the unprecedented thing of taking over the fisheries portfolio. He figured that beating the financially powerful trawler lobby would be politically unwise. At the same time, he was politically astute enough to realize that being unresponsive to the massive vote bank of artisanal fishing communities, spread along the length of the state’s coastline, would be political suicidal from the pure arithmetic of keenly contested direct parliamentary elections.

He ordered the constitution of a second Expert Commission to examine the issues raised by the fishworkers. This time it was composed of three eminent scientists from outside the state to give it the stamp of being unbiased. He announced greater institutionalisation of both promotional and protective social security for fishing communities (See Kurien and Paul, 2000). He stopped state patronage of the mechanized trawlers by withdrawing all forms of financial assistance hitherto extended to trawler owners. He also created a major organizational initiative which would be funded by government money and meant exclusively for the artisanal fishermen. It was called Matsyafed (the Fish Federation). It would cater to their specific technical needs. It was also proclaimed as a fish marketing organization. He promised to route a heavy dose of inputs – nets, boats, and outboard motors – to help the artisanal fishermen. His message was clear: you can’t beat them (trawler lobby) but you can join their ranks in your own way with our support. The announcement of these ‘goodies’ created disunity in the fishermen’s movement.

This decision by the state to ‘co-opt the small-scale fishermen’ can be seen as the starting point of the massive investment spree in the artisanal fishery sector of Kerala. The race for fish by the small-scale fishermen began here. Being unwilling and ill-equipped to regulate the access of the trawlers, the state was ipso facto converting the coastal waters into an open access realm. This helped to create and sustain myths like – the faster you get to the fish, the greater the chance that you will harvest some; the more you invest in nets and faster motors, the more fish you will catch.

\[110\] The idea was to start something on the lines of SIFFS. However, unlike in SIFFS, in the Matsyafed the real active fishermen are not involved in the decision-making bodies. Politicians from fishing castes dominated these bodies.
3.2 Moving to unsustainable fishing

The introduction of outboard engines and new fishing gear for the artisanal fishing sector was hastened by two external factors: (1) the greater liberalization of the Indian economy which permitted easy import of Japanese engines (unlike in 1974 when I tried out the motors in Marianad) (2) the availability of large financial incentives from the state in the form of subsidies. Given this, the adoption of these inputs by individual fishermen was rapid. This process was accompanied by the innovation of a new beach-landing fishing craft that could replace the kattumarams and other crafts like dugout canoes.111

With the availability of technological alternatives and financial support, small-scale fishermen could fish deeper and fish more often. This contributed to raising the fish production from its low levels of the early 1980s. However, the increases in the physical productivity brought about with technology adoption did not translate into economic gains because of the continued domination of the merchant class. Efforts by the state to introduce a market regulation act were scuttled. This partial technological solution to their problems also took a toll on the militancy of the independent fishermen’s movement. Moreover, by this time every political party had hastily set up their own fishermen trade unions. This was their strategy to retain influence in the politically volatile coastal fishing communities. It was much easier for politicians to distribute fishing equipment and get votes, than support fishery regulation and management measures which were highly divisive, difficult to implement and so different from the logic of the agrarian context with which they were more used to dealing.

These political and vote garnering compulsions were ideally suited to all political parties irrespective of their position on the ideological spectrum. They distributed thousands of outboard motors, ring-seine nets and plywood boats to a widely dispersed, relatively poorer fishing population. Two decades ago it was a few hundred mechanized trawlers to well-to-do capitalists from a few major fishing centres. Each of the new fishing units cost over 10 to 20 times the capital cost of the artisanal craft-gear combinations monitored in 1980. Having switched over totally to propulsion based on mechanical power, the operating costs also soared. The funds for such largesse were mobilised from national banks and development agencies eager to participate in this technology drive. The congruence between the technological penchant of the fishermen and the vote-garnering motives of the politicians provided an important basis for providing uncritical support to effort-enhancement. Despite all these welfare and technology measures initiated by the UDF government, it was not able to translate this into effective votes in the 1987 elections.

4. MONSOON TRAWL BANS AND LEGAL STRUGGLES

Eight years and two expert commissions later, the left-led LDF government that came to power in 1987 promulgated the first monsoon trawl ban in 1988. However, they exempted the main trawler-fishing centre – the site of the INP – from the ban. This made it a fiasco.112 The move caught the government on the wrong foot. Both the artisanal fishermen, and the trawlers owners (in the centres where trawling was banned) accused the government of partiality. The latter went to court on the issue and obtained a delayed but favourable verdict against the government. Clearly there were no gains from this rather ill-advised measure. The government resorted to getting yet another expert commission – the third in nine years – to re-examine the issue of the trawl ban. This commission produced its recommendation in June 1989. It strongly favoured a total ban of trawling in the entire state during the monsoon months. Armed with this recommendation the government hastily implemented a total monsoon trawl ban from mid-July 1989 to the end of August 1989.

111 This innovation was spearheaded by the SIFFS which promoted the design of these new genre of fishing crafts with the help of the organisation called ITDG in UK set up by Dr. E F. Schumacher, author of “Small is Beautiful”.
112 There were political compulsions for doing this. The leader of one of the parties in the LDF had major interests in the export processing industry that would have been affected if the ban were implemented in this centre.
The boat owners took the matter to the High Court. They argued that their fundamental right to pursue an occupation was being curbed by this trawl ban and requested a stay of the order. The court was unwilling to issue such a stay. The ban resulted in a considerable loss of employment for boat workers and processing workers. There was concern that it would affect the country’s export earnings. However, the government held firm and enforced the ban. In the post-ban period the fish landings soared – but prices dropped dramatically. Reminiscent of the 1950s, oil sardines had to be dumped as manure for coconut trees! Politicians and fishermen were quick to attribute the increased harvest entirely to the positive after-effect of the ban.

The success of the 1989 ban raised the hopes of the fishermen as the monsoon of 1990 approached. However, no ban was announced. There was pressure on the government from the exporters lobby not to impose a ban. The ministry of commerce of the Government of India also questioned it on the grounds of the loss of foreign exchange to the country. The fishermen launched a counter campaign. Finally, yielding to pressure from both sides the government issued orders that banned trawling in the coastal waters but allowed trawlers meeting certain high technical specifications to have ‘innocent passage’ through coastal waters. They had to trawl in the deeper waters. The trawler owners went to court stating that though their boats did not meet the specifications, they could indeed fish in deeper waters. The court appointed a commission to get the boat owners to practically demonstrate their claim. They did so and also hauled in fish (but not prawns). The court then advised the government to reconsider its technical specifications.

The future of trawl bans as a fishery management measure was in serious doubt. However, given the political sensitivity of the issue, it was likely to stay – perhaps more as a welfare measure to placate the majority of the fishermen. The ban would be imposed, but enforcement would be lax: a strategic approach to please both parties. (For a detailed account of these struggles see Kurien, 1992.)

4.1 Striving for consensus

In 1989, through the Centre for Development Studies (CDS), I took the initiative to call a meeting of all the different interest groups in the marine fishery sector to discuss the pros and cons of the trawl ban and the need for a larger consensus on fisheries management. There was no reluctance for the lead actors – leaders of the artisanal fishermen’s unions, the trawler association representatives, the exporters, the consumer associations, the representatives from scientific institutions and the officials of the Department of Fisheries – to come together. All except the Department of Fisheries officials voiced their views loud and clear. The officials were tight lipped since the constitutional validity of the trawl ban imposed by them was before the courts. The discussion identified several causes and consequences for the current impasse in the sector. All the stakeholders expressed their eagerness to create a socio-political and economic context within the fisheries sector where co-existence was possible. The state, represented by the bureaucrats, was unwilling to play the role of referee. In this circumstance, follow-up was not possible.

4.2 Analysing overfishing

One outcome of the discussions was an article written jointly by my senior fishery planner colleague and myself outlining the causes and consequences of overfishing in Kerala and suggesting broad directions for its resolution (Kurien & Achari, 1990). We identified five main contributory factors: (a) the current open access nature of the coastal commons (b) the use of inappropriate technology (c) the booming demand for fish from the domestic and international market (d) subsidies resulting in distorted incentives (e) increasing population pressure on the coastal waters due to lack of employment alternatives.

113 India was going through a very major foreign exchange crisis at this time. The trawler owners and the marine product exporters were able to use this as a major issue to scuttle the trawl ban.
We estimated the current of over-capitalisation in the fishery to be of the order of Rs. 530 million, an amount equal to the total development assistance given by the state to the fisheries sector over three decades. We assessed the impact of overfishing as leading to (a) falling productivity and income of fishermen (b) growing income disparities between owners and workers (c) and less fish for the domestic consumers. We then analysed the varying responses to the situation by fishermen, the boat owners and exporters, the state and the scientific community.

Finally we suggested measures to resolve the problems. These included: (1) An approach to the fishery in which development and management of the resources and the economy are seen as two sides of the same coin. (2) Matching the scale and type of harvesting techniques to make them consonant with the known biological and ecological parameters of the resource. We favoured small-scale operations, using multi-energy sources for propulsion and a decentralized mode of operation along the coast. (3) Restricting the ownership of harvesting technology exclusively to those who fish – calling for an ‘aquarian reform’. (4) Conscious efforts to enhance the biological productivity of the coastal waters – e.g. artificial reefs (5) Encouraging the movement of excessive effort to the deeper waters and providing subsidies for such actions (6) The creation of institutional arrangements for management of the resource to pull Kerala’s fish economy out of its crisis and into a sustainable future.

4.3 Drafting a fishery policy

In 1991 the UDF returned to power. The Fisheries Secretary mooted the idea of formulating a long-term fishery development and management policy. A woman officer from the fishing community headed the Fisheries Department. Given her understanding of the issues and her commitment to the cause, she was able to mobilize a high degree of commitment to the task. The High Level Committee (HLC) constituted for this was composed of a group of persons with considerable experience in the sector and representing a variety of interests. The HLC held several hearings with stakeholders from all over the state. A preliminary draft was formulated based on the inputs from these hearings and a series of HLC meetings. This was sent for comments to organizations representing the various stakeholders.

The highlight of this policy was the radical ‘aquarian reform’ package proposed for implementation in the state. This would ensure that access rights to the territorial waters would be restricted only to those who actually fish. All absentee owners of fishing equipment would have to leave the fishery in a phased manner. The rights to decide the mode of sale and the floor price for fish would be the prerogative of those with access rights.

Based on the feedback from the various stakeholders, a final draft was reworked by the Director of Fisheries, one of her senior colleagues and me. This was discussed and approved by the HLC and forwarded to the government. The draft was discussed in the state cabinet and the state legislature (Govt. of Kerala, 1994). It was approved with the addition of one word to the crucial section on aquarian reforms. The clause reading: ‘An aquarian reforms package will be implemented in the state’ was altered to read: ‘An aquarian reforms package will be gradually implemented in the state’. This single word made the commitment time indeterminate. It therefore became a ‘radical policy’ with few teeth.

4.4 The outlier thesis

In 1995 a major international conference was held in Kerala to discuss and evaluate the directions taken by the Kerala economy. The much-acclaimed “Kerala Model” of development – low-income yet high quality of life – was the focus of attention. I presented a paper, based on my first hand knowledge of the socio-cultural and economic conditions of the fishing communities and the subsequent research work I had done (Kurien, 1995). The thrust of the paper was to highlight that the fishing communities had been “left out” of Kerala’s positive development experience. They were not close to the “central tendency”

Note that it was the same Chief Minister in power who in 1985 offered the technology package. Intellectuals belonging to the communist party that led the LDF (then in the opposition) took the main initiative for the conference.
but were “outliers”. The paper also went into the causes and suggested that while that state had provided the physical facilities to achieve human development (e.g., schools, health infrastructure etc), what the community lacked was the ‘demand from below’ for the utilization of the same. Only with the articulation of such participatory demands from below would the facilities translate into capabilities and entitlements for individuals adding up to a higher quality of life for the community as a whole. The paper proposed that the socio-ecological movement of the fishing communities had made a major contribution to this. No data was available then to evaluate the changes between 1985 and 1995. However, first hand field assessments did indicate positive developments.

5. TASK FORCE ON LIVELIHOOD SECURITY OF FISHING COMMUNITIES

In mid-1996 the LDF came back to power again. This was also the time when the preparations for the Ninth Five-Year Plans were taking shape. Part of the planning exercise was the creation of expert task forces to review the development in various sectors and suggest new approaches and new schemes. Taking off from the “outlier thesis” the LDF government constituted a special Task Force on Livelihood Security of Fishing Communities, which I chaired (Govt. of Kerala, 1997). Unlike other Task Forces which consisted only of experts, at my instance, the membership of this one was opened up to representatives of the various interest groups in the fishing sector. The rationale was simple. Unless the analysis of the fundamental causes for the poor livelihood conditions of the fishing communities met with a modicum of consensus by the different interests groups, there would be no support for the schemes that were to be implemented during the Plan period.

The Task Force endorsed the soundness of the analysis of the Fishery Policy of 1994.116 It advocated the implementation of aquarian reforms as the basic pillar for improvement of livelihood security. It also endorsed the need for a more decentralized approach to fisheries management and greater coordination of the various activities of the state intended to promote fisheries development and provide social security arrangements for the community. These were to be organized through “single-window” organizational arms of the state at the panchayat (village) level. They were to be called matsya bhavan (fish house) and supported from below by janakiya samities (people’s forums) dealing with issues that have a bearing on resource management and community livelihood.

5.1 Multi-stakeholder training in fisheries management

In 1997, to bolster the initiatives which were intended to create a more sustainable fishery and to maintain the tempo of consensus creation, the Centre for Development Studies initiated a multi-stakeholder training in fisheries management. As in 1989, there was no reluctance to accept the mediation of CDS in this process. The first phase of the training was conducted with the collaboration of a Norwegian NGO with officials from the Norwegian Ministry of Fisheries participating in it. This was followed by a two-week study tour in Norway focusing on the fishery organizations and institutional arrangements. There were strong similarities and differences between the fisheries of Kerala and Norway. Meeting together in a different milieu in which they had no professional or political stake, representatives of competing and conflicting interests in Kerala’s fishery could introspect collectively and calmly about the issue of sustainability of Kerala’s fisheries.117 Many ‘discoveries’ were made. The most important was the lessons from the unique history of struggle of the Norwegian fishermen (1930–1940) and their efforts to create a just and participatory fisheries development. The state provided enabling legislations and governance structures. The meaning and the current relevance of this Norwegian history to the contemporary reality in Kerala’s fisheries was revealing. The ‘participation act’ which limited the right of ownership of fishing assets solely to those who actually fish and the ‘raw

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116 Though this policy was drafted at the time of the previous UDF government there was no attempt made to revise or change it. The LDF presumably found it an adequate and radical enough basis for their new approaches to the sector.

117 The representative of the independent fishermen’s union included in the group did not come for this exposure to Norway.
fish act’ which gave the right of first sale of the fish to this clearly defined set of fishers, were two examples of institutional arrangements which could be adopted in Kerala.

When the group returned to Kerala they submitted a report to the Government on their experiences and the lessons which they had learnt. They also made suggestions about what could be done to make Kerala’s fishery move to greater sustainability. The support for aquarian reforms gained greater ground. The LDF government was generally inclined to view the suggestions made by the group in a favourable light.

5.1.1 Aquarian reforms committee: a missed opportunity

In 2000 the LDF government constituted a committee to examine the issue of aquarian reforms and to formulate draft legislations to implement the same. The committee was composed of serving legislators and representatives from all the political parties in the LDF and UDF. These were persons who were closely related to the fisheries sector. Five of them had participated in the CDS – Norway training and exposure trip. The representatives of the trawler associations were however not included in the committee. A few independent experts from the field of law, social sciences and technology were also included. I was one among them, and argued for the inclusion of the trawler associations, but without much avail.

As a departure from the usual government practice, the committee was requested by the government to formulate its detailed terms of reference. This was to be based on the overall intention of the government to limit access to the fishery resources and enhance the value of the output such that the benefits of this accrue to the fishers. The committee circulated a questionnaire incorporating its terms of reference and requesting for views on them. The questionnaire was sent to all the fishermen trade unions, the trawler owner associations, scientists, community organizations, NGOs etc. The committee then held a series of hearings in different parts of the state providing occasion for stakeholders to air their opinions on the terms of references and any other matters of concern to them. Following these series of meetings a few members of the committee were given the task of drafting the report.

The Chairperson was mandated to consolidate these inputs and produce a draft which would be circulated to the members and discussed in detail. With the state elections drawing near, the members of the LDF in the committee were keen to finalise the report and submit the same for discussions in the legislature. However, for reasons that are still unclear, the Chairperson was unable to draft the report based on the inputs provided. The state elections were held in May 2001 and, in a major political upset, the LDF lost. With this the commitment to aquarian reforms was also given up. A major opportunity was lost to begin the process of entry restriction into the fishery, backed by adequate political support and legislative backing.

5.1.2 Who is a fisherman? The renewal of the caste card

In the late 1990s, at the all-India level, there was the renewal of the demands for ‘positive discrimination’ of communities which were ‘left out’ of the mainstream of the socio-economic development process. The class dimension of the issue was put on the back burner and the issue of caste once again became the defining identity of ‘community’. Caste has, and continues to be a major socio-cultural dimension of economics and politics in India and Kerala.

In Kerala however, the early history of radical left politics helped re-define a person’s status more on the basis of class than caste. However, in the fishery sector, the revival of the caste card vitiated the question of who should have access to fishery resources. Unfortunately, even the leaders of the independent fishermen’s trade union were now more inclined to give priority to caste though they did not totally renounce the class categorizations. Being born in a fishing caste – irrespective of whether one is an

118 Representatives of the independent fishermen’s union were not included. This perhaps reflected the consensus of the political parties to keep them out.
actual fisherman or not – was sought to be made the primary criteria for defining access to fishery resources. This would imply that the status quo would prevail with regard to the over-investment in small-scale fisheries and the trawler sector. Absentee-ownership would continue to rise. Those so involved were individuals or social institutions from fishing castes.

5.1.3 Reinventing fishery policy and greater dilemmas

The UDF came back to power in 2001. It was ambiguous about its approach to the fisheries sector. The fishery portfolio was given to a person hailing from a traditional fishing community. The power of the independent fishermen’s trade union was on the wane. Its support base was now restricted to a few districts. In fact, contrary to its stand in earlier state elections, many of its leaders had tacitly supported the UDF and played the caste (community) card effectively to garner votes. For the LDF, being voted out of power was totally unexpected. They became preoccupied with more crucial oppositional issues. Fisheries concerns were no priority in their scheme of things at the moment. Having failed to finalise the report of the Aquarian Reforms Committee, they also had no concrete positions by which to challenge the UDF perspectives.

There was talk about a new fisheries policy doing the rounds. A draft prepared by a small group of experts was circulated in 2002 for discussion. At the first round of discussions of this draft, to the considerable embarrassment of the Department of Fisheries, it was pointed out that there existed a full-fledged and duly approved fishery policy which was in fact promulgated during the earlier tenure of the same UDF government! The Director of Fisheries pleaded ignorance of this fact, very clearly highlighting the lack of institutional memory even for significant policy matters. The enthusiasm on this count waned. Then in 2004 another draft appeared on the state’s official website.\(^{119}\)

The severe financial constraints facing the state also resulted in a ‘go-slow’ of many social security measures which were the hard won benefits of the fishworker struggles of the 1980s. The subsidy and loan granting policies started in 1985 resulted in a substantial increase in the number of motorized fishing units operating in the state. The technological and investment divide between artisanal fishermen and those fishing on mechanised trawlers ceased to exist anymore. Both also fished unsustainably. The further liberalization of the Indian economy resulted in rising prices of capital equipment and fuel for outboard engines. The costs of fishing have soared. Fish harvests had stagnated between 530 000 and 560 000 tonnes over the decade period 1993–2003. Beach prices of fish were not rising rapidly. The inadequate returns from fishing left fishermen straddled with huge debts. This was further compounded because the issue of access to the resources remained totally unaddressed. Fishermen were confronted with very few occupational options but to continue fishing. Significantly, there has been very little coherent data and information about any of the above mentioned changes after 1990. As a result, it is difficult to make any informed judgments on the social and economic health of the fishery sector. To conclude that the whole marine fishery sector and the fishing communities in Kerala are today in a dilemma would be a gross understatement. Both seemed anchored in a stormy sea of unsustainability.

