



4TH GLOBAL CONFERENCE ON OCEANS, COASTS, AND ISLANDS

Working Group on Fisheries and Aquaculture: Sustainability and Governance



POLICY BRIEF ON FISHERIES AND AQUACULTURE



*Organized by the
Global Forum on Oceans,
Coasts, and Islands and
Hosted by the Government of
Vietnam, Ministry of
Agriculture and Rural
Development
with principal funding
from the Global
Environment Facility*



Vietnam



GEF



R O Korea



Indonesia



CANADA



日本国政府
農林水産省



Flemish Government,
Belgium



Global Forum on Oceans, Coasts, and Islands--Strategic Oceans Planning to 2016

The Global forum on Oceans, Coasts, and Islands has undertaken a strategic planning effort for the period 2006-2016 to develop policy recommendations for specific next steps needed to advance the global oceans agenda aimed at governments, UN agencies, NGOs, industry, and scientific groups. To this effect, Working Groups have been organized around 12 major topic areas related to the global oceans commitments made at the 2002 World Summit on Sustainable Development and to emerging issues facing the global oceans community.

The Working Groups have been organized and coordinated by the Global Forum Secretariat, under the direction of Dr. Biliana Cicin-Sain, Co-Chair and Head of Secretariat, Global Forum on Oceans, Coasts, and Islands, and involving the following staff from the Gerard J. Mangone Center for Marine Policy, University of Delaware: Miriam Balgos, Kateryna Wowk, Caitlin Snyder, Shelby Hockenberry, and Kathleen McCole.

Working Group on Fisheries and Aquaculture – Sustainability and Governance

WORKING GROUP LEADERS:

Rebecca Lent, National Marine Fisheries Service, NOAA

Chris Tompkins, Independent Consultant, formerly DEFRA, UK

Ali Mohamed, New Partnership for Africa's Development (NEPAD)

Le Thanh Luu, Research Institute for Aquaculture No. 1, Vietnam

David Balton, U.S. Department of State

Jean-Francois Pulvenis de Seligny, FAO

Kieran Kelleher, World Bank

Mick O'Toole, Benguela Current Large Marine Ecosystem Programme

John Connelly and Stetson Tinkham, National Fisheries Institute, International Coalition of Fishing Organizations

Barbara Hanchard, GEF UNDP Oceanic Fisheries Management Project

WORKING GROUP MEMBERS:

Arthur Bogason, World Forum of Fish Harvesters and Fish Workers, Iceland

Nguyen Chu Hoi, Institute of Fisheries Economics and Planning, MARD, Vietnam

Anthony Cox, Organisation for Economic Cooperation and Development (OECD)

Simon Cripps, Global Marine Programme, World Wide Fund For Nature (WWF) International

Anamarija Frankic, University of Massachusetts Boston

Julius Francis, Western Indian Ocean Marine Science Association (WIOMSA)

Matthew Gianni, Deep Sea Conservation Coalition, The Netherlands

Stephen Hall, WorldFish Center (ICLARM)

Dawn Martin, SeaWeb

Rebecca Metzner, FAO

Magnus Ngoile, Marine and Coastal Environment Management Project (MACEMP), Tanzania

Pietro Parravano, Institute for Fisheries Resources, World Fisheries Forum

Daniel Pauly, Fisheries Centre, University of British Columbia

James R. McGoodwin, Professor of Anthropology, University of Colorado

Gorazd Ruseski, Kelly Moore, Steven Purvis and Anne Frenette, Department of Fisheries and Oceans, Canada

Jorge Chocair Santibañez, Undersecretary of State for Fisheries, Chile

Kenneth Sherman, LME Program

Robin Mahon, University of West Indies

Sebastian Matthews, International Collective in Support of Fishworkers

Rudolf Dorah, Constitutional Reform Congress, Solomon Islands

Joe Terry, NOAA

Yihang Jiang, GEF Yellow Sea LME Project

Juan Luis Suárez de Vivero, Department of Human Geography, University of Seville

Paul Holthus, Independent Consultant

Global Forum on Oceans, Coasts, and Islands

Working Group on Fisheries and Aquaculture – Sustainability and Governance

**Policy Brief:
Fisheries and Aquaculture – Sustainability and Governance**

Lead Authors

Rebecca Lent, Elizabethann English, Ryan Wulff
Jean-François Pulvenis de Séligny, Robin Mahon, Anthony Cox, David
Balton, Chris Tompkins, Stetson Tinkham, Rebecca Metzner, Joe Terry,
James R. McGoodwin, Grace Mellano, Angela Bexten, and Kelly Moore