5.1.4 Hurdles to sustainability

The above diachronic elaboration of some of the salient turning points in Kerala’s marine fishery over three decades point unequivocally to some important hurdles to attaining sustainability. My premise is that the fishery that I entered in 1973 was bio-ecologically and socially sustainable. The costs and earnings study of 1980/81 proved that the small-scale artisanal techniques were in themselves economically viable. Yet the participants were poor. At the local level, collective action and the creation of appropriate organisational interventions ‘from below’ were a solution to this apparent paradox. However, at the macro level, despite the state-sponsored organisational structures that were created

\(^{119}\) It is embarrassing that this document is rather hastily drafted and replete with mistakes that show the literate state in poor light. For example there is reference to ‘World Food Organisation’ – presumably the Food and Agriculture Organisation; the ‘Responsible and Integrated Fisheries Guidelines’ – presumably the Code of Conduct for Responsible Fisheries; and the ‘World Trade Treaty’ – presumably the World Trade Organisation.
‘from above’, there was little change in the condition of the fisherfolk. We concluded that the control of such organisations by politicians, and the strong electoral compulsions for distribution of technological largesse, were at the core of actions which finally pushed the whole small-scale fishery also into unsustainable practices.

5.1.5 Poor Governance, Lack of Will and Pressure from Below

Poor governance and the lack of political will to make management decisions are without an iota of doubt among the important reasons for moving towards unsustainability. Between 1980 and 2004 there have been six changes in the government with the LDF and the UDF alternating in power. In the period 1980 to 1994 there was no stated fishery policy. During this period radical changes in the investment priorities and governance approaches came as a result of the sustained pressure from the fisherfolk’s movements. In 1994 a policy statement was legislatively accepted when the UDF was in power. This was not altered by the LDF in its rule after 1996. Attempts were made to sincerely follow up the spirit of the 1994 policy by specific institutional initiatives, including most notably the aquarian reform idea. Between 1994 and 2001 the independent fishermen’s union lost its cutting edge. The increasing dependence of artisanal fishermen on technology fixes and the re-emergence of caste/community identities reduced the fervour of sustained collective action. None of the radical policy proposals of this period were genuinely adopted by the fishermen unions as their own. They remained trapped in their own contradictions. The demand for the trawl ban continued to be their main banner for struggle. With the return to power of the UDF in 2001, rather than continue on the trajectory put in motion by them in 1994, or update it to meet the new developments, they made incoherent attempts to formulate a new policy. The result was impasse and confusion.

5.2 Lack of Secure Rights

Granting secure rights, exclusively to those who fish, was perceived to be the right direction to limit access to the coastal commons. There was an evolving political consensus for this idea. However, there were strong vested interests acting against closing access to the resource in this fashion. The re-surfacing of old identities such as caste and sectarian definitions of community are clear manifestations of this countervailing force. The longer the rights issue remains unresolved, the weaker becomes the momentum and collective ability to move towards sustainability.

5.2.1 Narrow Understanding of Fisheries Management

The decision to ban trawling in the monsoon months took ten years, three expert commissions and the annual feature of fishermen’s struggles. Even in 2004, it was only after the fishermen’s unions pressured the government that the decision to declare the ban was announced. However, a grave and creeping contradiction has evolved between the first total trawl ban in 1989 and the one in 2004. The ratio of levels of investment of artisanal craft-gear of the small-scale fishermen and that of the trawlers was no more 1:10 as in 1980. By 2004 the capital costs of several fishing units of artisanal fishermen were on average double the cost of the mechanised trawlers! Moreover, artisanal fishermen were adopting fishing techniques such as ring seines and mini-trawls that were at least as harmful to the marine ecosystem as bottom trawls. That during the monsoon, the former fished freely and the latter were banned, questioned the very rationale and resource management impact of the monsoon trawl ban.

Fisheries management concerns, if and when they become mainstream, should go beyond the bio-ecological realms. Fisheries management has now come to be equated to the monsoon trawl ban by the fishworkers, the politicians and the managers. The social and economic sustainability of the fisheries sector as a whole should be the foundational concern. But an engagement on these issues calls for much greater consensual discussions among stakeholders and more political sagacity. This also warrants that state fishery officers and planners make more structured efforts to assess and ascertain the emerging issues confronting this dynamic and evolving sector.
5.2.1 **Inadequate Human Capacity**

Capacity building and training are crucial elements in being able to more away from unsustainability. The staff of the Department of Fisheries (over 1,000), of whom at least half take decisions which impinge directly on the well-being of the fishers and the state of the fishery resources, need a clear reorientation of work perspectives. The mentality of achieving fisheries development through providing additional inputs – craft, gear and mechanical propulsion – must be thrown overboard. The focus must change to reducing the effort and enhancing the productivity measured per unit of investment, unit of cost or unit of energy expended. In short, a greater concern with resource management, ecological and economic efficiency. Retraining to appreciate these perspectives is paramount.

5.2.2 **Poor Data and Information**

The necessity for improved data and information for wise decision making which will get the fishery out of its current unsustainability can hardly be underestimated. The large scientific establishment has concentrated excessively on the natural resource. They also adopt a specie by specie approach, rather than a fishery or eco-system approach. Though more recently a greater degree of techno-economic studies have been undertaken, they remain in the academic realm with little impact on the policy-making processes. The real-time information on the fish economy from its technological, economic and socio-cultural perspectives has been largely left unattended. Much of it continues to be generated in the domain of the NGOs. The enormous knowledge that exists among the participants in the sector – the fishers, the traders, the exporters etc – has remained outside the realm of these state sponsored scientific institutions. Scientists have little regard for its validity, and when they do, there is no way to structure it into their disciplinary moulds.

5.2.3 **Few Employment Alternatives**

Lack of employment alternatives for the members of the fishing communities is an important cause for the unsustainable pressure on the fishery resource. The adoption of ‘appropriate technologies’ has also reduced the skill barriers that existed earlier. Today even the educated in the fishing communities have the option of investing in fishing and putting out to sea to ‘try their luck’. Such investment and employment options contribute to lowering the average yields. However, the characteristic of fluctuating fortunes of the fishery (and the probability of the chance bumper catch), act as important motivators for continued involvement of the youth even though average earnings from fishing are low. Considering that educated unemployment is a rampant problem in the state as a whole, this ‘return to fishing’ is no surprise.

5.2.4 **Booming Demand**

The underlying motivation for incessant fishing is the sustained demand for fish both from the domestic and international market. Beach prices of fish continue to increase at a faster pace than the overall commodity price index. But the producer’s share of the consumer retail price is not expanding. This highlights the lack of producer influence and control on the lower ends of the marketing chain. The sordid failure of cooperatives initiated by the state to enter into fish marketing and the undue political control over their functioning made them impotent institutions. The lack of control over the first sale leaves fishermen little choice but to maximise their volume of harvest to enhance income.

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120 For example, the only census of fishing crafts, gear and motors across all the fishing villages in the state was done by the SIFFS. This is the only data available from which estimates of investment in the sector can be made. After the costs and earnings study undertaken in 1980/81, no efforts have been made by the state institutions for even periodic assessments despite the major changes that have occurred in the sector.
5.2.5 Persistent Poverty

There is a strong perception that fishing communities as a whole continue to be perceived as among the poorest sections in the State. My interaction with them over the last three decades, my own studies of different aspects of their well-being, and my analysis of the available secondary data lead me to a more nuanced conclusion. The kind of abject poverty that I confronted in 1973 is now only confined to a few pockets. There has been an overall improvement in the quality of life – better housing, more literacy, significant improvements in health standards, and greater awareness of rights. The drudgery of fishing has vanished with the adoption of the outboard engines. But this has resulted in a total loss of significant occupational skills such as sailing. It has created a new form of ‘enslavement’ to the dictates of the multinational companies that produce the engines as they set the prices and phase out models. Incomes on average have increased because of the sustained increase in prices. The random occurrence of bumper harvests, the retention of the share system and the fact that the crew-share has not dropped below 50 percent of net earnings, provide a mirage against an overall deterioration of value added in the sector as a whole.\(^{121}\) But all this is against a backdrop of vastly increased indebtedness incurred for continuous technological upgradation and galloping running expenses. This reality has also lead to a new feature in the small-scale fishery – alarming asset and income inequalities. There is little reflection by fishermen unions or policy makers on these issues. The economic and social implications of this evolving reality in the sector point to further unsustainability of the fishery into the future.

6. CONCLUSION

Kerala’s marine fishery – particularly its ‘small-scale’ sector – has evolved towards unsustainability partly by its own volition and significantly due to the inability of the state to constructively intervene to manage the coastal commons. The early initiatives of micro-level development interventions (1970s) and the subsequent success of larger collective action (1980s), highlight the realms of the possible and the vast innate potentials – human and material – that exist in the sector to transport it to sustainability by determined community action alone. When development paradigms are contested, as they have been in Kerala’s fisheries, the state will necessarily intervene. However, the special character of any state is that it is the only institution that legitimately represents the interests of society as a whole and yet takes the predominant character of the special interest groups that effectively control it. This ambivalence often leads to schizophrenic actions by the state. The result is that all the stakeholders get the impression that ‘something is/will be done’. This scenario was very evident in Kerala over the last two decades. The net result has been the fostering of irrational choices and sub-optimal solutions to burning problems. The way out of this conundrum is for greater, more systematic and dedicated collusion by stakeholders with similar interests. In Kerala’s marine fishery, this alludes to all those who perceive long term livelihood stakes in the fishery, and as a result of this, have a stake in the sustainability of the resource. This may be the crucial ‘label of identity’ to recognise compatriots in the common struggle for removing the hurdles to sustainability. The old unitary labels of class, caste, creed and community must give way to this.

There is a long way to go. A beginning must be made. Now.

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\(^{121}\) My recent assessment (Kurien, 2004) shows that the ratio of value added by the fishery sector to the total value of output of the sector has dropped significantly over the last three decades pointing to lower transformation efficiencies.


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This paper focuses on issues affecting the management of fisheries when fisheries authorities are small, as is typical in most Small Island Developing States (SIDS), but also the case in many developing countries regardless of their size. SIDS are often stewards of large ocean spaces relative to land area, population and size of economy. Consequently, even if proportional in size to their populations, fisheries departments of SIDS are small relative to the ocean space they must manage and to the importance of fisheries in the society and economy. This is especially so in the contexts of food security, social structure, culture and environment. The fisheries management issues for SIDS have become increasingly urgent as they struggle to cope with their commitments, binding or otherwise, to international fisheries agreements and international programmes of action (IPOA). Following the World Summit on Sustainable Development (WSSD), which highlighted the need for action in fisheries and set time targets for stock rebuilding, ecosystem-based management and implementation of IPOAs, the urgency is even greater. Much of the problem in the structure of small fisheries authorities is that they are modelled on large fisheries management agencies in large and/or developed countries, often with large commercial fisheries. Sustainable fisheries will be difficult to achieve unless there is a better fit between the scales of management and management capacities in SIDS. There is a need to research appropriate structures and functions for small fisheries authorities. Ideas are shared on some of the issues and possible answers that will require further dialogue and development at sub-regional, regional and international levels to ensure that real progress is made.

1. INTRODUCTION

The 1994 Global Conference on the Sustainable Development of Small Island Developing States (SIDS) in Barbados focused world attention on this group of territories whose limited size has several consequences for natural resource management. Based on a global analysis of several fishery-related characteristics, Mahon (1996) found that SIDS differ more from mainland countries than among themselves. SIDS are typically the stewards of large ocean spaces relative to land area, population and size of economy. Consequently, even if proportional in size to their populations and comparable to other governmental agencies with terrestrial jurisdictions, the fisheries departments of SIDS are often small relative to the ocean space that they are expected to manage and small relative to the importance of fisheries to the society and economy.

In addition to this issue of scale there is the associated matter of inadequate management capacity in relation to responsibility. Fisheries management issues have become more challenging for SIDS as they struggle to cope with their commitments to international fisheries agreements and international programmes of action (IPOA) (FAO 1995 and 2001, UN 1995). The World Summit on Sustainable Development (WSSD) highlighted the need for action in fisheries and set time targets for stock rebuilding, ecosystem-based management and implementation of IPOAs. Capacity constraints have
been highlighted in the first and second workshops as factors that contribute to the unsustainability of fisheries. Insufficient and inappropriate capacity both need to be taken into account. This paper addresses mainly the latter.

A significant problem with small fisheries authorities is that they are modelled on large fisheries management agencies. In large countries and developed countries there are usually large commercial fisheries. While this may also be true of some SIDS, it is more common to find a larger number of smaller scale fisheries, not all of which are commercial. Scaling down a fisheries authority based on the template of that found in larger and developed countries is not what is required in many cases. Sustainable fisheries require a better fit between the scales of management and management capacities in SIDS. There is a need to research appropriate structures and functions for small fisheries authorities. Ideas are shared here on some of the issues and possible answers associated with this dilemma. Further dialogue and development is required at sub-regional, regional and international levels to ensure that real progress is made in ensuring that the fisheries of SIDS can be sustainable.

2. SIDS AND UNSUSTAINABILITY

Forty small island developing states are members of FAO. According to the FAO (2004), “effective fisheries management, implementation of national and international legal instruments, capacity building and institutional strengthening, statistical systems and good governance are the key issues for [sustainable] fisheries development in SIDS”. We do not dispute this assessment, but would argue that perspectives on these issues, and hence proposed solutions, may determine whether interventions lead towards real sustainability or tend to perpetuate unsustainable conditions, although perhaps with some more favourable characteristics. For example, more and better trained staff will almost certainly be an asset, but capacity added to an inappropriate discipline or programme will not facilitate real progress.

The FAO FishCode SIDS project notes that “the nature of problems faced by SIDS with respect to the effective conservation and management of fisheries resources are not vitally different from those of other states. However, SIDS are considerably disadvantaged in that they do not have the same range of solutions to these problems that larger States have at their disposal”. These statements point to the need for special emphasis to be paid to scale and capacity even within the realm of conventional solutions to fisheries problems. This also holds true for emerging alternative directions in fisheries management, especially for small-scale fisheries (Berkes et al. 2001).

Scale and capacity are recurrent themes in the Programme of Action for the Sustainable Development of Small Island Developing States (also called the Barbados or SIDS POA). Extracts are in Box 1.

IV. COASTAL AND MARINE RESOURCES

Develop and/or strengthen national capabilities for the sustainable harvesting and processing of fishery resources and provide training and awareness programmes for the managers (Government and local communities) of coastal and marine resources.

X. NATIONAL INSTITUTIONS AND ADMINISTRATIVE CAPACITY

Improve access to financial and technical assistance in order to strengthen national institutions and administrative and operational capacity.

Box 1. Extracts from the SIDS POA concerning scale and capacity

Source: Programme of Action for the Sustainable Development of Small Island Developing States

These themes also feature in the more recent 2002 Johannesburg Plan of Implementation (Box 2).
58. Small island developing States are a special case both for environment and development. Although they continue to take the lead in the path towards sustainable development in their countries, they are increasingly constrained by the interplay of adverse factors clearly underlined in Agenda 21, the Programme of Action for the Sustainable Development of Small Island Developing States and the decisions adopted at the twenty-second special session of the General Assembly. This would include actions at all levels to:

(a) Accelerate national and regional implementation of the Programme of Action, with adequate financial resources, including through Global Environment Facility focal areas, transfer of environmentally sound technologies and assistance for capacity-building from the international community;

(b) Implement further sustainable fisheries management and improve financial returns from fisheries by supporting and strengthening relevant regional fisheries management organizations, as appropriate, such as the recently established Caribbean Regional Fisheries Mechanism and such agreements as the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean;

(c) Assist small island developing States, including through the elaboration of specific initiatives, in delimiting and managing in a sustainable manner their coastal areas and exclusive economic zones and the continental shelf, including, where appropriate, the continental shelf areas beyond 200 miles from coastal baselines, as well as relevant regional management initiatives within the context of the United Nations Convention on the Law of the Sea and the regional seas programmes of the United Nations Environment Programme;

**Box 2. Sustainable development of small island developing States**

*Source: Chapter VII of the Johannesburg Plan of Implementation*

The challenge is to match the scale of management and capacity to the features of SIDS fisheries in order to address factors of unsustainability. The obstacles identified at the Bangkok Workshop were:

- lack of good governance;
- inappropriate incentives;
- high demand for limited resources;
- poverty and lack of alternatives;
- complexity and lack of knowledge;
- interactions of the fisheries sector with other sectors and environment.

In summary, the Mauritius Workshop found that important components of sustainability included:

- achieving better governance as a priority;
- securing property rights for resource users;
- building capacity at all levels of management;
- integrating social and economic perspectives;
- implementing international instruments;
- ensuring political will augmented capacity.
3. CONCEPTUAL FRAMEWORK

Fisheries managers and scientists are acutely aware of scale issues even outside of the context of SIDS. Making matches among the scales of fish stocks, fishing fleets, marine jurisdictions, labour force, enforcement capability, management agreements, benefits from fisheries, operational budgets and the like are at the heart of fisheries management in any country. However, taking note of the FishCode observation quoted above, fisheries managers in SIDS are often faced with fewer solutions, especially if they rely upon the conventional interventions developed by and for larger countries with different characteristics.

The perspective of scaling management used in this paper concerns matching the capacity that a fisheries authority has at its command, either in-house or out-sourced, to the types of management that are most appropriate for the situation. In the same way that “conflict resolution” evolved into “conflict management” as resolution proved elusive, there are growing tendency references to “capacity enhancement” rather than “capacity building”. The distinction is that just as conflicts may never be resolved, but they can be managed, it may never be feasible to build capacity to an optimal level, but one can enhance it to become more effective. In many cases, although the development language of capacity building is still being used, SIDS fisheries authorities realise that only enhancement is within their immediate reach. Few fisheries units can claim to have built capacity at a rate faster than the increases in their responsibilities and demands upon staff. The ideal management capacity may not be attainable on any reasonable time scale in relation to the growing threats to the sustainability of fisheries discussed in the previous workshops on unsustainability. Capacity has many definitions and is a multi-dimensional concept (Box 3).

As an example, the Caribbean Natural Resources Institute (CANARI) has developed a framework for capacity building that contains seven main elements organisations should focus on, illustrating the breadth of capacity building beyond training:

- **World view**: vision and mission guiding capacity requirements
- **Culture**: an organisation’s distinctive climate and way of operating
- **Structure**: roles, functions, positions, supervision, reporting, etc.
- **Adaptive strategies**: ways of responding to changing environments
- **Skills**: knowledge, abilities and competencies for effective action
- **Material resources**: technology, finance and equipment required
- **Linkages**: relationships and networks for action and resource flows

**Box 3. Dimensions of capacity**

Source: Krishnarayan et al. (2002)

The remainder of this paper uses the conceptual framework of capacity in Box 3 as a perspective on the factors of unsustainability. The points raised are intended to stimulate discussion and encourage learning by doing through exploration of new options.

4. SCALING MANAGEMENT AND CAPACITY

4.1 World view and culture

The model of large fisheries departments in large countries or developed countries is one with a variety of professional capability in the form of different persons to cover a range of responsibilities including:
biology and stock assessment, economics, sociology, fishing technology, post-harvest technology, marketing and distribution, international relations and community development. This model is based on the conventional approach to fisheries management with heavy dependence on stock assessment and economic modelling, requiring intensive data collection, technical analysis and top-down enforcement (Mahon 1997). The inclusion of social sciences is slowly increasing. In some countries private or parastatal agencies may be contracted to provide skills, but this is an exception. Reasons for this model being inherited by or transplanted to SIDS as part of their world view and organisational culture include the following.

1) This is the model that is predominant in the fisheries literature, serving as the industry standard.
2) Many fisheries managers in SIDs train in large countries and bring home this model to implement.
3) Development agencies and donors cause the organizational structures and skills found in their own countries to be mirrored in the SIDS beneficiary organizations.

Within this model, assuming that the SIDS department has gone beyond administering primarily capital projects for mainly economic fisheries development (e.g. wharves, processing plants, vessels), fisheries management is often perceived as a biological matter. Hence, personnel with training in biological and environmental sciences may predominate in this next phase of small fisheries department evolution. Where coastal management authority is shared by the fisheries agency there may be coastal ecologists, physical planners and engineers or technicians. Natural and physical sciences prevail. The Appendix contains, for illustration purposes only, a few examples of structures found in SIDS and developing countries. There is no blueprint solution for the ideal fisheries authority scale and capacity, but from the many different existing arrangements it should be possible to develop criteria on what works and what does not. Lessons learned should be shared and used to guide public administration choices, decisions and the direction of public sector reform.

It may not be useful to apply purely technical and mechanistic solutions to scale and capacity problems. One needs to examine entire organisational climates and cultures. Organisations quickly develop distinctive climates and cultures that shape the perspectives of those who work within them. This can be the result of customary practices that come to dominate the nature of the organisation. For example, the Fisheries Division in Barbados changed in character from a highly technical and innovative unit in the early 1960s to a more administrative unit by the late 1960s (Research and Productivity Council 1981). This reflected the more service-oriented and socialist immediate post-independence period. To reorient the unit towards scientific and developmental programmes in the 1980s required as much attention be paid to the organisational climate as to any technical matter.

One of the consequences of SIDS fisheries authorities recognising that they lack capacity is for them to accept, and perhaps even embrace, the position of underdog. This often occurs when fisheries units placed within large agriculture ministries are neglected, and are forced to struggle in the context of public administration. The world view of an underdog is narrow and constrained. It can become defeatist when the ideal, big country fisheries agency model, is unrealistic and unachievable. This perspective must change to one of being a champion that regularly faces and overcomes challenges if the SIDS units are to re-define their approaches to fisheries management. Organisational behaviour and management are not typically taught in fisheries courses. Therefore, an external catalyst or change agent may be required to instigate the process of transformation by the introduction of new ideas based on lessons learned elsewhere that can be adapted and applied to a particular SIDS situation.

If the SIDS unit has a vision for what it should be in the future, then the change process is more likely to occur smoothly. Without a clear vision, integrated within a planning process, the advice of an external catalyst or change agent may be implemented without reference to the organisational culture. This may become an obstacle to effecting change. In cases where fishing industry associations and cooperatives are part of the management structure the government fisheries authority may be the external change agent. One of the fundamental difficulties in bringing fishing industry organisations into management to increase the effective capacity of the fisheries authority is that these groups may have organisational cultures that are very different from the fisheries authority. These differences have to be recognised,
respected and accommodated. The vision, management plans and objectives should be developed in consultation or collaboration with stakeholders using a participatory planning process. Such a process was used with the Barbados sea urchin (‘sea egg’) fishery (Mahon et al. 2003). In this process stakeholders come to appreciate the trade-offs among competing and conflicting management goals, and that it may only be possible or feasible to agree upon broad reference directions rather than more precise reference targets and limits (Berkes et al. 2001).

4.2 Structure and adaptive strategies

Determining how small fisheries departments in SIDS should best be structured to achieve sustainable fisheries is a complex challenge. It depends on a number of contextual factors. These are primarily the scale, value and diversity of the fisheries to be managed. If there is a large, valuable resource (such as tuna) then a small island may be more able to afford a large, conventional fisheries department. Most often this is not the case. SIDS often have a large number of small-scale fisheries each of relatively low value (Mahon 1997). Their aggregate value may be high, and each small fishery requires some management, but few warrant a full conventional management approach. In this situation, a small fisheries department may have sufficient resources to address only one or two fisheries properly. The other fisheries may be left unmanaged. However, it is not uncommon for a department’s scarce resources to be spread across attempts to conventionally manage all of the fisheries so that no fishery is well managed. This challenge, at national and regional scales of management, has drawn attention in the Caribbean (Chakalall et al. 1998, Haughton et al. 2004).

Small fisheries departments with few staff (between one and ten persons having specialist fisheries technical or scientific training) are vulnerable to perturbations such that they may routinely do little more than “fire-fighting”. Despite having fisheries management and strategic plans with scheduled work plans to guide implementation, a SIDS fisheries authority may be overwhelmed by matters that small size and limited capacity tend to magnify. Small crises, that may occur frequently, can bring the more demanding, planned, operations of a small department to a halt. SIDS fisheries units need to realistically determine their performance limits and limitations. This is where adaptive strategies that allow an organisation to change according to real demand without becoming diverted from the vision are important (Berkes et al. 2001).

Regarding institutional sustainability, each staff member possesses a significant proportion of the small fisheries department’s institutional memory and learning. If a few high level individuals leave in a short space of time this can result in loss of continuity in the activities and strategic directions being pursued under approved management plans. This loss of human capital may occur due to staff taking up training opportunities overseas (and often not returning), low opportunity for advancement within the small organization prompting resignation, a lack of options for career advancement in the wider public service due to perceived niche training, or even early retirement due to the several frustrations of such working conditions. This situation is exacerbated by the difficulty in establishing operational and informational systems for institutional memory in small fisheries departments due to inadequate resources. Thus filing systems, computerised records and data processing routines may not persist. More attention needs to be paid to internal governance and systems to enhance organisational resilience.

The structure envisaged for small fisheries departments puts operational emphasis more on technical coordination than on actual technical activities. This includes managing projects and facilitating multi-stakeholder and iterative planning/implementation/review processes. Being much more people-centred than the conventional approach, this operational mode requires greater emphasis on planning and process, including an appreciation of social and economic systems to balance the concentration on ecosystems. Social-ecological systems thinking is gaining recognition in the context of resilience (Berkes and Folke 1998; Olsson et al. 2004).

Planning and process can stabilize small departments at several levels. Government ministers and senior bureaucrats frequently move from one ministry to another due to political elections and public service re-shuffles. The existence of plans and established processes can provide stability, particularly when
these plans have wide stakeholder support. Within small departments, stability can be enhanced by plans reducing the influence of strong personalities. Without planning, strong personalities may lead departments astray or concentrate decision-making and leadership in one person. When this person leaves, the department may be left in a dysfunctional state. This reinforces the need for institutional analyses and capacity assessment to address personnel dynamics at all levels, and to tackle the area of political will in relation to capacity where policy-makers pay insufficient attention to capacity issues.

4.3 Skills and material resources

We suggest considering management approaches that are much less technically-based or intensive (lower demand for data and analysis). It is becoming clear that much can be achieved in managing fisheries through effective planning, coordination and consensus building by integrating basic technical and scientific information on catches and fleets with stakeholder knowledge of the situation (Mahon 1997, Johannes 1998). We advocate utilising traditional ecological knowledge and other forms of local knowledge. This approach requires a differently structured and staffed fisheries department (Berkes et al. 2001, Allison and McBride 2003). The key new skills include strategic planning, project development and management, social science, negotiation and facilitation. These are seldom taught in the natural science or technical training programmes to which most fisheries managers are subjected during typical career paths. This illustrates the need for reviewing and revising fisheries curricula at tertiary education institutions and training centres worldwide.

There are several additional implications to the alternative structure and operational mode proposed above. There may be greater dependence on skills that are currently external to the fisheries unit. Technical inputs could be contracted on a project basis or as opportunities arise. These options require linkages with sources of the technical skills. These skills are available on the international market, but there are advantages to developing local and regional capacity. The latter is favoured by most SIDS occurring in geographic clusters reinforced by political and economic alliances. SIDS consultants, NGOs and academic institutions can become a part of this capacity building strategy (Chakalall et al. 1998).

There are also small, but not trivial, examples of areas in which administrative change can be more strategic. Travel to workshops and training courses, with associated per diems, may increase the annual salaries of fisheries officers substantially. For example a two week trip to a workshop with US$ 100 per day surplus per diem (after hotel and food costs) would leave participants with US$1 400 in pocket. For a fisheries officer with an annual salary of US$ 14 000 the trip can provide a ten percent supplement to annual salary. Consequently, in the absence of transparent planning, activities that include well-paid travel may get priority. In a small fisheries department, several such absences per year can wreak havoc. It is clear that travel is necessary, and may need to be increased in some cases to allow adequate representation of SIDS in certain forums, but travel should be part of a fisheries strategy wherever possible. Making this clear and explicit can be advantageous where reduction in travel to technical meetings is one of the most sacrificial areas of budgets controlled by political decision-makers.

4.4 Linkages and feedback

The approaches suggested also lead to increased emphasis on regional coordinating organizations that can provide expertise to several SIDS or assist with the linkages to expertise. Networking among regional stakeholders is essential for them all to be informed and coordinated in their actions on the international stage. The balance, and perhaps trade-offs, between building and using national and regional capacity needs to be carefully planned and incorporated into national policy. Models of national/regional arrangements that take advantage of limited resources are only now beginning to emerge in some locations (Sydnes 2001, 2002). Centres of excellence for fisheries can be developed. Regional fisheries management organisations (RFMOs) can serve this purpose (Haughton et al. 2004). This further complicates the matter of national investment in management, because regional institutions must be supported from national funds, usually at the expense of the national institutions. Thus it can be
expected that, in addition to collaboration between the two levels, there will be tension and perhaps conflict that should be managed by persons with appropriate training.

There is also a tendency for small fisheries departments to be highly influenced by one or a few high level individuals, either positively or negatively. Where the fisheries sector or authority has little political or economic appeal (perhaps few linkages to political reality) the senior officials in a small fisheries department may operate unmonitored by the parent ministry in most of its operations. Where fisheries is seen as an obscure technical specialisation, the persons leading management can often have a freer hand in carrying out activities with less ministerial scrutiny than counterparts in agriculture or tourism, for example. The consequences may be good (progressive) or bad (regressive) depending on whether such leaders seize the opportunity to introduce new unconventional approaches appropriate to SIDS, or to maintain approaches that are conventional but not appropriate to SIDS.

The 1995 FAO Code of Conduct for Responsible Fisheries urges the integration of fisheries into coastal management. Planning and process are valuable in governance, and essential when dealing with a wide range of stakeholders such as the integrated coastal management that is critical for highly vulnerable SIDS (Clark 1992, Manson and Die 2001). Participatory planning has numerous benefits, including facilitating accountability and transparency, and opening communication channels between authorities and other stakeholders (McConney et al. 2003). Under these conditions fisheries unit staff cannot easily deviate from what is planned without explaining their reasons to stakeholders. Such communication is also part of participatory monitoring and evaluation (Abbot and Guijt 1999). Planning also includes prioritization which reduces the opportunities for ad hoc activities. Small fisheries departments are particularly susceptible to diversion of staff time into ad hoc activities. Often these may be high priority to particular individuals while being of low priority in the overall scheme. Some cases of this are foreign travel and the pursuit of special interests through opportunistic projects that are inconsistent with the plan. For example, a fisheries officer with strong interest in reef conservation may shift the departmental focus in this direction while providing limited attention to offshore fisheries. Formal planning can provide the balance and prioritisation to overcome these problems, assuming that there is effective oversight or monitoring of planned performance.

Planning that includes stakeholders increases the chances that they will buy into the plan (create or strengthen ownership) (Mikalsen and Jentoft 2001, Mahon et al. 2003). It requires information exchange and the capacity for stakeholders to participate effectively in planning. Political will is stimulated by participatory planning as it becomes easier to ‘sell’ the plan to the political directorate if they believe that it reflects popular opinion or has widespread support among the electorate. This has assisted in the easy approval of successive Barbados fisheries management plans.

Planning and building consensus can shift the distribution of power through knowledge among stakeholders and strengthen upward and downward linkages from decision-makers through fisheries officials to industry and community stakeholders. This also facilitates lateral communication with non-fishery stakeholders in the public and private sectors such as those concerned with tourism and shipping. It is especially important that fisheries managers in SIDS not ignore the inter-sectoral and inter-agency linkages that often receive less attention in larger countries where redundant capacity is affordable.

4.5 Resistance to the changes proposed

Not surprisingly, there is typically some resistance to participatory planning as it may reduce existing freedom, particularly of those in power. In a small fisheries department, with everyone in daily communication, planning may also be perceived as time wasting and redundant. Particularly for those without a management background, participatory planning may also be seen as difficult, and not a comfortable mode of operation for persons with a natural science background. This problem is exacerbated by the fact that there is very little guidance in fisheries literature on how to approach the planning process for fisheries management and even less for how best to structure and organise fisheries departments. A systemic/structural impediment to planning is that most post-colonial administrations
remain formally rigid, slow to adapt and unwieldy. In these cases change is often informal and unplanned. It will be necessary to actively promote and experiment with planned change. This requires adaptive strategies that incorporate institutional learning.

5. CONCLUSIONS

Issues relating to the appropriate scale and capacity of small fisheries departments in SIDS are complex. There are questions about the benefits of top-down versus bottom-up management, what are appropriate capacity and capacity building or enhancement, and the consequences of wider public sector reform. These issues are also relevant to larger fisheries departments in developed countries and public sector administration in general. A small fisheries department cannot simply be a miniature of a large one. When this is attempted, the functions become compressed into a few individuals who cannot possibly have the capacity required to carry them out effectively. Critical mass is lacking. Since fisheries in SIDS are no less complex than those in larger and/or more developed countries it is unreasonable to expect that they can be managed with less capacity if conventional approaches are used. Key capacities for SIDS include fisheries assessment, participatory management planning, integrated decision-making, appropriate innovation, management of change and the institutional learning.

The issues identified relating to small size of fisheries departments make it difficult for SIDS to achieve WSSD targets. The appropriate scale and capacity of a developing country fishery department being based on levels of financial support that are related to the value of resources to be managed is a topic that has not been systematically addressed. Similarly, although the need for improved planning processes is frequently identified, there is little to guide managers in these areas. Systematic research to address these fisheries issues has been minimal in the area of public administration. Practical recommendations for improvement do not appear to be reaching SIDS fishery managers. Institutional strengthening and capacity building continues as if the models to follow are self-evident except in cases where specific agencies have learnt from their own experiences. Few of these lessons are shared internationally compared to other, more technical, aspects of fisheries management.

If these issues are to be addressed, they must be brought into active discussion with programmes developed to focus on solving them. There is the need to conduct research on the appropriate scale and capacity of small fisheries departments worldwide. Some of the proposed approaches are being implemented in SIDS. A synthesis of what works and what does not work in SIDs around the world would useful. Alternative structures and mechanisms to ensure the stability and resilience of small fisheries departments must be explored. There is an urgent need to develop literature that can provide guidance on the optimal planning and operation of these departments. While this paper did not address these topics comprehensively, it raised key issues which can serve to stimulate further discussion on the topic and reduce factors of unsustainability in fisheries.
Figure 1. Grenada Fisheries Division

Source: McConney 2003
Figure 2. Belize Fisheries Department
Source: McConney, Mahon and Pomeroy 2003

Figure 3. Barbados Fisheries Division
Source: McConney, Mahon and Oxenford 2003
Figure 4. Suriname Fisheries Department

Source: Charles, McConney and Mills 2001
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DISCUSSION PAPER 17

POVERTY ALLEVIATION, SUSTAINABLE LIVELIHOODS AND MANAGEMENT IN SMALL-SCALE FISHERIES

by

Edward H. Allison and Benoît Horemans

Summary

Poverty alleviation is now high on the agendas of most developing-country fishery management agencies and their partners in donor and multilateral institutions. ‘Sustaining livelihoods’ of the poor in fishing-dependent communities by enabling or enhancing their access to fishing opportunities is prominent in contemporary fisheries development thinking. This appears to be fundamentally incompatible with the current imperative to reduce capacity and to create more effective barriers to entry to fisheries, in order to conserve fully or overexploited fish stocks.

This paper discusses possible means of reconciling the apparently contradictory agendas of pro-poor fisheries development and the imperative to manage fisheries by limiting access. Current conceptualisations of poverty and vulnerability are introduced, and the Sustainable Livelihoods Approach (SLA) is outlined, together with its application to addressing issues of poverty and fisheries management. Insights derived from the application of the SLA are used to critically examine the current consensus view on the relationship between poverty and small-scale fisheries, as encapsulated in the concept of ‘Malthusian overfishing’.

A more nuanced and situation-specific understanding of poverty-fisheries relationships is supported and the different roles that fisheries might play in poverty alleviation efforts are examined. A distinction is made among policy visions that portray fisheries as: (i) an ‘engine of economic growth’; (ii) a means of providing better incomes or reduced vulnerability for ‘traditional fishers’; (iii) a means to supply consumers, particularly poor consumers with elements of a high-quality diet, and; (iv) a means to reduce the vulnerability of the poorest in rural society, including ‘non-traditional’ fishers (a broad safety net function). It is argued that the compatibility of fisheries resource management and poverty alleviation can be reconciled with each of these visions, but that such reconciliation requires greater compromise in some cases than others.

The conclusion is that, providing one understands and can define the main role for fisheries in the economy, one can begin to make policy that recognises the trade-offs between increasing contribution to poverty alleviation and the need to conserve the resource. One reason why fisheries are managed sustainably is that society expects them to deliver on too many incompatible functions.

1. INTRODUCTION

Participants in the management of small-scale fisheries in developing countries – including fisherfolk themselves – apparently face a critical dilemma. Should the alleviation of poverty among people with current or potential access to fish stocks be the overriding concern of fisheries development? Or should we be responding to the apparent crisis in world fisheries by advising management organizations to limit access to fisheries that are thought to be overexploited, whether the fisherfolk dependent on them are...
poor or not? If exploitation rates are not somehow limited, won’t resource rents be dissipated so that all fishers will be poor in the future, if they are not already? Depending on how one answers these questions, one can be accused of ‘favouring fish over people’, or ‘supporting the irreversible destruction of the environment’.

One of the key roles of fisheries policy is to set a vision for the future of fisheries and to guide management towards achieving this vision. It is for this reason that we consider different policy visions for reconciling poverty alleviation and fisheries conservation, and we explore how existing and proposed policy is based on understandings of the relationship between poverty and overexploitation – understandings that may be based on worldviews that have received limited empirical and theoretical scrutiny. We add the caveat that a global vision for the future of fisheries and oceans doesn’t have to result in a ‘one size fits all’ policy, but should rather be sufficiently broad and flexible to accommodate a diversity of policy at regional, national and local scales. The Code of Conduct for Responsible Fisheries (FAO, 1995) seems to provide an adequate framework for taking fisheries into the future, despite its lack of rhetorical fire and galvanising metaphor.

Poverty alleviation is now high on the agenda of most developing-country fishery management agencies and that of their partners in donor and multilateral institutions. Sustaining livelihoods of the poor in fishing-dependent communities by enabling or enhancing their access to fishing opportunities is prominent in contemporary fisheries development thinking. Can these worthy objectives, such as poverty alleviation through improved access to fishing opportunities by the poor, possibly be compatible with the current imperative to reduce capacity and to create more effective barriers to entry to fisheries, in order to conserve declining fish stocks?

In order to address this question, we first need to revisit our understanding of the relationship between poverty and fisheries. It is a relationship that has been portrayed in an oversimplified way, with damaging consequences for both people and fish. Even before that, we need to outline what we understand by poverty and we need to explain and defend the new tools we are using to broaden and improve our understanding of poverty among fisherfolk.

The paper thus starts with a brief overview of our current understanding of poverty, followed by an outline of the framework through which we look at poverty and ways to alleviate it – the sustainable livelihoods approach (SLA). We then examine the conventional wisdoms on poverty in fisheries and look at how the SLA has helped us (and others) to challenge them. We make no apologies for seeking to replace popular but unfounded rallying slogans such as ‘there are too many people chasing too few fish’, ‘fishermen are the poorest of the poor’ and ‘fishing is the occupation of last resort’, with more nuanced, complex and case-specific understanding of the relationship between fishing and poverty.

2. UNDERSTANDING POVERTY IN THE FISHERIES CONTEXT: A LIVELIHOODS APPROACH

2.1 Poverty and vulnerability – a brief review of concepts and definitions

Our understanding, measurement and definition of poverty have evolved from a focus on poverty as defined mainly by low consumption and low income, and encompassing a lack of basic needs (access to food, shelter, health and sanitation). Today’s more comprehensive definition is exemplified by the one found in the Development Action Committee’s (DAC) Guidelines on Poverty Reduction (Organization for Economic Co-operation and Development (OECD) 2001):

“Poverty encompasses different dimensions of deprivation that relate to human capabilities including consumption and food security, health, education, rights, voice, security, dignity and decent work.” (OECD (2001, p. 8).

In the1990s the ‘basic needs’ approach of the International Labour Organization (ILO), with its multi-dimensional concept of poverty, was adapted by the United Nations Development Program (UNDP) for
its Human Development Index (HDI), and provides the indicators for setting the Millennium Development Goals. This model, which is clearly recognised in the OECD DAC definition above, seems to have achieved broad consensus in the international community.

Complementing the quantitative indicators of development used to construct the HDI are more qualitative understandings of poverty, as encapsulated in the ‘voices of the poor’ exercise conducted by the World Bank (Narayan et al., 2000). At national level, most countries now have ‘participatory poverty assessments’ (PPA) to supplement quantitative, survey-based, poverty assessments such as integrated household surveys as a means to monitor progress in implementing poverty reduction policies. PPAs, like the ‘voices of the poor’ exercise, attempt to capture poor peoples’ own experience and definition of poverty. Such definitions recognise the complexity and multidimensional nature of poverty, and give prominence to lack of the assets needed to achieve ‘well-being’, the psychological aspects such as feelings of powerlessness, humiliation and insecurity, the absence of basic infrastructure and services and the absence of rights (be they land rights or human rights). Poverty analysis thus focuses on the vulnerability to risk that results from these conditions, rather than on incomes alone.