Draft March 30, 2008

Table of Contents

Foreword by Biliana Cicin-Sain, Global Forum	iii
Policy Brief	
1. Climate Change and Fisheries	1
2. IUU Fishing	19
3. Regional Fisheries Management Organization (RFMO) Reform	25
4. Overcapacity	31
5. Aquaculture	49
6. Tuna: A Global Sustainability and Governance Challenge	61
References	

Foreword

Working Group on Fisheries and Aquaculture – Sustainability and Governance

About three quarters of the world's marine fisheries cannot withstand increased pressure. In 2005, 76% of marine fish stocks were classified by the Food and Agriculture Organization of the United Nations (FAO) as fully exploited, overexploited, or depleted, meaning the stocks are being fished at or beyond their maximum biological productivity. Only 23% were under or moderately exploited and 1% were recovering. According to the FAO, there has been a steady increase in the proportion of marine fish stocks that are classified as overexploited or depleted. Sustainability in fisheries and aquaculture is essential as the world's population continues to grow and fish consumption increases. Employment in fisheries is growing faster than other agriculture sectors and many communities in developing countries rely on fishing for their livelihood.

An important shift from species-by-species management of fisheries towards ecosystem-based management is occurring at various levels. In particular, regional fisheries management organizations and Large Marine Ecosystem Projects are trying to operationalize ecosystem-based management, strengthen cooperation, and improve compliance and enforcement mechanisms, so that highly migratory, straddling, and shared stocks are adequately managed. Much further action, however, is needed to address such issues as: 1) overcapacity of the world's fishing fleet; 2) illegal, unreported, and unregulated (IUU) fishing, including by vessels flying "flags of convenience;" 3) subsidies which contribute to overcapacity and IUU fishing; 4) the use of fishing techniques and technologies that have adverse effects on the physical habitats and on non-targeted species; 5) allocation of fishing rights; 6) sustainable development of aquaculture; and 7) international fish trade and the impacts of market based standards.

With regard to Fisheries and Aquaculture, the 2002 WSSD established the goals of:

- Implement the FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported, and Unregulated Fishing (IUU) by 2004
- Implement the FAO International Plan of Action for the Management of Fishing Capacity by 2005
- Eliminate subsidies that contribute to illegal, unreported, and unregulated fishing and to overcapacity
- Maintain or restore depleted fish stocks to levels that can produce their maximum sustainable yield on an urgent basis and where possible no later than 2015
- Assist developing countries in coordinating policies and programmes at the regional and sub-regional levels aimed at *conservation and sustainable management of fishery resources* and implement integrated coastal area management plans, including through the development of infrastructure.
- Develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the *elimination of destructive fishing practices*, and the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012.

In the Global Forum's 2006 report on *How Well Are We Doing in Implementing Global Commitments on Oceans, Coasts, and Islands*, we reported that in the period 2002-2006, only very modest tangible progress had been made in the fisheries area. For example, with regards to IUU fishing, only about 10% of nations had prepared or are preparing national action plans to address IUU fishing. Nevertheless, the 2006 report concluded that regarding the long-term goal of maintaining or restoring depleted fish stocks and the broad goal of achieving ecosystem management of fisheries, a growing acceptance of the ecosystem approach to fisheries appears to be taking place among national governments and international organizations. Indeed, a paradigm shift may be taking place—fisheries matters have traditionally been considered in a highly sectoral and separate manner, but now key fishery practitioners are moving toward a broader ecosystem concept which also takes into account other uses and resources of ocean and coastal areas. There are encouraging signs that the groundwork is being laid for attaining the enabling conditions which will lead to sustainable fisheries development in 2015.

This Policy Brief incorporates a number of papers which have been prepared by the Working Group on Fisheries and Aquaculture: Sustainability and Governance, under the very effective leadership of Dr. Rebecca Lent, Director of International Fisheries, National Oceanic and Atmospheric Administration and her team. The following major issues are addressed:

The Effects of Climate on Fisheries. This brief, prepared by Professor James R. McGoodwin, calls attention to the effects of global warming on fisheries which will prompt unprecedented, extraordinary and lasting change in various fisheries to which fishing people will have great difficulty in adapting (or may not even be able to do so). Fish species that have never been seen before may suddenly become more abundant while other species fishers have long relied on may disappear, deeply affecting coastal communities, shore-side fisheries facilities, and supporting infrastructure.

Illegal, Unreported and Unregulated (IUU) Fishing. This brief calls attention to specific next steps which should be taken by the international community to strengthen global monitoring control and surveillance efforts to prevent, deter, and eliminate illegal, unreported and unregulated fishing.

Regional Fisheries Management Organization (RFMO) Reform. This brief considers measures to improve the performance of the key fishery management organizations around the world to become the stewards of sustainable fishing as well as to evolve toward broader understanding of the whole ecosystem of which fisheries form part.