Vulnerability (of a person or livelihood) is a function of the risks to which people may be exposed, the sensitivity of their particular livelihood system to those risks, and their ability to adapt to, cope with or recover from the impacts of an external ‘shock’ to their livelihood system (e.g. Adger et al., 2004). In the case of fisheries, people may be exposed to physical risks (e.g., waves and high winds, accidents hauling nets), climate-induced risks (rising sea levels, impacts of global warming on fish stock productivity), health risks (bilharzias, malaria), market risks (currency devaluations) and security risks (theft, conflict) among many others. Their sensitivity to fishing-associated risks will be related to their dependency on fisheries, and their adaptive capacity may depend on their ability to adjust to, or avoid risks (e.g. by drawing on assets such as savings or education). The three elements of vulnerability may all be related to other dimensions of poverty. For example: people living in poverty may be more likely to live in an area where they are exposed to health risks from poor sanitary conditions; if their nutritional status is poor, they will be more sensitive to infection than a well-nourished person; and if they lack money for treatment their capacity to cope with and recover from infection will be lower than a rich person, who can pay for medicines. A recent review of the literature on poverty in fishing communities (Macfadyen and Corcoran, 2002) concludes that targeting the vulnerable – those with a high chance that they will fall into poverty – may be as important to poverty alleviation as focusing on those who are currently the poorest in income or material asset terms.

The multi-dimensional nature of poverty in fishing communities is now widely acknowledged. Townsley (1998) for instance points out that “fishing communities are often characterized by overcrowded living conditions and inadequate services, low levels of education and a lack of skills and assets (particularly land)...”, and the FAO emphasizes that fishers generally “live in remote and isolated communities, are poorly organised and politically voiceless and ... often highly exposed to accidents and natural disasters” (FAO 2000, point 8). Recent studies have also shown that rates of HIV prevalence and death from AIDS-related illnesses are particularly high in many fishing communities in low-income countries (Allison and Seeley, 2004).

The above discussion points to an important conclusion: poverty in fishery-dependent communities is not necessarily directly – or only - related to the resource or catch levels (Béné 2003). For example, although resource over-exploitation may be a major cause of impoverishment for fishing communities, extreme poverty (in some dimensions) can also be observed in remote fishing camps where fishers catch and trade reasonable volumes of fish but lack access to health and other public services and are politically un-represented.

125 The mental health costs of the psychological stresses of poverty have only recently been widely recognised (e.g. The WHO World Mental Health Survey Consortium, 2004), partly in the context of rising suicide rates in rural areas of some developing countries. The UK Department for International Development has recently identified assistance to countries to deal with poverty-associated mental health as one of its programme priorities.
Poverty and vulnerability are not unique to fishing communities and their distribution reflects the wider issue of deepening rural poverty in many countries, associated with de-agrarianisation and increasing urbanisation (e.g. Cohen, 2003; Tiffen, 2003). Fisherfolk are also found in urban areas (particularly in densely populated S and SE Asia and some West African countries), and although little is known of their socio-economic status, it seems likely they are to be found among the urban poor. Likewise, the important question of gender differences in the dimensions of poverty transcends the small-scale fisheries sector, with an estimated 70 percent of the world’s poor being women (United Nations, 1996).

This progress in our understanding of poverty in fisheries has been reflected in recent attempts to assess the different dimensions of poverty in fishing-dependent communities that combine measures of incomes, assets and vulnerability context, often carried out under the organising framework of the ‘Sustainable Livelihoods Approach’.

2.2 The (Sustainable) Livelihoods Approach

Understanding the multiple dimensions of poverty and vulnerability requires a broad, multidisciplinary approach. Frameworks are useful in this context. Systems thinking, as applied with great clarity to fisheries by Charles (2001), provide an overall conceptual structure within which specific systems components can be considered from alternative perspectives. One such perspective is the SLA.126

2.2.1 Origins, principles and definitions

The SLA has its origins in studies concerned with understanding the differential capability of rural families to cope with crises such as droughts, floods, or plant and animal pests and diseases (Chambers & Conway, 1992). The approach also borrows ideas from an ecological literature concerned with the sustainability of ecosystems or agroecological systems. The concepts of resilience and sensitivity as livelihood attributes also originate in this context. Resilience refers to the ability of an ecological or livelihood system to “bounce back” from stress or shocks; while sensitivity refers to the magnitude of a system’s response to an external disturbance. It follows from these ideas that the most robust livelihood system is one displaying high resilience and low sensitivity; while the most vulnerable displays low resilience and high sensitivity.

The concept of ‘a livelihood’ seeks to bring together the critical factors that affect the vulnerability or strength of individual or family survival strategies:

“A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household.” (Ellis, 2000; p.10).

The livelihoods approach is typically set out in the form of a set of guiding principles and an explanatory framework.

There is no prescribed livelihoods ‘method’, although the core principles that underlie sustainable livelihood (SL) thinking can be summarised, in a fisheries context, as:

- putting people’s social and economic activities at the centre of the analysis (rather than, for example, just their ‘fishing effort’);

126 Some authors (e.g. Ellis, 2000) drop the word ‘sustainable’ from “Sustainable Livelihoods Approach” as they consider that understanding and supporting dynamic livelihood strategies, with the goal of improving the livelihoods of the poor, is the essence of the approach, and that the notion of ‘sustaining’ existing livelihoods may reduce the value of the concept by minimising the importance of dynamism and change in the system.
• taking a view of the options for management and development intervention that transcends traditional sectoral boundaries (such as fisheries, agriculture, pastoralism, wage labour or small enterprise) and that incorporates over-arching issues that affect all people, irrespective of occupation, such as access to social services (e.g. health, education, social security, political representation, legal and judicial services);
• making links between local issues, meso-level processes (such as decentralised government) and wider concerns such as national policy and economic or social change;
• being responsive and participatory in addressing management priorities, which normally involves working in partnership with fishers and other stakeholders in the public and private sectors and promotes a dynamic, adaptive approach to management;
• taking a wide view of sustainability. The four key dimensions to sustainability - economic, institutional, social and environmental sustainability (Charles, 2001) are all important to overall sustainable fishery management, and a livelihoods approach seeks a balance between them, which will often mean that compromises and trade-offs will need to be made.

The livelihoods framework brings together assets and activities, as well as demonstrating the interactions between them. There are many different diagrammatic representations of this framework, all of which seem to confuse rather than illuminate! The version used by the UK Department for International Development is given in Figure 1.

The reference social scope of this framework is typically considered to be the household. In many developing countries, the extended household includes members who are away from home (including urban and international migrants) but send remittances back to the resident homestead.

A starting point for the framework are the capital assets owned, controlled, claimed, or by some other means accessed by the household. The livelihoods framework recognises five main asset categories, comprising:

• physical capital (at household level – boats, house, bicycle etc, but also includes, at community or citizen level, access to infrastructure such as harbours, road networks, clinics, schools etc);
• financial capital (savings, credit);
• natural capital (fish stocks, areas of seabed leased or accessed by licence, land owned, crops cultivated etc.);
• human capital (people’s ‘capabilities’ in terms of their labour, education and health); and
• social capital (the kinship networks, associations, membership organizations and peer-group networks that people in a household can use in difficulties or turn to in order to gain advantage).

Access to both assets and activities is enabled or hindered by the policy and institutional context (or transforming structures and processes) of livelihoods, including social relations, institutions and organizations. For example, it may only be possible to access fishing as a livelihood source if you have a licence, or are a member of a producer organization, or come from a local fishing family. The licence is an example of a formal institution, enshrined in national law or local by-laws, and enforced through formal organizations such as fishery management organizations of government. The other examples are of informal institutions that use social pressures to ensure compliance. Access and rights regimes and how they work – or don’t – are of course at the heart of fisheries management. The livelihoods approach helps to ensure that any fisheries or coastal policy and management intervention gives full consideration to the range of resources that people may be able to draw on and the factors that may help some in doing so, while hindering others.

Livelihood sustainability is also affected by external factors, sometimes referred to as the vulnerability context, comprising seasonality of livelihood activities, and trends and shocks that are outside the control of the household. Trends might include decreasing catch rates, increasing prices for fish, and a number of non-fishing related trends that nevertheless impact on fishing households, such as degradation of critical coastal habitats by pollution or increased restrictions imposed by planning
authorities on coastal building and infrastructure development. Examples of shocks are storm events that damage shore facilities, toxic algal blooms or the Asian financial crisis of 1997. At a household level, methods used by the illness or death of a family member or the theft of a fishing net is an obvious shock. The vulnerability context should not be considered only in terms of negative factors. External trends and events can have positive impacts: increasing coastal tourism can improve local markets for fish, or a new road can improve market and service access and generate more economic activity, although those best placed to benefit most from these changes will tend to be the non-poor.

Understanding how people succeed or fail in sustaining their livelihoods in the face of shocks, trends and seasonality can help to design policies and interventions to assist peoples’ existing coping and adaptive strategies. These interventions may include, at various levels, social service provision, insurance and compensation payments and promotion of diversification127 – all issues seldom considered by fisheries management and policy analysts.

Capital assets permit livelihood strategies to be constructed by individuals or households. These may be composed of a portfolio of activities, only some of which may be related to fishing. Migration is an important component of many fisherfolks’ livelihood strategies (both men in the catching sector, and women in the post-harvest sector). Strategies can also relate to people’s consumption choices (e.g. ‘doing without’ or the sale of assets).

Finally, this framework points to outcomes of livelihood strategies. A sustainable livelihood is one in which people are able to maintain or improve their standard of living (related to satisfaction, ‘well-being’ and income), reduce their vulnerability to external shocks and trends, and ensure their activities are compatible with maintaining the natural resource base (in this case the fish stocks). A sustainable livelihood is therefore likely to be one in which people are able to build their capital assets – e.g. through savings and access to credit, access to education and training, or investment in their own boat and house. They should also be able to at least maintain the natural capital that they share with other households – the fish stocks and the quality of the aquatic environment. Quality of life is also enhanced if ‘social capital’ is maintained or enhanced. Fishing livelihoods are sustained partly through fishing community solidarity but links to the wider community are also important. Fisherfolks’ political and social marginalisation in many countries often means they currently have little support outside the sector.128

127 Diversification need not mean diversifying out of fishing entirely, it could mean promoting alternative activities that may supplement fishing and reduce dependency on fish stocks. Allison & Ellis (2001) suggested such diversification in small-scale fisheries was unequivocally a good thing, while three years later, Ellis & Allison (2004) were at least prepared to discuss its pros and cons.

128 We recognise that this is not always the case and there are cases where to be a fisherman is to be powerful and esteemed (e.g. Senegal), while in many countries, small-scale fishers are romanticized as guardians of traditional values (family, religion), stewards of the sea, noble and heroic. Or they may be regarded as picturesque and interesting – ‘the last wild men on this tamed Island of ours’ (English playwright and author, J.B. Priestley, 1934).
Figure 1. The rural livelihoods framework as a means to understand natural resource management systems
(Source: UK Department for International Development)
Policies, institutions and organizations can help improve livelihood outcomes by supporting the design of appropriate access regimes and by providing an ‘enabling environment’ comprising good, responsive public services to fishing communities.

The SLA is now widely used by development agencies and NGOs to achieve a better understanding of the scope for development intervention in support of natural resource management systems (Ashley and Carney, 1999). The Food and Agriculture Organization (FAO) of the United Nations, the UNDP, many major international non-government organizations (INGOs) (e.g. CARE, OXFAM, ITDG) and most of the European bilateral agencies have recently put these principles into their development practice and recognise that, taken together, they represent a new way of working. A fundamental precept of the approach is that it seeks “to identify what [people] have rather than what they do not have” and “[to] strengthen people’s own inventive solutions, rather than substitute for, block or undermine them” (Moser, 1998; p. 1). This alone serves to distinguish it from many past fishery development approaches!

2.2.2 Using the SLA in practice

The livelihoods approach is utilised in different ways, according to the goal of the study or programme. In development practice, it is often used as a ‘process’ tool to enable participants in development programmes who come from different sectors (e.g. local government, business development, health, transport, natural resources) to work together to identify key constraints and opportunities for development intervention (Ashley and Carney, 1999). The SLA is also widely used as a project and programme design framework. Management programmes or development projects can be re-focused on sustaining livelihoods by appropriate definition of their aims and objectives, the means of verifying achievement of these objectives and indicators for monitoring progress. Standard project cycle management procedures are an appropriate way of incorporating SL thinking into project design and implementation.

Many examples of the SL approach in practice can be found on the ‘Livelihoods Connect’ website (http://www.livelihoods.org), sponsored by the UK Department for International Development. In fisheries, the 25 – country Sustainable Fisheries Livelihoods Programme (www.sflp.org) is pioneering the cross-scale application of the concept in West Africa’s fisheries sector (Horemans, 2004).

The concepts and methods of livelihoods analysis have recently been applied to understanding the role that fisheries play in the rural economy in coastal, lakeshore and floodplain areas in developing countries (e.g. Allison and Ellis, 2001, Béné et al., 2003, Béné and Neiland, 2004, Nettleton and Baran, 2003, Whittingham et al., 2003, van Oostenbrugge et al, 2004, Pittaluga et al, 2004, Allison, 2005). This work is helping to challenge accepted wisdoms about small-scale fisheries and generalisation about their status in an ‘occupation of last resort’ and refuge for ‘the poorest of the poor’.129 We report some insights from this work in a later section of this paper.

The livelihoods framework also forms the basis for recent policy-relevant empirical research that seeks to capture the cross-sectoral nature of rural people’s income-generating and subsistence activities and identify how their pursuit of improved livelihoods is helped or hindered by change in central government policy and global policy shifts such as market liberalisation and political and fiscal decentralisation (e.g. Ellis and Freeman, 2005). Livelihoods research combines qualitative and quantitative methods drawn from a range of disciplines. Once again, there is no standard ‘method’, but there is an emerging consensus that at the core of the methods are quantitative household income and asset and expenditure surveys, as used in micro-economics research. These are combined with a range of qualitative methods of enquiry designed to analyse peoples’ concerns and perceptions of change (vulnerability context) and their local institutional context (Pittaluga et al, 2004; LADDER project http://www.uea.ac.uk/odg/ladder ). The qualitative tools are largely drawn from the range of participatory methods developed in the context of community development programme (e.g. Mikkelsen, 1995). Added to these are the

129 Béné (2003) provides a comprehensive review of the origins and perpetuation of these statements in the fisheries development literature.
methods used by geographers, institutional analysts and political scientists to map out policy linkages from local to international level (e.g. Pasteur, 2001).

2.3. Limitations of livelihoods approaches

Lest we come across as SLA evangelists, we briefly examine some potential difficulties and shortcomings.

The livelihoods approach may imply the collation of a daunting quantity of information but in fact it is best thought of as a checklist of issues and concerns that need to be thought about when designing interventions for policy. Often, much of the information is already available but has not been appropriately synthesised. In many cases, management and policy change can be based on existing understanding of livelihood issues, synthesised from key informants and from representatives of different stakeholder groups, rather than investment in detailed research to quantify all the boxes and linkages.

Many people erroneously see the livelihoods framework as a mathematical model for which it is necessary to quantify stocks (boxes) and flows (arrows). It is usually neither possible nor useful to quantify the value of all asset categories in the ‘asset pentagon’. Important social concepts such as ‘agency’ (the ability of an individual to influence others, or their own circumstances) are not always better understood by reducing them to quantitative indicators. In the asset pentagon, the categories of capital (physical, natural, social etc) are most useful as a conceptual tool – to remind us that people use not only money, boats and fish to support their livelihood, but may also draw on inputs from their family labour, their educational and professional skills, their political influence, their physical strength, the social services provided by the state, the infrastructure funded by taxpayers and a host of other ‘assets’ that policy and management intervention can help to support, redistribute or undermine.

It is possible to use indicators of different elements of the asset base of households, where such indicators are useful for quantitative comparison (e.g. to identify different groups of people within a fishery or make comparative assessments over time). An example of indicators that can be relatively easily measured are given in Figure 2, which shows how certain assets can be used to differentiate the poorest, middle and highest income terciles among households in a Malawian fishing village. In that case, the poor are clearly differentiated by their lack of ownership of livestock and fishing-related assets, suggesting that large family size and low education are not the primary correlates or determinants of poverty in these communities, as is often suggested.

<table>
<thead>
<tr>
<th>Asset Categories Measured</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size</td>
<td>Number of people, with adults of working age given greater weighting</td>
</tr>
<tr>
<td>Education</td>
<td>Years of school attendance by adult members of the household</td>
</tr>
<tr>
<td>Land area owned</td>
<td>Land owned in terms of area</td>
</tr>
<tr>
<td>Livestock owned</td>
<td>Ownership of livestock in cattle equivalent units</td>
</tr>
<tr>
<td>Monetary value of tools</td>
<td>Value of agricultural implements and other productive assets such as bicycles</td>
</tr>
<tr>
<td>Boats and fishing gear</td>
<td>Examples of physical capital at the household level</td>
</tr>
</tbody>
</table>

The sample was divided into income terciles using household income survey data and the average asset value or indicator calculated for each tercile. All asset indicators are standardised as a proportion of the highest value. In this case, the wealthiest group (income tercile III) are distinguished from the other two groups mainly by the greater value of livestock and fishing-related assets that they own. Household size, educational level and land-area owned are not clearly related to livelihood outcome in terms of higher household incomes. The middle income group tend to be more engaged in farming and trading than the wealthiest group, who are more involved in fishing. Qualitative research, including life histories and institutional analysis, is then used to understand the factors that led to some households being able to successfully access fishing opportunities and others not (e.g. through the interplay between social capital and local level political and social institutions).
In addition to remarking on an unhealthy preoccupation with the asset pentagon, Brocklesby and Fisher (2003) summarised a number of other criticisms of the livelihoods approach, particularly in its widely-applied DFID form. These criticisms included:

- an essentially managerial and structural perspective that is insufficient for analysing and addressing power and power relations;
- limited utility in conceptualising human agency, experience and conflicts over values;
- limited utility for understanding the highly fluid, organic ways in which people’s livelihoods shape and are shaped by local institutional practices and relationships; and
- limited engagement with community development approaches and concepts.

SLA-fatigue has set in among some development agencies, and DFID – probably its most fervent champion – has decided that, like gender, the SLA has been effectively ‘mainstreamed’ and consequently disbanded the Livelihoods Support Group, stopped central funding for training and awareness on SLA (although this continues through DFID country-level programmes) and phased out support for the website. All this took place just around the time those outside the development industry were beginning to take an interest in it.

Will SLA prove to be been a passing fashion? Our own view is that the underlying set of principles are likely to survive, but there will be less emphasis on the dogmatic adherence to the asset pentagon and all the other boxes and arrows. The deficiencies outlined above can be – and are – addressed in most contemporary livelihoods-focused development programmes. Livelihoods approaches are evolving and merging with rights-based approaches and community-development, most notably in the way that community-based or co-management systems are being analysed, designed and supported by development programmes. At the very least,

“adopting a livelihoods approach has involved a critical shift from saying ‘how do we plan for forests, agriculture or fisheries, etc.’ to saying ‘how do we plan for people’s livelihoods (in a participatory manner)’ ” (Brocklesby and Fisher, 2003, p. 195).
This has led to improved dialogue between fisheries managers and policy makers and those concerned with other areas of rural development in areas such as water resources, health and education ministries. This, in turn, helps raise the profile of fishing in poverty reduction policies at local and national level, which may translate into more political support for sustainable fisheries.

3. CONTESTED UNDERSTANDINGS OF THE RELATIONSHIPS BETWEEN POVERTY AND FISHERIES

There has long existed in the fisheries literature a dominant narrative describing ‘artisanal’ fisherfolk as landless, unskilled, uneducated poor people, locked into fishing through lack of alternative opportunities. It has been assumed that fisheries are easy to get into but difficult to get out of leading to overcapitalisation and dissipation of resource rents as the growing population of poor fisherfolk scramble to catch the last fish. Pauly (1997) describes this process as ‘Malthusian Overfishing’, perhaps an unfortunate label (or deliberately provocative), given the strong feelings evoked by neo-Malthusian arguments linking ‘overpopulation’ with poverty and environmental degradation – arguments that have in any case largely been discredited (reviewed in Allison, 2002).

This ‘poorest of the poor’ narrative has been difficult to challenge, particularly in the face of undeniable resource declines, because there has been little information on the relationship between fisheries and poverty (Béné, 2003). In Tanzania’s recent national Household Budget Survey, for example, agriculture, livestock and fisheries are not disaggregated and in surveys of poverty in Malawi, such as the Integrated Household Survey of 1997 and 1998 households involved in fishing and related activities were not sampled, so that national-level generalisations about poverty and livelihoods are not necessarily applicable to understanding the particular circumstances of fisherfolk. However, recent empirical work on fishing livelihoods has been undertaken by several researchers in the last few years (see references in section 2.2.2 of this paper) and has allowed these assumptions to be tested, while Béné (2003) has conducted a detailed conceptual review of the causative and correlative elements of the relationship between poverty and fisheries.

The elements of the ‘Malthusian’ narrative are considered below, one by one.

3.1 Population growth is leading to an increase in the number of fishers

Rural populations are shrinking or stabilising in many countries, as urbanisation gathers pace (Cohen, 2003; Tiffen, 2003) and demographic transitions occur (from high to low birth rate) in fast-growing economies such as those in SE Asia. One of the very few studies of fisheries and population (Tietze et al., 2000) has shown the number of fisherfolk in several major fishing nations is similarly decreasing (Malaysia), stabilising (Tanzania, Philippines), or the rate of increase is slowing (Bangladesh). As Malthus posited exponential population growth, we can reject the Malthusian over-fishing narrative on this basis alone. Population growth is undeniably a problem for fisheries, but most acutely so because it leads to increased market demand.

3.2 Fisheries are easy to get into

We have seldom encountered true ‘open access’ (where anyone can fish whenever, wherever they want with no institutional constraints). In even the apparently unregulated fisheries, some negotiation with existing fishers or de facto authorities is often required. In Africa, permission to fish may be seldom refused, but it is usually granted upon some condition. These de facto arrangements (informal taxes, letters of recommendation from traditional authorities etc) may not constitute sufficient barriers to entry to have a significant effort-limitation effect in many cases, but they provide evidence for the existence of remnant or evolving property rights regimes. The existence of conflict is an indicator of a struggle to assert or defend rights of access.

For any fishery that requires a boat, the notion that the poor face no barrier to entry is clearly false. Studies in Eastern and Southern Africa (Allison and Mvula, 2002; Allison, 2003; 2004) indicate that
current boat owners typically worked 8-10 as crew labourers to make enough money to buy a boat. Often this was achieved in stages, with a crew member first owning a hurricane lamp (for night fishing), then a part-share in a net, until eventually they were able to buy a boat. In many cases, alternative avenues of income-generation were required to accumulate sufficient capital to enter the fishery. Documenting peoples’ life-histories (a neglected and extremely useful tool for analysing fishery dynamics) reveals, for example, that Malawian boat owners had accumulated capital through a variety of geographically dispersed activities that included working in the mines in South Africa, as security guards in Tanzania, and, in one case, as a ‘cook for a white man in Zambia’.

There are obviously very poor people involved in fishing, either as share-earning crew labour or in various low-margin associated activities (e.g. carrying fish from the boat to the market, cleaning the landing site, repairing nets etc), but the key point is that these jobs don’t add fishing capacity and the number of available positions for crew labour is not infinite, but is set by the number of boats in the fishery. The number of boats depends on the number of people with sufficient capital to invest in a boat. The number of sufficiently wealthy people who choose to invest in a boat will, in turn, be a function of the anticipated financial returns for doing so, relative to alternative forms of capital investment, such as buying more cows or more land, building a restaurant, bar or guest house or setting up a bicycle-repair workshop. In a declining and unprofitable fishery, it is unlikely that crew members will progress to boat ownership, so this too, limits future entry into the sector.

The only fisheries likely to consist uniquely of ‘the poorest of the poor’ are open-access, shore-based fisheries that can be equated with gleaning and scavenging activities (e.g. the fisheries for shrimp larvae in Bangladesh). All other fisheries will support the livelihoods of a large variety of people of varying wealth and levels of dependency on fishing. The wealth and occupational structure of those involved in fishing needs to be broadly understood before any management and development intervention is proposed, particularly if such intervention aims to target the poor as its beneficiaries.

3.3 Fisheries are hard to get out of

The notion of people being locked into fishing through their sunk capital pervades the fisheries economics literature. But there is a lot of evidence to suggest that, in SSF, in the absence of external interference in the form of grants, technical assistance, subsidised credit etc., capital investment and capacity utilisation are limited to what can generate a viable financial return from the fishery, and people commonly leave the fishery, permanently or temporarily, in response to other opportunities (e.g. Panayoutou, 1982). An artisanal fishery that might have been judged technologically primitive or inefficient might simply reflect carefully calculated and limited levels of capital investment by individuals, based on past experience of the need to adjust to fluctuating returns (Allison and Ellis, 2001). In this context, keeping capacity idle in bad years is not too costly, and fishing effort and capacity may be only loosely related (making frame surveys unreliable as a measure of effort). Past development projects’ attempts to increase the level of capital investment in fisheries to increase efficiencies and fishing incomes in the artisanal sector has probably been responsible for increasing overcapacity and fisheries dependence.

3.4 Fishers are occupationally immobile and lack transferable skills

Fisherfolk not only exhibit occupational diversity at any given moment (the majority of the worlds’ small-scale fishers have multiple occupations); entry into and out of the fisheries sector is also highly dynamic, as has been suggested above. Migration is a key element of fishing livelihoods in many important small-scale fisheries (e.g. Allison and Ellis, 2001; Jul-Larsen et al., 2003) and can be seen

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130 We recognise that perfect economic rationality does not apply – boats are also bought by gamblers, optimists, the misinformed and the misguided. They are also sometimes bought by returning migrants (e.g. retired civil servants) who see boat ownership as a means to reconnect with their home community and acquire the status and social position that boat ownership often confers (e.g. membership of village-based management committees, mens’ drinking clubs etc.)
either as a problem for sustainability, or a means by which excess capacity voluntarily exits an economically overexploited fishery, allowing it to recover. Unregulated migration is obviously a problem for sustainability, but, faced with mobile and fluctuating coastal fish stocks or floodplains and lakes whose geographical extent varies seasonally and from year to year, it is obviously necessary for some fisherfolk to retain some degree of spatial mobility. Migration is associated with acquisition of new skills, life-experiences and opportunities and can thus be seen as contributing positively to occupational mobility.

The diversified livelihoods of many fisherfolk are indicators that they are able to engage in different activities when these are available, but not all diversification is positive and accumulative. The unskilled may find themselves in ‘poverty traps’ where they diversify into a range of marginal activities in order to piece together a livelihood (Ellis, 2000). “Poor endowments of productive, non-labour assets such as land, livestock [or fishing boats] commonly force poorer households to hire themselves out to work others’ fields, herd others’ animals [or fish on others’ boats] for low wages” (Barrett et al., 2001, p. 370 – boats added by us).

If fisherfolk are ‘trapped’ in fishing, it is often external forces, rather than fisherfolks’ human capital limitations, that conspire to increase fishery dependence and therefore the risk of overexploitation. In the case of settled farmer-fishers in Africa’s inland waters, declining returns from agriculture and livestock-keeping, due to various combinations of unfavourable macro-economic adjustment policies, theft due to declining internal security, and withdrawal of government extension services under market liberalisation, is pushing more people into full-time fishing (Allison and Mvula, 2002; Freeman et al, 2004). Increased dependency on fishing is not desirable in the long-run, even if it may be profitable in the short run. The livestock-farming-fishing ‘tri-economy’ has been a common livelihood strategy in lakeshore areas throughout Africa and has proved resilient to extensive biophysical and economic changes (e.g. Geheb and Binns, 1997; Neiland et al., 2000; Sarch and Birkett, 2000), and could remain viable if flaws in the current institutional context are addressed by improved local-level governance. The removal of barriers to mobility and active support for livelihood diversification are relevant overall policy directions in this context.

In summary, occupational and geographical mobility are pervasive features of small-scale fishing, challenging the view that fisherfolk are ‘locked into’ fishing. And, as Hannesson (2002) has pointed out “There is ample reason not to underestimate the entrepreneurship and employability of fishermen who one might be tempted to write off as human capital with stranded skills. In the exercise of their trade, fishermen often show themselves both inventive and adaptable. Those skills are quite likely to be portable to other settings”.

3.5 Fishermen are ‘the poorest of the poor’

Empirical work on incomes and occupational choices in coastal and riparian communities suggests that fisherfolk, particularly those who own fishing gear and control rights of access to resources, are among the wealthier members of these communities (Pollnac et al., 2001; Allison and Mvula, 2002; Allison, 2003; 2005; Béné and Neiland, 2004; Freeman et al 2004), with migrant fisherfolk – the most fishery dependent of all - often having better (or larger, more destructive) fishing gear than residents and thereby achieve greater incomes from fishing than settled farmer-fishers achieve from combining farming, agricultural wage labour, livestock keeping and fishing. Among settled farmer-fishers, it is those with access to skilled jobs, command over greater land and livestock assets and access to markets, services and infrastructure that are wealthier, in income and material asset terms (Ellis and Freeman, 2005). Fishermen are also often wealthier than women in fishing-related activities, who may be confined to low-margin economic activities (Dolan, 2002). Disaggregating the undifferentiated ‘fisherfolk’ is clearly necessary before sweeping statements on relative poverty status can be made.
We would not wish to replace one generalization with another by suggesting that small-scale fishers are the ‘richest of the poor’. Levels of poverty (relative to a national poverty line) are higher in fisherfolk around the Visayas, Philippines, than in non-fishing communities (Munoz, J.C., cited in Schmidt, 2004, this workshop), and fishers (particularly women and youth) are found disproportionately among the extreme poor in Bangladesh (J. Seeley, ‘Livelihoods of the Extreme Poor’ study, pers. comm.). Added to this, as has already been mentioned, higher incomes do not necessarily make fisherfolk rich or invulnerable.

Although fisherfolk are not always among the ‘poorest of the poor’ in terms of income, other dimensions of poverty and vulnerability must be considered. Like other rural people, fisherfolk tend to be poorly served by access to basic needs such as education and health service provision, financial services and practical and technical support provided by extension or small business advisory services. Several features of fisheries also make fishing households vulnerable. Fishing is one of the riskiest of occupations (ILO, 2000); it is hard manual labour and requires good physical health. Prevalence of HIV/AIDS are high in many fishing communities in low-income countries (Allison and Seeley, 2004). Increasing levels of theft are widely reported requiring monitoring of nets at night. As temporary residents or recent migrants, fisherfolk are often marginalized from local decision-making structures; and fisherfolk are prey to rent-seeking officials - often, the first person a fisherman sees on returning from a night’s fishing is the local tax revenue collector.

3.6 Fisheries are the ‘occupation of last resort’

Despite the risks and vulnerability associated with fisheries-based livelihoods, fishing remains an occupation of choice for many in Africa, as it does in South-East Asia (Pollnac et al., 2001), where fishermen rated their job satisfaction very highly. The lifestyle attractions of fishing are often overlooked. To young men, the chance to earn cash income outside the social strictures of their home village and enjoy the masculine camaraderie of a migrant fishing fleet may be a significant ‘pull’ factor, for which it is worth putting up with danger and drudgery. For women in search of economically independent lives, fishing ports and landing centres may offer opportunities unavailable in rural areas with less monetized economies (Appleton, 2000). Fishing may be seen as providing alternatives to other, similar options, such as migration to urban centres, or even into professions such as small-scale gold mining, which offers similar rewards, but with even higher risks and lower probabilities of success (Graz, 2001).

That risk and marginalization should be seen as a price worth paying the chance to earn a livelihood is a sad reflection on the difficult choices individuals in poor countries have to make in order to seek better lives, but it should not condemn fisherfolk to being seen as entirely helpless victims at the bottom of the social heap. Among the fisherfolk are many enterprising people who make significant positive contributions to regional and national food systems and economies. A livelihoods perspective suggests that we identify these strengths and assist fisherfolk to build on them, rather than trying to offer new, externally-conceived solutions.

3.7 Conclusion – rejecting generalisations

To conclude, we reject the common generalisations that make up the ‘Malthusian overfishing’ narrative described in sections 3.1–3.6 above. Fisheries are not always the occupation of last resort but sometimes they are. Fisherfolk are not always the poorest of the poor but they can be. Small-scale fisheries play different roles in different locations, and fisheries can therefore contribute to the prevention and/or reduction of poverty in several possible ways. The trade-offs between conservation and development need to take these differences into account. A ‘one size fits all’ policy is unlikely to be helpful in supporting efforts to move towards sustainability. It is more useful to consider some of the main potential functions of fisheries in the wider economy, drawing on case studies from empirical study, to

There are perhaps 30 million artisanal or small-scale miners in the world; their livelihood strategies, risk-management approaches and the discourses of poverty, vulnerability and resource depletion around their activities are very similar to those about fisherfolk.
examine how short-term poverty alleviation goals and long-term sustainable fisheries can be reconciled. This is addressed in the next section.

4. WHAT ROLE DO FISHERIES PLAY IN THE RURAL ECONOMIES OF LOW-INCOME COUNTRIES?

Our point of departure is that it is desirable to sustain fisheries for the societal benefits they confer and for the present and future value of the resources, but that current national and sub-national fishery policies have avoided the difficult choices that need to be made regarding the role that fisheries could play in contributing to poverty alleviation. We set out four different roles that fisheries have played at various times and places in small-scale fisheries, and we look at how policy goals align (or don’t) with these roles.

4.1. Increasing fisherfolks’ incomes

The conventional development wisdom of the 1950s to the 1970s was that the cause of persistent poverty among small-scale fisherfolk lay in the limited productivity of small boats and ‘artisanal’ fishing gear, a problem curable though provision of more effective technologies (Bailey et al., 1986). Sometimes, efforts to convert what were seen as ‘subsistence fisheries’ into ‘commercial’ fisheries were attempted by scaling up and centralising catching and landing facilities. Fisheries development projects of this era are not generally judged to have been successful (Cycon, 1986) and a legacy of abandoned state-owned ice plants, disused central markets and rusting trawlers can be seen scattered throughout the tropics. Since structural adjustment programmes were instigated, state involvement in the production side of fisheries has gradually been withdrawn. Throughout the period of donor and state support for scaling up or industrialisation of fisheries, the so-called subsistence or artisanal sector continued to expand with limited development assistance, sometimes to out-compete the industrial vessels fishing the same stocks (e.g. Horemans, 1992).

It is fairly obvious that, faced with resource productivity constraints, increasing catching efficiency to increase incomes will result in a decline in the number of fisherfolk that can be supported by a fishery. This trade-off may be acceptable, if it is able to be implemented. However, this has seldom been the case. Aiming to improve fishing-based livelihoods by improving fishing incomes, in the context of widespread rural poverty and ineffective barriers to entry, will quickly result in dissipation of any short-term gains as new entrants arrive to take up opportunities that would otherwise not be available or attractive. In any case, providing technology as a means of entry tends to favour the better off (e.g. those who already have boats) and may have no or negative impacts on the poor.

Although one of us has already been accused of wishing to keep artisanal fisherfolk ‘naked, poor and paddling’, we contend that subsidised credit for the purchase of outboards and improved fishing gear are likely to exacerbate poverty in fishing communities. Production-orientated subsidies as a form of fisheries development aid are likely to be as damaging in small-scale fisheries as they have proved in industrial fisheries.

4.2 Supplying poor consumers with affordable elements of a high-quality diet

There are more consumers than fishers, and it is therefore not surprising that government fishery agencies may see the service of consumer interests as being more important than those of fisherfolk’s interests. Colonial fisheries policies in much of southern and eastern Africa emphasised maximising domestic fish supply. In Malawi, for example, fisheries were seen as important in supplying nutritious food at low cost to plantation labour forces (Allison et al., 2002). Post-independence policies retained this focus on production. To make the maximum quantity of fish available at minimum price, development agencies have sometimes grant-aided fishing vessels and processing plants (to be run by the state) so that fish could be supplied at controlled prices. Price subsidies to consumers in the form of price controls (no longer a real option under liberalisation) have negative effects on fisherfolks’ incomes.
Supplying poor consumers with low-cost fish usually means focusing catches on small, high productivity fish species that can be caught in large quantities. In a multispecies fishery, such as those found in most large tropical lakes and the demersal zones of shelf-seas, this is likely to deplete both the economic value and ecological resilience of the stocks.

4.3 Small-scale fisheries as an ‘engine of economic growth’

In order to act as a stimulus to growth and poverty reduction, a sector must create significant spin-off effects through inter-sectoral linkages. Studies in four Eastern and Southern African countries (Allison, 2005) and in several West African fisheries (papers in Béné and Neiland, 2004) suggest that the fisheries sector can indeed play these roles, particularly in areas otherwise remote from the cash economy. Income from fishing enables investment in other rural enterprises or in building household assets and therefore security against poverty. This may include investing in livestock, land and agricultural inputs and education for children, or spending on healthcare. Income generated from fisheries is also spent on consumption of a range of goods and services that support markets in some of the poorest areas of rural Africa.

However, in situations where fishing effort exceeds what could be estimated as the long-run maximum economic yield, growth in the sector cannot be promoted without diminishing the benefits that are derived from the resources. Thus, policymakers have the difficult task of balancing the contribution to the rural and national economy from fisheries against concerns for the sustainability of the fish stocks that generate those benefits. State-enforced licensing and technical regulations have been the primary instrument of fisheries regulation in the past and, although the management targets remain similar, the approach has now shifted towards involving fisherfolk in the management of their own resources through community-based or government-community ‘co-management’ partnerships (Wilson et al., 2003).

There are several ways in which rents are captured from fisheries to provide potential development benefits. Central government budgets may benefit from the generation of export revenues (e.g. from Nile Perch in East Africa, marine fisheries in West Africa), local governments see fisheries as a key source of tax revenues. Local markets benefit from fishermen trying to convert their cash into consumables or other forms of capital before the government and other revenue-seeking agents get their hands on it. Weaknesses in the governance environment are the main constraints to realising the development benefits from fisheries-generated income.

4.4 Access to fisheries as a safety net for the poorest and most vulnerable

In countries where many people live in poverty, where economic diversity is very limited, where fish consumption is high, where the economy is not growing fast enough to absorb significant new labour, where property rights are weak or absent and where fisheries are accessible with very low technological input, the fisheries sector may indeed become the refuge for the poorest. This is likely to be the case for some fisheries in countries like Cambodia and Bangladesh, with their accessible floodplain and coastal fisheries, dense populations, high rates of poverty, a tradition of fishing, high rates of fish consumption, few accessible livelihood opportunities for the landless and non-literate, relatively low rates of economic growth and urbanisation and limited or poor regulation of access to resources.

There is a consensus that in such situations, fisheries are very unlikely to be environmentally sustainable, and that they will generate few economic benefits, besides the social benefit of sustaining people who would otherwise have no alternatives. In these contexts, some form of limitation of access that, as much as possible, favours access by the poor, is required.

In other contexts, where national dependence on fisheries is relatively low, fisheries are sporadic and environmentally-driven and the economy is prone to shocks, keeping fisheries as (relatively) open access resources to exploit in times of need would appear to be a sensible policy option. Allison and Sarch
4.5 Hard choices in fisheries development

The potentially conflicting roles that fisheries play in the rural economy makes it important for governments to establish clear policy directions at either national or sub-national level, depending on the nature and variety of a country’s fisheries. An individual fishery cannot be managed simultaneously to maximise the supply of cheap fish for domestic consumption, maximise export earnings of high-value fish, provide employment and income-generation to the maximum number of fisherfolks and act as a safety net for all the poor in a region. Neither can interacting fisheries in the same area be optimised to provide all these functions.

Fisheries development involves hard choices between incompatible objectives. At present, many national fisheries policies in developing countries include the goals of increasing the supply of fish to domestic markets and promoting the export of fisheries products, increasing the level of fisherfolks’ incomes and providing new employment opportunities in fisheries. These are all individually valid goals, but are mutually incompatible. This can be illustrated by considering the example of policy objectives to increase production, increase domestic consumption of fish by the poor and increase fisherfolk’s incomes (Bailey and Jentoft, 1990: 339).

- Fisherfolks’ incomes can be raised by increasing the catch, reducing production costs, or increasing prices. Increasing catch is not an option in fully exploited fisheries and will in any case increase costs of production per unit of harvest as the catch-per-unit-effort (CPUE) declines.
- Improving economic efficiency by reducing costs of production is best achieved by eliminating excess fishing capacity and labour, relieving pressure on the resource and making it less costly for those who remain to harvest a given quantity of fish (higher CPUE). However, if restrictions on access to fishery resources are promoted, this will have a negative impact on employment.
- Price controls in favour of fishermen (e.g. minimum sales prices) are not good for consumers, and would attract additional investment of capital and labour into the fishing industry, leading to a cycle of reduced CPUE and rising costs of production.
- Price controls to benefit consumers would only do so at the expense of fisherfolks’ incomes, and are difficult to enforce, leading to the development of black markets.

The trade-offs between main policy options for fisheries and the main dimensions of sustainability in a fishery system are summarised in Table 1 and explored in the subsequent bullet points.

Each fishery policy goal is considered below.

- **Improve fishing incomes.** An attempt to improve fishing incomes independently of other sectors could promote environmental sustainability and some local growth if strong, exclusionary property rights can be allocated and maintained to provide stewardship incentives. This would be socially inequitable and may lead to conflict, unless other non-fishing opportunities providing similar returns can be created as well, for non-fishers and those excluded. If, however, property rights cannot be allocated and defended, resource rents will be quickly dissipated and the resource sustainability threatened. This has been the common experience of these types of intervention to date.
Table 1. Speculative matrix of compatibility between fishery policy goals and sustainability dimensions.