Addressing Overcapacity in Fisheries—This brief details specific measures that can be taken to address the major problem of overcapacity in fisheries—too many boats going after too few fish.

Aquaculture: Fish for Food—A Shift in Reliance from Wild Stocks and Capture Fisheries to Aquaculture? This brief addresses the global expansion of aquaculture asking the question of how to do aquaculture right? Unless there is proper planning and adequate legal and regulatory structures are in place to avert potential environmental harm, there could be unregulated, uncontrolled aquaculture development in many parts of the world which could in turn lead to the industry's self-destruction.

Tuna: A Global Sustainability and Governance Challenge

Through the lens of this highly valuable fishery, this brief examines the challenges facing the management of tuna fisheries including fleet overcapacity, institutional overfishing, IUU fishing, maintaining and restoring depleted stocks, and reducing bycatch of non-target tuna species and other species (such as sharks, seabirds, turtles, and mammals). Mechanisms to address these challenges include implementation of flag State, port State and market State responsibilities, as well as better data collection and information sharing regarding catches and vessels.

Major Discussion Goals on Fisheries and Aquaculture at the Global Conference

1. What will be the range of climate effects of fisheries and what policies can be put in place to help fishers adapt to these changes and to address such changes?
2. What specific next steps need to be taken by the international community to accelerate progress in controlling illegal, unregulated and unreported fishing?
3. What specific next steps need to be taken by the international community to accelerate progress in addressing the problem of fishing overcapacity—too many boats going after too few fish?
4. What specific next steps need to be taken by the international community to accelerate progress in enhancing the performance of the Regional Fishery Management Organizations to achieve sustainable fisheries management as well as to move toward ecosystem-based management of ocean areas?
5. How to do aquaculture right? Is additional and more detailed global guidance as well as global targets (akin to the WSSD targets on fisheries) needed to properly steer this important food-generating activity?

The Global Forum Secretariat expresses its gratitude to the Leaders and Members of the Working Group on Fisheries and Aquaculture for their expert perspectives and hard work in delineating key issues in fisheries and aquaculture for the consideration of Global Conference Participants, with special recognition of the pivotal roles played by Rebecca Lent, Elizabethann English, Ryan Wulff and Joe Terry, U.S. NOAA, David Balton, U.S. Department of State, Jean-Francois Pulvenis and Rebecca Metzner, FAO, Chris Tompkins, DEFRA UK, Stetson Tinkham, International Coalition of Fishing Organizations, Lori Ridgeway, Steve Purvis, Grace Mellano, Angela Bexten, and Kelly Moore. Department of Fisheries and Oceans, Canada, James McGoodwin, University of Colorado, Robin Mahon, University of the West Indies, Barbados, and Anthony Cox, OECD.

The Working Group and the Global Forum Secretariat wishes to express its sadness at the untimely passing away of Ralph Rayburn, a key leader in fisheries management in the United States, a wonderful friend and colleague, and a strong supporter of the work of the Global Forum.

Possible future directions:

The Global Forum kindly invites Global Conference participants to consider mobilizing, in the next phase, a Group to focus on Enhancing Ocean Use Agreements in the Exclusive Economic Zones of Developing Countries (agreements for fisheries, oil and gas development, etc.) to improve their design and implementation in order to enhance local benefits, social equity, resource conservation, and public transparency. The need to mobilize on this issue was emphasized by high-level leaders at the 2006 global oceans conference.

Biliana Cicin-Sain
Co-Chair and Head of Secretariat,
Global Forum on Oceans, Coasts, and
Islands

Policy Brief:

Climate Change and Fisheries

1. Introduction

The Intergovernmental Panel on Climate Change reports in 2001, as well as those recently released in 2007, conclude that the global climate system is warming (IPCC 2001 a., b., and c., and IPCC 2007 a., b., and c.). Since the mid 20th century most of this increase has been due to anthropogenic causes--specifically, humanity's use of fossil fuels which releases carbon-dioxide and other "greenhouse gases" into the atmosphere. A global increase in temperature, as well as sea level rise prompted by melting ice in high latitudes, is anticipated. And even if greenhouse gas concentrations are stabilized, the warming trend will continue for centuries to come, with the extent of its future increase depending mainly on the relative intensity of human fossil fuel use in the future.

The IPCC reports project world temperature will rise by 1.1 to 6.4 °C (2.0 to 11.5 °F) during the 21st century, while sea levels will rise by 18 to 59 cm (7.08 to 23.22 in). There will be more frequent heat waves and heavy rainfalls, continuing disappearance of glaciers, and an overall increase in droughts, extreme high tides, tropical cyclones, and significant changes in the earth's living ecosystems.