<table>
<thead>
<tr>
<th>Fisheries policy goals</th>
<th>Dimensions of sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Environmental Sustainability (national, local)</td>
</tr>
<tr>
<td>Improve fishing incomes</td>
<td>- - / ++</td>
</tr>
<tr>
<td>Food for low-income consumers</td>
<td>-</td>
</tr>
<tr>
<td>Engine of growth</td>
<td>++/- -</td>
</tr>
<tr>
<td>Safety net</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 1. Speculative matrix of compatibility between fishery policy goals and sustainability dimensions.

\(--/+ = \text{strong negative/positive impact}\) \(-/+ = \text{weak impact}\) \(0 = \text{neutral or no impact}\)

(See text for explanation)

- **Food for low-income consumers.** Maximising low-cost food supply tends to be associated with catching large volumes of small fish (the poor cannot afford to buy large fish, asset-poor traders cannot afford to purchase and transport them etc). In multispecies fisheries, this promotes the ‘fishing down’ of larger species, so is only tenable for small-pelagic stocks. This objective is also sometimes associated with neglect of the interests of the fisherfolk in favour of those of the consumers. There will be wider social and economic benefits to ensuring poor consumers have access to high-quality food at affordable prices.

- **Engine of growth.** Where fisheries are managed to maximise their contribution to the rural economy, there may be incentives to maintain stocks of high-value species (in the absence of good management and/or secure rights, these will be depleted), the economy and wider society benefits from a combination of multipliers at local level and fishing communities. However, the cost and availability of fish to poor consumers may decrease.

- **Safety net.** In managing for a safety net function, there is a high risk of stock depletion as, by definition, no access constraint is placed upon any one who needs to access fish. Excluding the better off in favour of the poor is either not possible (as the poor can’t get to a fishery without using the capital assets owned by the rich) or is difficult to do because it challenges existing power structures. The economic benefits by allowing fisheries to fulfil this function (e.g. in the form of social problems foregone, such as crimes not committed, emergency food aid not needed etc) have to be balanced against the resource rents foregone and risks of resource collapse.

5. **IMPLEMENTING SUSTAINABLE PRO-POOR FISHERIES GOVERNANCE**

“Success in creating a more just world is measured not by the effectiveness with which a policy idea is sold or the passing of legislation or regulations which pertain to it, but in the effects on peoples’ lives”. (Li, 2002, p. 266).
Developing, promoting and selling policies to solve the sustainability dilemma has been a growing industry. Legislative reform has followed policy reform and policy reform has led to money being put into new forms of management and development intervention. As Li (above) reminds us, however, success in selling our new policy ideas is only the first step. Making policy and management work remains a major challenge. This section briefly reviews recent suggestions made at the expert consultation. These will be detailed elsewhere (Béné et al., 2005) and included in a set of technical guidelines on poverty and small-scale fisheries (FAO, 2005), intended to assist states in the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF).

5.1 The role of international instruments

Although one of the objectives of the CCRF (para f) Article 2) is to: “Promote the contribution of fisheries to food security and food quality, giving priority to the nutritional needs of local communities”, the Code’s objectives do not specifically refer to poverty alleviation, or to the role that small-scale fisheries can play towards alleviating poverty and ensuring food security. Indeed, the focus of the Code is more strongly placed on the need to manage industrial fisheries. This is currently being addressed, and technical guidelines for implementation of pro-poor fisheries policies are being developed by FAO.

Non-fishery international policies and instruments, such as agreements to develop poverty reduction strategies as part of the highly indebted poor countries initiative, global free trade agreements and regional economic and labour mobility agreements (e.g. in ECOWAS ASEAN etc.) are likely to have important effects on fishing activity, and the scope of studies of fisheries governance needs to be enlarged to include more explicit consideration of how these processes can help or hinder the implementation of sustainable fisheries policies.

5.2 The role of national policies in fisheries and in poverty reduction

Fisheries policy has been carried along by the currents of three major governance and policy trends: decentralisation, market liberalisation and sustainable development (Allison, 2001). PRSPs share these orientations, so that policies informed by the FAO CCRF appear to complement the main thrust of PRSPs in combining global market integration with effective governance to generate sustained growth (Craig and Porter, 2003). Figure 3 identifies potential contributions of fishery sector objectives to poverty reduction strategies.

Although there are many synergies between poverty reduction strategies and fishery policy objectives, fisheries issues have a very limited profile in PRSP documents. In West Africa the sector was mentioned in only two out of 23 interim and full PRSPs, despite the economic and social importance of fisheries, particularly along the coast and around Lake Chad and the Niger Inland delta (SFLP, 2002). Lack of coverage of the fisheries sector in national poverty data collection is an important reason for this absence. Poverty assessments are used to derive policy priorities, which are then allocated funds through either Medium Term Expenditure Frameworks (MTEFs) or Poverty Action Funds (PAFs), so the absence of the fisheries sector from PRSPs can be significant – they could miss out on any funding allocation.

Most national fisheries policies avoid the ‘hard choices’. Since all the potential different contributions of small-scale fishing are apparently compatible with poverty reduction strategies, PRSPs provide little guidance as to which fishery goal should be prioritised. For fisheries policy to provide useful direction, the most straightforward way to make trade-offs between incompatible policy goals may be to set different policy priorities for different water-bodies or other non-overlapping sub-sectors of the fishery, as the Tanzanian Fisheries Master Plan has done (Allison, 2005).
The integration of fisheries development with broader poverty-focused development programmes would benefit from:

- maintaining sufficient profile in national poverty reduction strategies to ensure the sector receives funding commensurate with its potential contributions to pro-poor economic growth;
- adopting a more critical and politically engaged approach to promoting community-based fisheries management;
- ensuring that sub-sectoral studies that highlight the contribution of fisheries to national and local economies are disseminated widely amongst opinion formers in the policy domain; and
- incorporation of fishing households explicitly in national poverty surveys.

There are welcome signs that all these processes are underway in Africa, so that the continent’s fishing people can continue to provide economic, social and cultural benefits to their countries.

5.3 Co-management as a pro-poor fisheries management framework

Co-management is widely advocated as an organizational model to develop the means to sustain small-scale fisheries, following the perception that it is institutional failure that is largely responsible for resource degradation and loss of access to livelihood opportunity by the poor. Institutions fail when the pillars on which they rest are weak (Jentoft, 2004). The rules that regulate behaviour may be underdeveloped or poorly enforced; the normative standards may provide few incentives and little guidance; the knowledge that could inform decision-making may be inadequate. Thus, governance should improve if these pillars are strengthened. Any diagnosis of the problems and opportunities of institutions and how to improve them should therefore start here. However, institutional failure may also result from conditions outside the co-management initiative, in situations in which they are embedded or ‘nested’ in wider institutions. Fisheries management intuitions may also fail because of unsupportive legislation, inadequate financing, poorly organized user-groups etc. Thus, an investigation into the causes of institutional deficiencies must broaden the perspective to include exogenous conditions.

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132 This section is summarised from a recent review of inland fisheries co-management, prepared by E.H. Allison and M-C. Badjeck, for the FAO/DfID Sustainable Fisheries Livelihoods Programme. It will be available shortly, either as an SFLP Working paper or as an FAO Fisheries Technical Paper.
Despite their variety and complexity, community based natural resources management (CBNRM) projects have a number of shared objectives (e.g. Kellert et al., 2000):

- commitment to involve community members and local institutions in the management and conservation of natural resources;
- interest in devolving power and authority from central and/or state government to more local and often indigenous institutions and peoples;
- desire to link and reconcile socio-economic development and environmental conservation and protection;
- tendency to defend and legitimise local and/or indigenous resource and property rights; and
- belief in the desirability of including traditional values and ecological knowledge in modern resource management.

Thus, CBNRM contains a mixture of political, organizational, socio-economic, environmental and epistemological/institutional features, and despite the many possible obstacles to successful implementation, the idea of some form of partnership or dialogue between relevant citizen-groups and their government and of devolution of rights and responsibility to local-level actors is likely to remain the dominant form of fisheries governance in small-scale fisheries for some time.

The key issues and challenges in introducing and sustaining co-management systems are all fundamentally connected to issues of rights and their allocation.

1. Support from government is critical. Legislative and policy support is only the first step – if there is little political will and incentive for fisheries departments to relinquish control over resource management, then externally-driven project interventions will not result in sustainable outcomes. Perhaps paradoxically, a strong, supportive state is as important to the success of co-management as a strong, enforcing state was to the success of old-style ‘command and control’ fisheries management. Conversely, where citizens are up against unsupportive states, the potential of CBNRM to empower them is very limited. Older vocabularies about peasant struggles, class conflict and democracy are better able to name the problems and indicate the forms of collective actions through which they might be addressed (Li, 2002).

2. Elite capture of community-based development initiatives is a widely-recognised problem and there are many cases where the poor have not benefited from a transition from state to community-based natural resource management (e.g. Beck and Nesmith, 2001; Kumar, 2002). Mechanisms for ensuring equitable outcomes of co-management are critical to achieving a pro-poor orientation.

3. Few common-property systems in low-income countries are based on total exclusion of outsiders. Often, access regimes are filters rather than barriers, allowing partial access to outsiders on the basis of kinship, perceived need, or under historical reciprocal access or trading arrangements. Building co-management on these traditions may be more widely acceptable and enforceable than emphasising total exclusion of particular groups (e.g. migrant fisherfolk).

4. Financing co-management beyond donor or government-assisted transition periods can be difficult. Often, resource users are reluctant to commit funds to management until they can see returns from their investment. This has meant that successful donor-funded co-management projects have tended to require commitments of typically 6–12 years before they have been judged to be self-sustaining.

5. It is easier to self-finance a pro-rich development than a pro-poor one. The mutual support between rich entrepreneurs and government fishery officials and security personnel in Cambodia’s Auction Lot system is an example of self-financed co-management that helped the rich become richer (FACT, 2002). Funding pro-poor development that has the backing of local-level elites is proving much more challenging.
6. Building trust between stakeholders is a key issue for project success. Trust-building exercises between groups that may have had conflictual relationships in the past (e.g. government fishery enforcement agents and resource users, migrant and resident fisherfolk) is an essential activity before inclusive, multi-stakeholder management becomes a realistic option. Where there are known to be serious disputes over resource access that might overwhelm existing capacities for self-reorganization, conflict management assessment (CMA) can help to determine what form of intervention is appropriate (see Jones and Warner, 1998).

7. Co-management is a political project that involves the redistribution of power alongside the reallocation of use rights and control over resources. When the political dimension of co-management is not explicitly recognised then unexpected outcomes can occur, such as new conflicts or the exacerbation of existing ones. The rhetoric of co-management often refers to empowerment but seldom considers that one group gaining power often means that another group has their power and influence diminished. If an empowering vision of co-management is the aim (Figure 4) then the process needs to be explicitly connected to decentralisation initiatives. Decentralisation, however, is itself often conceived in technocratic rather than political terms – as a means of improving efficiency of government service delivery and collecting tax revenues more efficiently rather than as a means of giving citizens a stronger voice in government and making government more accountable for their actions.

8. Critics of the ‘design principles’ approach to understanding CBNRM success suggest that historical and ecological context are so influential in the emergence of CPR management systems that the search for rules or design principles is fruitless (Mosse, 2003). In a similar vein, Hara and Raakjær Nielsen (2003) argue that, for Africa, each specific fishery will require co-management design to be tailor-made. Thus, the very relevance of the transferability of ‘lessons learned’ is a subject of continued debate in the commons literature. Our own view is that lessons on good practice in institutional change are transferable, while technical design features of individual commons management systems are likely to require locally adapted designs.

9. The existence of an incentive to participate in co-management is a fundamental pre-requisite. This is usually, but not always, an economic incentive – there must be some advantage to be gained by foregoing individual strategies in favour of collective ones. This applies to all participants in co-management, whether they are fisherfolk, traditional leaders or government officials. Co-management usually requires some participants to relinquish current benefits and powers and grant them to others. Government departments are effectively being asked to participate in their own down-sizing and local elites may be asked to devolve more of their power over resource allocation decisions to people they may regard as their social inferiors (the poor, women, youths etc). Fishermen are often asked to cut back their fishing effort. In all of these cases, the incentives to comply need to be identified and communicated to all participants and ways to secure future benefits devised. Where there are no incentives for compliance, it may have to be externally enforced. This may be the case where resources have become degraded to the point where the poor cannot imagine that their share of any increased benefit would make it worth all the effort of organising for joint NR management or where power relations are such that the elite-capture of any rehabilitated resource is a very real prospect (Baumann and Farrington, 2003).
6. CONCLUSIONS

6.1 Directions for fisheries development suggested by livelihoods analysis

Our evolving understanding of poverty in fisheries and the multiple roles that fishing may play in the rural economy seems likely to shift the emphasis of future fisheries development away from attempts to improve fisherfolks’ incomes and towards interventions aimed at reducing vulnerability of fishing-dependent populations. Despite often having higher incomes than people mainly engaged in other sectors of the rural economy, small-scale fisherfolk are often vulnerable due to insecurity of tenure over both land and water resources and to political and social marginalisation.

All the livelihoods studies conducted thus far have indicated that maintaining a diverse portfolio of activities in addition to fishing is important to coastal, river floodplain and lakeshore households. Fishing is a high-risk occupation and one prone to seasonal and cyclical fluctuations in stock size and location, some of which are highly unpredictable in occurrence. Diversification reduces the risk of livelihood failure by spreading it across more than one income source. It also helps to overcome the uneven use of assets (such as a fishing boat) caused by seasonality, to reduce vulnerability, to generate financial resources in the absence of credit markets, and it confers a host of other advantages in the presence of widespread market failures and uncertainties.

Recognition of this cross-sectoral mobility is overturning previous notions that fisherfolk were marginal specialists stuck in their present occupation and unable to turn to others. It also challenges policies that seek to ‘professionalise’ part-time or ‘subsistence’ fisherfolk, as the diverse livelihood strategies observed are often sensible adaptations to the uncertainties of fishing. These adaptations have the useful
by-product of reducing dependency on fishery resources. Specialisation promotes dependency, which is obviously undesirable in the face of declining stocks.

Livelihoods analysis has also shed light on how local-scale, informal institutions work in practice. This is most clearly seen in the cases where mobile fish stocks are exploited by migrant fisherfolk, with informal reciprocal access agreements being the main means of controlling movement and exploitation patterns. Fisheries management agencies, unaware of these arrangements, have sometimes sought to impose a system of fixed, territorial boundaries on these highly adapted, flexible management systems (Allison and Ellis, 2001).

Adopting a livelihoods view of small-scale fishing in Africa, Asia and Latin America is leading to policy-makers now seeing small-scale fisherfolk, not just as poor, backward, marginal and problematic, but as potentially important contributors to the rural economy and potential focal points for market development in areas otherwise remote from the cash economy. Migrant fisherfolk are often revealed to be welcome trading partners of resident communities rather than transient marauders. Livelihoods analysis has thus contributed to revealing and quantifying the hidden role of small-scale fisheries in the rural economies of developing countries, strengthening the case for their inclusion in national poverty reduction strategy programmes (Allison, 2005; Thorpe et al., 2005).

Analysis of the success of fisheries development policies since 1950 (Neiland, 2004) adds support to the conclusions of livelihoods analyses. The most successful types of fishery intervention – in terms of their short and long-term poverty alleviation benefits, equity, sustainability, technical feasibility and ease and cost of implementation – were projects to improve fisheries management (St Lucia), re-allocate fisheries resources to favour the small-scale sector (Indonesia) and increase economic growth and diversity (thereby raising opportunity incomes and diversification options) through integrated rural development (Malaysia).

6.2 Being realistic on what can be achieved through fisheries development

Poverty will obviously not be solved by fisheries management and development alone. Neither will fisheries management problems necessarily be solved by wider poverty reduction. We contend, however, that in small-scale fisheries in developing countries (and possibly in many developed ones too), dealing with some of the dimensions of poverty (vulnerability in particular) will go a long way to addressing fisheries unsustainability for inshore and inland fisheries, by reducing some of the risks and uncertainties that fisherfolk live with, and that are among the reasons why it is entirely rational for many people to fish unsustainably.

There are at least three unavoidable problems to confound expectations of what can be achieved through improved fisheries management and development policy and practice.

- Fisheries cannot fulfil all the social and economic goals that we would like them to. Fishery policy makers and resource users have to make the hard choices between a number of possible functions, on the basis of which one fits best with their existing situation and with wider national development priorities.

- Much of what happens in fisheries is driven by what goes on outside the sector, in government, the rural economy, and in processes of global change. This limits the extent to which fisheries scientists and managers can address factors of unsustainability in fisheries.

- Uncertainty pervades fisheries management and things don’t always turn out the way we think they will. For example, it would be nice to be able to identify, in advance, points at which environmental or social change becomes effectively irreversible so we can manage to prevent irreversibility.
None of these reasons deters us from trying to understand and manage fisheries better. We are therefore also able to offer three reassuring responses to the above points:

- Whichever function any fishery can fulfil, it offers a potentially important contribution to wider processes of development. Clarity of objectives, negotiated and agreed with those who are involved in the fishery, can help to address unsustainability brought about by pursuing multiple, incompatible goals (or from not having a goal at all).

- Fisheries development actors have realised that integrating fisheries with wider development policy is necessary, and are raising the profile of fisheries issues with government and wider civil society. Where fisheries are important and influential, they can achieve representation (and funding) in broader development planning. Also, successful institutional and governance innovation can spread to other sectors. Innovations in fisheries co-management may help to build social capital that can then be utilised to support other local-level development initiatives, irrespective of sector.

- Fisherfolk have long lived with uncertainty and have evolved a variety of robust risk-management strategies to cope with it. Management agencies may be able to build their management systems on these principles.

6.3 Responding to identified ‘factors of unsustainability’

We conclude by drawing on some of the ideas outlined in this paper to addressing a selection of the many questions posed in the terms of reference to this workshop (referred to by number):

It is not possible to manage any fishery without recognising and accounting for its linkages with the wider socio-economy (1.6). We need to see fishing as something that people do to earn (usually part) of their living, but that is not the only feature of their lives that has a bearing on livelihood outcome. Poor internal security affecting fisherfolk’s ability to invest in livestock to reduce dependence of fisheries (Malawi), collapse of the agricultural economy leading to a huge influx of migrant fishers (Senegal) and rapid urbanisation and economic growth providing alternative occupational choices (the ‘Asian Tigers’) are just some of the many examples of how fishing and other sectors of the economy – both locally and at macro-level, are linked in ways that either support or undermine sustainability. The dynamic nature of such links also makes sustainability rather difficult to assess in conventional terms, and it even challenges it as a valid goal for policy (the Norwegian wooden ski metaphor – Hannesson, 2004, this workshop).

Successful and effective participation of small-scale fisherfolk in fishery management processes (1.7) is dependent on reducing the worst extremes of poverty. Where wealth inequalities and poor governance generate inequalities of power that act to exclude the poor from decision-making processes (management rights), the hope for improved sustainability is a vain one. Without simultaneously working to reduce poverty and vulnerability of fisherfolk, expecting them to participate in co-management is optimistic at best.

Similarly, there can be no equitable allocation and viable defence of property rights without a significant decrease in inequalities of wealth and power within fishing communities and between fisherfolk and external actors. Empowerment through community-building can help achieve this, even in the face of continuing income inequalities. On-going initiatives on Tonle Sap are a worthy attempt at this (Schmidt, 2004, this workshop).

The allocation of rights is supposed to bring responsible behaviour (2.1), but to those unable to access, defend or benefit from rights granted to them, this is unlikely to come about. Legal recognition of rights is an important first step, but support is needed to realise the remaining elements of stable property rights.
In many cases, fishery management agencies see granting improved or exclusive rights to fish as being sufficient to solve the problems of poverty in fisheries. But if fishers have no access to other assets, or remain vulnerable to other shocks, granting rights over aquatic spaces and/or the fish in them will not reduce overall uncertainty. ‘Responsible behaviour’ will only occur if some benefit in behaving responsibly can be discerned. While fishers continue to be vulnerable to risks resulting from poor governance, ranging from violence by the powerful (Tonle Sap film) to predation by rent-seeking officials, they are unlikely to see much benefit in behaving in what outsiders might term a ‘responsible fashion, even if they do manage to secure legal rights to a resource. Vulnerability reduction, community-building and improved democratisation, encapsulated in the much-overused words ‘empowerment’ and ‘building civil society’ are a key part of any poverty reduction strategy that seeks to foster responsible behaviour.

We agree that the main factors of unsustainability are largely known (1.3) although some of the psycho-cultural dimensions that prevent behavioural adjustment from unsustainable to sustainable behaviour are underemphasised. Issues such as loss of community coherence, cultural stress and fatalism as a risk-rationalisation strategy are too seldom remarked upon. Thus, current social science research in fisheries does not address all the factors of sustainability (3.5). Much could be learned by comparison with other groups who confront similar risk environments in pursuit of their livelihoods. These might include nomadic pastoralists and small-scale miners.

The experience of indigenous communities in the Americas and Australasia, whose sources of livelihood and cultural survival were threatened by rapid social and economic change, may also shed light on what is happening or has happened in many small-scale fisheries. Reassertion of cultural rights has reversed the spiral of decline that many such communities experienced. Interest in culturally and ecologically sustainable development has recently increased among many indigenous communities, and it follows from empowerment, reduction in discrimination, and a growing confidence in asserting their identity. There may be useful lessons to assist traditional fishing communities (many of which are also pursued by indigenous groups that have been marginalised and are threatened with cultural extinction) to rediscover their vision of the future. The renaissance of community-based marine resource management in Oceania provides a good example of how legal and political recognition can help to restore and adapt cultural values to contemporary situations, and rebuild confidence in the future and commitment to sustainability (Johannes, 2002).

Responding to multidisciplinarity (3.8): The SLA can help us to identify existing strengths in the small-scale fisheries sector and build upon those to ensure that inshore fishing continues to make important contributions to poverty alleviation. But the SLA is not a ‘magic wand’ that can solve existing problems of overcapacity and declining fish stocks, it can merely help to broaden and deepen the search for solutions to this overriding problem. It can also help to identify interventions to alleviate poverty in fishing communities (e.g. by reducing vulnerability, building social capital, dealing with corruption and weak governance, improving service delivery in health, education) that do not directly lead to increased fishing effort.

A major challenge to fisheries sustainability is the observation that demand for fish will increase for the foreseeable future (Delgado et al., 2003). Demand management is a hitherto neglected instrument of control in fisheries management, although it is becoming a significant means of limiting over-consumption of other scarce natural resources (e.g. in water resources management). The impacts of reducing demand (e.g. from export and urban markets) on the small-scale fisheries of poor countries could be ambiguous. Losing markets is seldom good for poverty alleviation, but may reduce pressure on resources. Ecological sustainability would be won at the cost of fisheries’ contribution to livelihood sustainability. A middle course is provided by market standards that foster sustainable practices, in the hope that socially and environmentally aware consumers will make choices that support sustainability. This is likely to apply mostly to rich consumers in wealthy countries, and therefore to export-orientated fisheries in LDCs that supply these markets.
Poverty has proven persistent, both in fisheries and more generally. It even persists in the world’s wealthiest countries. It seems likely that lack of progress with poverty alleviation in much of sub-Saharan Africa will compromise the achievement of the Millennium Development Goals (Sahn and Stifel, 2003). Inequalities are arguably a structural feature of any market-based system of governance, but gross inequalities are not socially and politically sustainable, as the 18th century French aristocracy and the last Czar of Russia discovered to their cost. Compliance by the poor with fishery management goals set by the rich will likewise remain untenable while poverty and inequality and political and social exclusion persist in fisheries. The poor will deploy the ‘weapons of the weak’ (Scott, 1987) – a diverse array of passive and active acts of resistance - to subvert rules imposed on them by the powerful in either states or local elites. Without empowerment, progress towards sustainability through improved fishery management will be blocked by the very people it claims to serve.

Poverty is unsustainable, inside or outside the fishery. It is time for all involved in fisheries development to make a concerted effort to directly address issues of equity, empowerment and poverty alleviation in fishing communities. The future sustainability of fish stocks may depend on the outcomes of those efforts.

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DISCUSSION PAPER 18

DECENTRALIZATION, GOVERNANCE AND POVERTY: DETERMINANTS OF UNSUSTAINABILITY

Lessons Learned from the Visayan Sea, Philippines, and the Tonle Sap Great Lake, Cambodia

by

Ulrich W. Schmidt

Summary

The paper, focusing on small scale fisheries, examines the role of poverty and imperfect governance in natural resource management. It refers to the holistic approach of ecosystem management as advocated by FAO’s Code of Conduct and its application under conditions of poverty and population growth induced resource pressure and imperfect governance.

For the two cases discussed, i.e. the Visayan Sea, Philippines, and the Tonle Sap Great Lake, Cambodia, a third variable is considered: decentralization/devolution and the perspective of participatory, people and community based/participatory natural resource management (CBNRM, PNRM) which this structural change entails. Both constraints and potentials are examined, with particular emphasis on opportunities for poverty alleviation.

The working hypothesis of the paper is that natural resource management – here particularly management of living aquatic resources – under the conditions sketched above, must be:

- based on locally evolving management, plans elaborated with the full participation of resource users under conditions of basic democracy; and

- supported by enabling regulatory and management frameworks developed and enforced by Government as sovereign function of state.

The paper argues that even where the pressure of poverty and population increase can be balanced, and constraints imposed by imperfect governance can be overcome, policy makers may have to face the fact that limited resources ultimately imply limited capacity to absorb last resort fishers.

1. INTRODUCTION

The focus of this paper is on small scale fisheries of the developing world, for reasons which include the following.

- Compared to industrial fisheries, the far greater aggregate contribution of the subsector to income and employment worldwide/in developing countries/in rural/coastal areas. Ninety percent (90 percent) of the estimated overall 35 million fishers are considered small scale operators by FAO, and the World Bank estimates there are 2.2 billion people worldwide living within 100 km of the coastline (World Bank, 2004).

- The high incidence of poverty among small scale fisherfolk and the fact that increasing poverty produced in other sectors of the economy potentially and effectively increases “last resort fishing” and, thus, further threatens the resource base of small scale fishers.

133 The views expressed in this paper are solely those of the author, Ulrich W. Schmidt.
• The particular vulnerability of fishers as producers of a single commodity (fish and other aquatic organisms as raw material, not value-added products) and their reliance on monetary exchange/markets (dominated by others) in order to survive/meet their basic needs.

• Further increase in fishing pressure, from within the artisanal sector as well as from semi-industrial and industrial fleets, as demand from affluent markets continues to rise.

• Continuing trends of environmental degradation of coastal zones and other aquatic ecosystems exploited by small scale fishers through multiple resource use and negative effects of land-based economic activities.

It is evident that there is need for management of small scale fishing in both coastal and inland waters, not as a sub-element of an overall management regime, but as an integral and, possibly, its most important subject. Here, the author supports the “counter assertion” John Kurien made in the 2002 Bangkok Workshop with respect to the opinion expressed, in the same workshop, by Stephen Cunningham and Jean-Jacques Maguire, i.e. that “some element of fishing may prove difficult to bring within the management system” and, “over time, may undermine the system”. As one obvious example they suggest small scale fishing in developing countries (Cunningham and Maguire, 2002).

To this Kurien replied that “small scale fishers and their fishing activities will be central to any long-term vision of fisheries management and development in the developing country, tropical water multi-species ecosystem. Any future management system for these countries and ecosystems that takes no cognizance of this fact will be ecologically, economically, socially and politically infeasible” (Kurien, 2002). In the light of the fact that, within the fishery sector of most developing countries, the small scale sector is the most important, this statement is convincing.

Apart from the fact that they must be an integral part of any management system, small scale fisheries require management approaches which address their specific needs. Legal and regulatory frameworks and other macro-level management efforts must adequately cater for these needs and, above all, “manage” the interfaces of small scale fishing with semi-industrial/industrial fisheries and other economic sectors impacting the resource base of small scale fishers.

The notion that they may interfere with or “undermine” management schemes implemented on macro-level (applying regulatory instruments developed mainly for single species stock management and semi-industrial/industrial fisheries) abstracts from the central role small scale fisheries play in most developing countries. A few additional thoughts in support of this position are offered below.

In the (optimistic) view of the author, there may be a chance, in the long term, that industrial fishing capacities are reduced or at least arrested by national and international regulatory efforts, public pressure and civil society (from above). A similar scenario for the small scale fisheries of the developing world is less likely to become reality in the foreseeable future, as it would require a much more complex, multidimensional effort in order to overcome constraints from within and from outside of the sector. Constraints generated from within many small scale fisheries are the result of social, economic and cultural change best illustrated by a short look back in time.

Historically, open access and “no management” scenarios were the most commonly found conditions under which the fisheries took place, with abundant resources making catch limitations unnecessary. Where management took place, it was usually in delimited waters with a relatively high intensity of extraction. Under such traditional fisheries management systems, access was limited in accordance with shared value and behaviour patterns, providing for exclusivity. Compliance was rewarded with economic benefits and positive social sanctions, and perpetration resulted in collectively accepted negative sanctions (Cofad, 2002).

In most of today’s small scale fisheries, social cohesion/group dynamics favouring resource sharing and economic discipline have eroded, because of external factors (acculturation, super-imposed
“modern” management, increasing resource pressure/increased market demand), but also from within. Regulatory measures are no longer based on individually conceived and collectively based demand and compliance with traditional regulatory measures is no longer rewarded.

At the same time, management following “scientific” criteria is difficult, because of the complexity of the biological and ecological resource base of most tropical small scale fisheries which make a “rational choice” of management measures problematic. If rational management measures are developed, their enforcement is technically difficult because of the diverse structure, mobility and geographical dispersion of many artisanal fisheries, making them uneconomical and possibly politically expensive.

These and other “inherent” problems of today’s small scale fisheries make the “race for fish” the rational choice for most fishers. What to do? Going back in time and restoring “pre-industrial fishing” stock abundance appears impossible even to the most ardent restocking apologists. Therefore, going back in time towards participatory, people and community based/participatory natural resource management appears to be the most promising way to respond to the growing problems of small scale fisheries in developing countries. The realities and major determinants of this perspective are examined below for the coastal marine small scale fisheries of the Visayan Sea in the Philippines and the freshwater fisheries of the Tonle Sap Great Lake in Cambodia.

Although different in many ways, both fisheries have common features. Until not long ago, they were exploiting abundant and seemingly limitless stocks, which made management in terms of access limitations and other regulatory measures unnecessary. Now, they are experiencing dramatic increases of resource pressure that take place in a socio-political context determined by increasing poverty, imperfect governance and only partially/embrionically implemented decentralisation.

2. COASTAL FISHERIES OF THE VISAYAN SEA

The Visayan Sea, which covers about 10,000 km², is a relatively shallow sea basin surrounded by five islands. It used to be one of the most productive marine ecosystem in the Philippines, with its inshore (municipal) fishing grounds providing 13.5 percent of marine capture fisheries in 1995. However, overfishing by both small scale and industrial fleets (i.e. vessels of more than 3 GT), with regular encroachment into municipal fishing grounds by the latter, and increasingly destructive fishing practices by small scale fishers have brought about massive habitat loss and degradation and stocks that are close to collapse.

Severely depleted stocks led to increased levels of poverty among the small scale “municipal” fisherfolk and arrested the steady influx of fishers recorded until the beginning of the 1990s (FAO, 2000). Today, between 40 and 50 percent of the population of the Visayas are living below the poverty threshold, and among the small scale fishing household, 80 percent are estimated to live below the poverty line (Munoz, J.C., in FAO 2004).

A recent evaluation of a Filipino-German TA project (Visayan Sea Coastal Resources and Fisheries Management), described below, suggested some explanations with respect to decentralization, governance and poverty, and the limited progress observed (Schmidt, U.W. and Carada, W., 2004).

The existing legal framework is, overall, conducive to sustainable fisheries, and. It refers to the Philippine Constitution of 1987, which postulates that “the state shall protect the nation’s marine wealth in its archipelagic waters, territorial sea, and exclusive economic zone, and reserve its use and enjoyment exclusively to Filipino citizens”. Furthermore, it pledges to “protect the rights of subsistence fishers to the preferential use of the communal marine and fishing resources, both inland and offshore, and to provide support to subsistence fishers through appropriate technology, research and other services.” Other major components of the legal framework are:
• The Local Government Code (LGC). The Act introduced decentralization to the Philippines in 1991. The LGC transferred the responsibility for delivering of basic services and operating public facilities from central government to local government units (LGUs). The LGC also provided the LGUs with the mandate/the legal basis to safeguard and to manage marine resources within an area that extends from the shoreline to 15 km offshore. Central Government, through the Bureau of Fisheries and Aquatic Resources (BFAR) retains control only of waters beyond 15 km, while the Department of Environment and Natural Resources (DENR) is responsible coastal resource management (CRM) and the conservation of the coastal environment.

• The Philippine Fisheries Code of 1998. The Code succeeded the Fisheries Decree of 1975, which promoted fisheries as an area of investment and productive exploitation, and which defined municipal waters as waters extending three nautical miles (5.56 km) from the coastline, later to be expanded to 7 km. The Fisheries Code departs from this “production orientation”, confirms the extension of municipal waters to 15 km and the exclusive rights of municipal fishers to these waters, and defines sustainable development, management and conservation of fishery and aquatic resources as both a policy and objective of state. It includes provisions for registration and licensing of fishers, management of contiguous fishing grounds as a single resource/ecosystem, limitations of resource use, closed seasons, prohibition of the use of destructive fishing gear, and designation of fisheries reserves and sanctuaries. The Code supports the responsible involvement of LGUs and coastal communities in coastal resource management and the creation of Fisheries and Aquatic Resource Management Councils (FARMCs) as managing bodies.

• The Agriculture and Fisheries Modernization Act (AFMA) of 1997. The AFMA focuses on rational delivery of support services with the aim of poverty alleviation and social equity, food security, rational use of resources, global competitiveness, sustainable development, people empowerment and protection from unfair competition. AFMA provides for the formulation of an Agriculture and Fisheries Modernization Plan by the Department of Agriculture in consultation with the private sector and appropriate government agencies. Although the Act includes protection and preservation of the environment and empowerment/participation of small-scale producers as objectives, its overall orientation is towards increased production and growth.

• Other laws are the National Integrated and Protected Areas System Act and the Indigenous People’s Right Act, which deal with management issues and rights with regard to protected areas and local indigenous communities, or the Philippine Agenda 21 (PA 21). PA 21, for example, which aims at empowerment and capacity building of stakeholders for sustainable development in their decision-making processes and at directing efforts at conserving, protecting and rehabilitating ecosystems through an approach that harmonizes economic, ecological and social goals.

These and other provisions allow for decentralized, locally based coastal resource management, in spite of some inconsistencies in the institutional framework and disputes over delineation of municipal waters of LGUs with offshore islands. In fact, in some instances important achievements can be noted, e.g. in Iloilo and Negros Occidental, some municipalities formed regional alliances and joined efforts to better manage adjacent municipal waters, and in some areas the bantay dagat, fish wardens tasked to enforce law in municipal waters, have successfully kept intruders at bay.

However, these success stories are the exception rather than the rule and the critical mass of sustainably managed municipal fisheries necessary for sustainable management of the Visayan Sea ecosystem is far from being reached.

Two overarching constraints are evident. One is the limited extent to which decentralization has resulted in local capacities to manage resources and to deliver services. The Department of
Agriculture, for instance, had devolved more than 50 percent of its staff to LGUs by 1992, but respective budget provisions did not follow up devolution (as observed in decentralization scenarios worldwide, financial capacity/autonomy is the ultimate determinant of effective devolution of functions and capacities to local government). In the municipalities visited during the evaluation, means to implement management measures, in particular to enforce compliance were scarce at best, in spite the growing autonomy of LGUs to generate fiscal and other revenues. “Bantay dagat” boats, for example, were not available (no gasoline or under repair) or not fast enough to pursue violators and funds to buy or replace delineation markers, e.g. for marine protected areas (MPAs), were lacking.

Another factor impeding effective management was the organizational structure of the LGUs. There are three levels of local government, with the province at the top. The second level consists of municipalities and component cities. Component cities and municipalities are divided into barangays, the smallest political unit in the Philippines. Municipalities and even barangays, however, are not homogeneous socio-political entities and even where they consist mainly of fisherfolk, there are conflicts of interest. This is illustrated by the different organizations (FARMCs on municipality and barangay level, commercial fishermen association, or multi-purpose cooperatives including fishers) co-existing on LGU level and representing different interests. Although the Fisheries Code provides for a minimum of small-scale fishers to be included in the FARMCs, it was reported that groups not representing the interest of small-scale fishers often dominated the councils.

Vertical communication and interaction, between line agencies, municipal and barangay FARMCs, were found to be limited by lack of funds and logistics. The partner agency of the TA project evaluated, the Bureau of Fisheries and Aquatic Resources, depended largely on funds provided by the German side for carrying out fieldwork on LGU level.

Except for a few cases, as the alliances mentioned above, little horizontal communication/coordination (between different barangays and municipalities) existed, impeding integrated CRM in the sense of a holistic ecosystem approach. In some cases, this led to problems being “exported”, i.e. fishers who abstained from dynamiting in their municipal waters continued to do so in neighbouring fishing grounds.

Limited capacities of LGUs, low levels of organization and legitimacy of representation of FARMCs, heterogeneity of interest and little vertical and horizontal integration all contributed to the limited performance of the LGUs/FARMCs, both with respect to the decentralization process and the implementation of the legal framework of fisheries and CRM.

To this, evident imperfections of governance contribute. Elected or appointed political players have to balance loyalties to their appointing sponsor(s) and/or electorate with their duties to serve the common good. The resulting granting of concessions and favours are often to the detriment of environmental protection and little organized and represented groups like small-scale fishers. The latter are disadvantaged with respect to a judiciary which lacks democratic representation and is often partisan towards the more influential industrial vessel owners. In the few cases where commercial fishing vessels were intercepted while intruding in municipal waters, for example, the arbitrariness and favouritism in court decisions prevented deterrent sentences.

Conflicts between “commercial” vessels and small scale municipal fishers is of particular relevance for the the Visayan Sea. Vessels are categorized “commercial” when they exceed 3 GT (gross tonnes) and for many of these boats municipal waters are the traditional fishing grounds, because of their limited reach and because most stocks are found inshore. Although not necessarily pertaining to a different socio-economic strata, they are better organized and represented. Also, they argue (according to observers with some reason) that destructive fishing is done mostly by municipal fishers.

In conclusion, the following factors are considered decisive for the unsustainability of present fishing practices in the Visayan Sea.
Overfishing and destructive fishing practices resulted from a dramatic increase of municipal fishers (from about 130,000 in 1970 to more than 290,000 in 1990) and increased production by commercial fishing, especially in the 1990s (FAO, 2000). Small scale fishing appears to have been economically attractive until about 10 years ago, drawing large numbers of people into the profession, until individual revenues declined. This led to the levelling out of the numbers of fishers in the last decade, but, in spite of rampant poverty, not to any significant numbers of fishers leaving the subsector. The principle reason is that alternatives are still less attractive, and that so-called “alternative livelihood” projects financed by political patrons in truly paternalistic fashion (e.g. “swine dispersal”) induced people to continue fishing where, without these “supplementary” incomes, they may have left the profession.

An overall deficient decentralization process, which has failed to provide for effective services delivery because devolution of line ministry staff was not followed up by respective budget provisions. The process has resulted in large numbers of FARMCs formally established (in 85 percent of coastal municipalities and cities and in 64 percent of coastal barangays) but has largely failed to build legitimate, articulate and democratic representations of small-scale fishers. The principle reasons for this appear to be their overall socio-political context (imperfect governance, legal uncertainty and lack of democratic tradition), and their organizational structure, with heterogenous interests inviting elite capture.

The overall well designed legal framework has not been implemented to the extent that conflicts between commercial and municipal fishers are diffused by mediation, or that compliance, of commercial vessels with territorial use rights of municipal fishers, is enforced on meso- (province/region) level.

Finally, and in spite of being conducive to integrated CRM, the Fisheries Code and other legal and regulatory provisions are not sufficiently imperative with respect to neighbouring municipalities streamlining management efforts. As the area of jurisdiction of one LGU only covers a small portion of the fishing grounds across which stocks are distributed, holistic management of the Visayan Sea marine ecosystem depends on a critical mass of concerted and enforced local management plans. At present, this condition is far from being met.

3. THE INLAND FISHERIES OF THE TONLE SAP GREAT LAKE

The Tonle Sap Great Lake (TSGL) and the Mekong River are the main freshwater resources of Cambodia. On entering Cambodia the Mekong River joins the Tonle Sap River near Phnom Penh. The Tonle Sap River links the Great Lake which has an area of 0.25 million hectares and a maximum depth of about 3.6 metres in the dry season and which expands to 1.25 million hectares and is more than 10 metres deep in the rainy season, when rising waters flood the lower lying lake shores.

The TSGL and its floodplains are one of the most productive aquatic ecosystems in the world and support a freshwater fishery producing an estimated 235,000 tonnes of fish (Van Zalinge et al. 2000). The system is thus of central importance for rural livelihoods and for food security. Unlike in most other countries, where fish is becoming less and less affordable for the poor, fish is still a mainstay of the diet of consumers from all sections of society in Cambodia, accounting for 75 percent of the animal protein intake. During the peak fishing periods, for example, when small whitefish (trey riel) are abundant and cheap, tens of thousands of people, including many from upland fish deficit areas, harvest, buy or barter fish which they process into fish paste (‘pra hoc’), take home and store as a year-long protein supply.

However, the TSGL, as the main feature of Cambodia's inland freshwater fishery, is still a finite resource. Effects of an ever increasing resource pressure are becoming more and more evident, with respect to large species from the upper reaches of the food chain becoming scarce. Another indicator is the decline of fish catches per unit of effort many people and communities complain about.
Sverdrup-Jensen compiled data which showed that the 3.3 fold population increase between 1940 and 1995/96 (with fishing community members around the TSGL growing from 0.36 million to 1.2 million) had resulted in a decline of average catch by community member of 44 per cent in spite of an 1.9 fold increase in production (Sverdrup-Jensen, 2000). For domestic consumers, this trend has resulted in rising prices, with retail prices of some fish tripling over the last year.

Thus, indications are that the "carrying capacity" of the TSGL ecosystem is approaching its limits and there is an urgent need for management if the contribution of the system to Cambodia’s economy and food balance is to continue. Management must consider both domestically generated and transboundary problems. The latter include main stream dams in China and over 6,000 dams constructed in the lower Mekong basin since the 1950’s. Interventions in upstream countries, but also existing and planned dams on the TSGL tributaries are considered, by many scientists and observers, to be the main factors threatening not only the Lake but the inland fisheries of Cambodia.

The growing domestic problems that negatively impact on aquatic resources and habitats include, interdependently, imperfect governance and increasing poverty. Governance related problems have virtually impeded management and regulatory measures provided under the existing legal framework, the FIAT Law on Fishery Management and Administration of 1987 (the legal framework is being revised at present), including the following.

- The law, and subsequent sub-laws, allocate inland freshwater resources to open and limited access fisheries, specifying closed seasons, allowed and illegal fishing gear, fish sanctuaries and protected areas.

- Open access fisheries include middle-and small-scale fishing. Middle-scale fisheries require a license from the Provincial Fisheries Department, which defines allowed fishing methods, but the number of licenses are not limited.

- Small-scale, family fisheries are defined by allowed fishing methods alone, which include a large variety of simple gears such as single hooked lines, small dip nets, cast nets and gill nets less than 10 metres in length. Small-scale gear can legally be operated anywhere and at any time except from October to June in limited access areas and in protected areas such as fish sanctuaries.

- Limited access fisheries are concessions of delineated areas (lots) obtained by public auction. The concession grants lessees temporary exclusive use rights over fishing grounds or anchor points for large-scale fishing gear. Lessees are responsible for environmental protection within lot boundaries. Specific instructions for the management of each lot are contained in a "Burden Book" and include times of open and closed seasons, lot boundaries, access routes for the lessee, other users and members of fishing communities and define allowable gear types and locations.

Lack of enforcement of these potentially effective regulations led to a situation where the existing legal framework was all but ignored by stakeholders. Furthermore, groups or individuals holding power, whether through public office or informal mechanisms, drew benefits from inland fisheries, by direct exploitation, by providing protection to illegal fishing operations or by extracting "fees" from fishers, middlemen, processors and others.

Abuse of power, in particular by lot concessionaires expanding the area of their lots and intensifying fishing by sub-leasing (often with the help of armed guards) and large-scale illegal fishing by members of military or police led to widespread and dramatic conflict at the turn of the century. In response, Government, by a Prime Ministerial Decree, returned 56 percent of the total lot fishing area to open access in recent years. The areas “liberated” under the “fishery reform” were to be managed as “community fisheries” by fishing communities under the auspices of the Department of Fisheries (DoF) and a respective “sub-decree on community fisheries” was drafted.
However, the political will of Government to foster community-based natural resource/fisheries management encountered problems:

- After decades of civil strife and displacement, fishing communities had, and still have, low levels of organisation and social cohesion and traditional, locally evolved resource management structures upon which CBNRM could have been built on did not exist (presumably because of the past abundance of fish which provided enough for everyone).

- Where communities initiated first efforts towards community based fishery management (CBFM), they found that, with the “sub-decree on community fisheries” not yet adopted, they had no legal basis for key management measures, e.g. to prevent outsiders from fishing in their waters.

- The fisheries reform was not integrated into the SEILA decentralization strategy (the sub-decree, for example, foresees no institutional interface with commune councils and village development committees), which made holistic natural resource management at local government level problematic.

Thus, fishing communities were unable to take over from lot operators who had previously controlled access before. Together with weak DOF structures at provincial and district level, this created a power vacuum. As an immediate result, everybody who had any means to do so engaged in indiscriminate and destructive fishing, and the plundering of fish resources increased to levels never experienced before.

Today, more than three years after having been set in motion, the “fishery reform” is still in its inception phase. Local authorities and fishing communities, Government, in particular DoF and its Community Fisheries Development Office (CFDO), the donor community and NGOs have engaged in multiple efforts to improve the situation, drafting a new legal framework and helping fishing communities to take up their mandate. Successes are, as in the case of the Visayan Sea, scarce, with the Belgian funded, FAO implemented project “Participatory Natural Resource Management in Siem Reap Province” leading the way.

If community based fisheries management is to become the central instrument of aquatic resource management of the TSGL, there are major problems to be overcome. They concern the generally poor understanding of the concept of CBNRM on the part of many stakeholders (including most communities), an astonishing (considering the amount of funding which went into scientific research over the last decade) lack of data on the state of the living aquatic resources and the ecosystem at large, and the scarcity of other technical and socio-economic information. In fact, the community level management plans facilitated by the above mentioned project in Siem Reap Province rely, almost entirely, on local knowledge.

While these and similar “technical” shortcomings may be addressed through sensible and sufficient development support centring, for example, on grass-root capacity building and empowerment, major problems relating to the general social, political and economical context may prove much more difficult to overcome. As in the case of the Visayan Sea, they concern governance, including issues of decentralization and poverty.

Poor governance has been and is a prime constraint to the enforcement of the legal frameworks regulating the utilization of natural resources, including aquatic resources. UNDP, in its 2001 Draft Proposal on Integrated Resource Management in the Tonle Sap Region listed governance-related deficiencies concerning inland fisheries on three levels (quoted from Schmidt, U.W. Griffiths, D. and Chap, P., 2002) described below.
• **Local governance**: inadequate management of the fishing lot system; land tenure problems with increasingly inequitable land distribution; community participation in management and conservation limited by a lack of basic skills and by “top down” power structures; high rates of illiteracy; local social networks disrupted by 25 years of war and conflict; lack of local mechanisms for conflict resolution, ineffectuality of the court system; lack of accountability on the part of local leaders; insecurity, especially for non-Khmer minority fishers.

• **National governance**: an inadequate fisheries law which is currently under revision; unreliable statistics on fish catches; rivalries between ministries responsible for aquatic resources; no research stations (fisheries, agriculture, ecology); tendency to blame others for perceived problems in both the national press and politics rather than look for solutions.

• **International governance**: rivalries among international agencies are damaging rather than reinforcing inter-ministerial cooperation; the reliance on short-term projects where long-term projects are required; not enough investment in capacity building; little ownership by the Cambodian people of development assistance projects which is dominated by international organisations and NGOs.

Cambodia is still recovering from the impacts of war, genocide and civil strife and governance problems will continue to constrain sustainable use of natural/aquatic living resources for some time to come. CBNRM, as envisaged in the sub-decree on community fisheries, supported by a legal and regulatory framework on meso and macro level is possibly the most promising avenue to overcome the legal vacuum in which resource utilization takes place at present. However, an implementable regulatory and legal framework to support CBFM is still not in place (a recently completed project sponsored by ADB “to improve the legal and regulatory framework of inland fisheries” fell short of operationalizing the multiple governance related problems of fisheries management and proposed heavy-handed investment in infrastructure and technology-based solutions instead).

Another factor conducive to CBNRM could be SEILA, the decentralisation policy in which the Government has been engaged since 2000. Indeed, a major reason for the achievements of the FAO Participatory Natural Resource Management Project in Siem Reap was the fact that community fisheries could be integrated into local planning processes in spite of the lack of legal provisions supporting this process (see above). However, progress in effectively devolving functions to local level, in particular to the commune councils (who have the mandate of NRM, except for forestry resources) and village development committees is slow. Whithout management based on locally evolved and supported management plans and integrated into/ streamlined with overall NRM by local government, holistic management of the TSGL ecosystem will not be possible.

However, the dominant obstacles to sustainable management and utilization of the natural resources of the TSGL ecosystem are population growth and growing poverty. Poverty, induced by inequitable land distribution and increasing landlessness because of “land grabbing” by the powerful has steadily increased resource pressure. More people are entering fisheries because entry barriers are low. Especially for the landless, fishing is a last resort, together with hunting and the collection of fuel wood. At the same time, environmental degradation increases, because undiversified, marginally low production farming systems force small holder farmers to encroach on flooded forests and other floodplain habitats which are vital for fish production.

In conclusion, and in comparison with the Visayan Sea coastal fishery, factors perpetuating unsustainable use of the fishery resources of the TSGL ecosystem are more aggravated. As in the Visayan Sea, population pressure and increasing landlessness clearly translate into the management need to limit access. Legal provisions exist (or will, in the foreseeable future, be in place) but rational resource management by empowered communities will require more effort and a longer process than in the Philippines. The institutional framework required on local level will be forthcoming only slowly, because the decentralization process continues to be obstructed by interest groups seeking short term financial and political gain.
Imperfect governance, with little transparency and accountability is not fostering a stronger commitment, by Government, to the long term preservation of the environment and the natural resource base of inland fisheries. The donor community and many NGOs, on the other hand, shy away from the social and political costs of resource conservation, as documented by the fact that multi-and bi-lateral external assistance in forestry and fisheries have steeply declined in recent years. However, as in the Visayan Sea, not incurring these costs now, or as soon as possible, will ultimately destroy the livelihoods of future generations of people depending on the fishery of the TSGL.

4. LESSONS LEARNED

Lessons that can be learned from the examples support the “re-thinking” of management issues in small-scale fisheries of recent years, as expressed, for example, in the report of the Expert Consultation on the Role of Small Scale Fisheries in Poverty Alleviation and Food Security (FAO 2004), and provide, hopefully, some additional insight with respect to the relevance of decentralization, governance and poverty for CBNRM.

4.1 Decentralization and Management

In both cases discussed, decentralization policies entail provisions for locally based, participatory NRM. However, decentralization does not necessarily mean that co-management or CBNRM will evolve. In the Philippines, after more than a decade of experience, participatory coastal resource management has materialized only in a patchwork fashion and with massive development support, e.g. by the Filipino/USAID coastal resource management project. One reason for the difficulties encountered appears to be the heterogeneity of interests represented in the FARMCs, the designated fora for participatory local level management. Other reasons are deficient support/service delivery by devolved line ministry staff and lack of vertical (between central, meso-level and LGU-level) and horizontal (between LGUs) integration of efforts to implement a legal and regulatory framework.

In Cambodia, decentralization has reached a dimension where the de jure existence of local government has only just begun to foster, de facto, effective and participatory resource management. The process is in motion, however, and there are some significant examples that community fisheries can be integrated into local government planning processes. But there are also tendencies to return to centralized power and decision making structures, and the absence of a conducive regulatory framework may frustrate efforts, of community fishers and supporting government or non-government organizations, to implement CBFM. This is of particular relevance to the need to manage the TSGL ecosystem holistically, in a horizontally as well as in vertically integrated fashion.

The problems discussed should not downplay the actual and/or potential importance of decentralization for small scale fisheries and participatory, community based natural resource management (CBNRM). CBNRM requires decentralization and deconcentrated institutions on local level as the first interface with the institutional hierarchy of state. From experiences made over the last decades, for example those of the resident Participatory Natural Resource Management Project, a few elements on how to approach CBNRM can be gleaned, as follows.

- CBNRM must be locally based and demand driven. This means, for example, that management plans are elaborated area specific and with the full involvement of the resource users in order to correspond to objective (e.g., biological, ecological, socio-economic) and subjective (as seen by the users) demand.

- CBNRM must be horizontally integrated in order to fit with the management needs of the larger ecosystem. The need for a holistic approach to PNRM is addressed by Thay and Schmidt for the TSGL ecosystem: The authors suggest that management “can only be effective and sustainable if the interdependencies of all natural, human and political factors are realized. An ecosystem is not a scenario frozen in time but a dynamic and dialectic
process of interacting players and conditions driven by synergies and contradictions alike. Therefore, it makes sectarian intervention precarious, lends itself with difficulty to roadmaps and will frustrate blue print approaches to development” (Thay, S. and Schmidt, U.W., 2004).

- CBNRM must be supported by both effective local government structures and by macro-level legal and regulatory frameworks (which Government designs and enforces as sovereign function of state) and a functioning and impartial judiciary.

An example how decentralization can, if not actively foster, allow for CBNRM is given by Satria and Matsuda. The authors describe how fishing communities in the island of Lombok in Indonesia resurrected a traditional management system called awig-awig, meaning “a local rule”. This was done in response to the inability of local government to enforce a legal and regulatory framework potentially conducive to PNRM, in particular with respect to illegal and destructive fishing. The reinstatement of awig-awig proved effective, in spite (or because of) a catalogue of negative sanctions including “physical sanctions without resulting in death”, and “has grown under recognition of the local government” (Satria, A. Madsuda, Y. 2004).

4.2 Governance and management

From both cases discussed it is evident that effective decentralization is a function of effective good governance. The same has been said with respect to management, i.e. that effective natural resource management is a function of good governance. Unfortunately, many small-scale fisheries (not only in developing countries) take place under conditions of imperfect governance, for example with respect to basic democracy, accountability and transparency, elite capture and a biased judiciary. Under these conditions, effective political participation of small scale resource users is not likely to materialize as a result of development assistance conducted “from above”. Here, well functioning networks and patronages of political-economical power groups will be inclined to obstruct political participation of small-scale users and impede the “trickling down” of well meant “aid packages”. The means that they employ to achieve this are well documented.

The Philippine and Cambodian cases discussed show the need for legitimate representation of small scale fishers. Where basic democratic structures are missing or deficient, pluralistically constituted advisory or decisionmaking bodies as the FARMCs are likely to favor the more powerful and articulate. In order to voice their interest, small scale fishers must organize in truly representative fora restricted to owner-operators “bona fide” fishers eligible to fish under exclusive use rights arrangements.

This leads to the obvious conclusion that CBNRM must be rights based. This means that legal/regulatory provisions for territorial or other exclusive use rights allowing for CBNRM exist/are enforced on local, meso-and macro-level and that an impartial judiciary is in place to support enforcement and provide for mediation. Only under such conditions can communities take the initiative and create a momentum where central and local government have to follow-up on the many management and development plans which provide a central role for CBNRM.

Being right based does not mean that everybody has the right to fish, however, without consideration of resource limits, as remarked by Macinko and Bromley: “fishing is a privilege granted to fishers by society, and not a right in the sense normally accorded to the word” (Macinko and Bromley 2002 cited in Zeller and Pauly 2004).

4.3 Poverty and management

In both cases discussed, poverty, as a function of population growth, is obviously the most persistent problem of sustainable natural resource management. Population growth increases pressure on already severely depleted resources and resources increasingly under pressure in the Philippines and in Cambodia respectively. There is an urgent need for management, in particular for access limitations.
However, increasing poverty and the lack of livelihood alternatives make access limitations a rational but socially and politically high risk choice.

Poverty is thus a central element of small scale fisheries management and CBNRM (poverty is understood holistically and multidimensionally here, as expressed in the OECD Guidelines on Poverty Reduction and the UNDP’s Human Development Index, with emphasis on basic human rights including the right of households to provide for their basic needs, to security and to political participation). In order to classify different policies of combating poverty, this paper adopts the interpretations proposed recently in the “Draft Technical Guidelines on Small Scale Fisheries” presented for the Expert Consultation on the Role of Small Scale Fisheries in Poverty Reduction and Food Security (FAO, 2004, unpublished). The draft differentiates between poverty reduction, poverty prevention and poverty alleviation:

- Poverty reduction refers to increased monetary income derived from fishing and sale/processing of fish (either by improved efficiency of fishing operations or by increased prices at landing sites) and their distribution/consumption at household level and within households.

- Poverty prevention implies maintenance of livelihoods at a level which allows for the material, social and cultural survival of fishers, their family and their community. (Nota bene the subjectivity of this benchmark; what is seen as poor working and living conditions by outsiders may well be seen as perfectly acceptable by the “poor”, as often observed during participatory assessments).

- Poverty alleviation, in turn, is seen as straddling poverty reduction and poverty prevention.

These definitions may appear semantic, but they help to understand the evident trade-off between poverty reduction and poverty prevention implied in management approaches to small scale fisheries, described below.

If poverty reduction is the management goal, as it is the case, for example, in many poverty reduction strategies led by the Development Banks, increase in individual incomes and wealth generation is the intended effect of the resulting financial assistance projects. With most small scale fisheries approaching their respective “limits of growth”, however, investment in technology and infrastructure (with the intended result of increased efficiency of fishing operations) further accelerates the “race for fish”, with fishers not able to compete successfully being marginalized and, ultimately, loosing their livelihoods.

In other words, where the economic term of “rent” is used “value-free”, without considering who benefits, it denies the importance of distributional impacts and the equity dimension of primary production using common pool resources. Thus, the rationale of many large scale investment projects, i.e. that production and growth is a common goal by definition, is an analytical shortcut creating the illusion that increased sector rent equals increase of both individual incomes and equity of income distribution. Abstracting from the fact that more and more fishers are “racing” for less and less fish, this “shortcut” explains, at least in part, the ineffectiveness of many such development interventions in combatting poverty.

If poverty prevention is the management goal, distributional impacts must be the determinants of decision making. In both the TSGL and in the Visayan Sea, distributional considerations have been central to the management decision to provide small scale fishers with exclusive use rights. This paper argues that, whatever structural problems (as “stuttering” decentralization processes), imperfect governance and institutional shortcomings are plaguing implementation of this political will, the decision was justified. The following arguments are offered.
In dealing with small scale fisheries, rent (if the term needs to be used at all) should be understood as the sum of individual incomes. Overall production and rent in the conventional use are indicators for sector performance on macro-level, but income distribution and consumption patterns are the factors that will determine quality and quantity of livelihoods provided within the small scale subsector.

If we accept this, admittedly and purposely, simplified line of thought, the political-economical alternative to improved efficiency/productivity would be to improve the carrying capacity of small scale fisheries. This alternative is of particular socio-political attraction where fishing becomes a last resort activity of the poor and where poverty is on the increase, i.e. in both cases discussed above.

A further trade-off between optimizing equity of incomes distribution and the maximization of individual wealth is how consumption of monetary “rent” impacts on economic development. Here, the assumption is offered that polarised accumulated wealth is more likely to be “exported” while diversified small incomes are more likely to be consumed locally, spurring internal demand and supporting local/regional economies.

This does by no means project an “egalitarian” scenario where individual income and standards of living are independent from individual effort and performance. It is suggested, however, that the trade-off between polarisation and equity is of particular relevance for participatory and community based natural resource management (CBNRM). Here, a certain degree of equity, in the sense of sharing the resources granted to the fishing community by society (see Macinko and Bromley 2002) will be a necessary incentive, with “intergenerational equity” (Zeller and Pauly 2004) serving as an additional incentive.

The causalities of decentralization, governance and poverty in the context of small scale fisheries and participatory, community based natural/fisheries resource management are certainly more complex and interdependent than discussed above. But, following the seemingly banal and oversimplified argument, what is the evident conclusion? The conclusion is equally banal: The trade-off between resource sustainability and poverty alleviation as discussed above has (at least) two dimensions:

- if we reduce poverty by increasing the income of some at the expense of others, we don’t alleviate but create poverty if the displaced have no way to go; and
- if we prevent poverty, i.e. by accommodating as many people as possible, the capacity to do so remains limited.

Preventing and/or alleviating poverty by accommodating too many, for political, humanitarian or whatever reason, may deplete stocks/degrade the environment to the “point of no return” and bring about the ultimate trade-off: less poverty today at the expense of dramatically increased poverty tomorrow, with the “thrown in” malus of increased food insecurity and sustainably diminished fish supplies.

REFERENCES


This international workshop was organized in order to identify factors of unsustainability and overexploitation in fisheries and review major issues in the implementation of international fisheries instruments. The Workshop was based on a review of discussion papers that took into account the outcomes of the previous workshops on these issues. It addressed the following thematic issues: governance and fisheries management; causes or solutions for unsustainability; access and fishing rights; fishery management and sustainability dimensions; and small-scale issues and developing country perspective. This document contains the report of the Workshop and eighteen discussion papers submitted by participants.