The IPCC reports further suggest there is a good likelihood that past, present, and future anthropogenic greenhouse emissions will contribute to climate warming and sea level rise for more than a millennium to come. In other words, the IPCC reports suggest that

humanity will not be able to do much to stem the tide of global warming, at least not over the coming century or so.

Today's global population is also confronted with a paradox that will be very difficult to resolve. On the one hand there is now widespread acceptance of the reality and inevitability of the foregoing phenomena; but on the other hand the global human population continues to grow, and likewise clamor for the very fossil fuels that are so implicated in this problem in order to sustain and develop its social and economic systems.

Various futuristic scenarios have been put forward. Some describe gradual, incremental changes that humanity will have a high likelihood of adapting to. Others foresee catastrophic and even "doomsday" changes that would be disastrous for much of the world's future human population.

Yet while future global warming is now conceded to be a virtual certainty, its specific impacts and how these can be accommodated pose questions that are currently marked with high degrees of uncertainty. Hence, while most scientists agree that a long-term global warming trend is already underway, there is little agreement among them regarding its specific impacts and consequences for humanity.

Perhaps the only future that can be projected for sure is that there will be unprecedented environmental changes, and equally unprecedented levels of uncertainty regarding them.

1.1 *Global Warming's Impact on the World's Fisheries*

With regard for global warming's impact on the world's fisheries, a variety of future climate change scenarios have been proposed, ranging from the mildly beneficial to the truly catastrophic.

At the most benign end of the spectrum a few scientists have suggested that a general global warming of ocean waters will increase global ocean productivity. However, even these still concede that this will be accompanied by significant changes in species distributions and ecosystem biodiversities. Some have also suggested that the general warming trend will especially increase the productivity of certain species in high-latitude regions.

1.2 *Mainstream projections*

Most mainstream scenarios, however, describe more disruptive changes in marine-species distribution and ecosystem biodiversity. Some also add that there will be outright extinctions at the margins of various species' current distributional ranges. And in any event most also think that the impact of ocean warming on various marine species will be most pronounced at the northern and southern margins of their customary ranges. Moreover, because these margins or transitional regions are usually characterized by greater degrees of biodiversity, changes in them will impact biodiversity to a greater degree than will be seen in ocean regions that are well away from them.

Clearly global warming will prompt widespread, and in some regions even radical changes in biodiversity, stock sizes and distribution, and other changes in natural ecosystems. But at

present there is not enough information to forecast these changes with very much certainty.

Even slight changes in ocean temperatures may prompt significant shifts in the distribution of various fish species—for example, from one nation's EEZ to that of a nearby nation, while changes in stock distributions within a nation's EEZ may be disruptive to various components of the fish chain, including producers, processors, marketers, ancillary fisheries enterprises, and ultimate consumers. Such disruptions may therefore be especially disruptive in developing countries, whose coastal inhabitants often have few other economic opportunities available to them.

Water temperature is a fundamental variable underlying the ability of marine ecosystems to support various organisms, and temperature is likewise fundamental to determining a species' geographic range. And because most fish species have a fairly narrow range of temperatures they can tolerate and thrive within, the area they occupy may expand, contract, or be relocated with changes in ocean temperature.

Although global warming will prompt a *general* increase in ocean water temperature worldwide, many regions may actually become cooler. Thus, new climatic and ocean-current patterns will prompt the development of temperature regimes in many regions that are currently difficult to foresee. And whether these changes will be sufficiently gradual to allow species and ecosystems to adapt to them also remains to be seen.

While changes in water temperature certainly have profound effects on fish populations, the production of fish biomass is also importantly influenced

by complex interactions among other physical, biological, and chemical processes. Thus, global climate change may prompt fisheries in some regions to display unanticipated, anomalous, and even counter-intuitive effects.

Regarding regional changes in the abundance of various fish species, there will definitely be “winners” and “losers,” but not necessarily in a zero-sum sense. This is because the *pace* of change will also be an important determinant of how various marine species fare as a result of warming. Warming may therefore prompt rapid collapses of species and marine ecosystems that are unable to adapt as fast as the environmental changes that are taking place.

1.3 Impacts on Fishing People

Even the more conservative projections of future sea level rise and increased frequency and intensity of storms will place great strains on many coastal people. Rising sea levels accompanied by persistent coastal flooding in some regions, and permanent inundations in others, may prompt not only radical marine-ecological change, but will also require costly re-location of shore-side facilities, housing, and supporting infrastructure.

Most of the world’s fishing people understand that climatic and environmental *variation* prompts variations in ocean-ecological conditions, which in turn prompts variations in fish-stock sizes and availability. Most also understand that excess fishing can lead to stock depletions or collapses. Thus, many fishing people have developed means for adapting to the ordinary variations that are seen in fisheries without experiencing serious problems.

The global warming trend, however, will prompt unprecedented, extraordinary, and lasting *change* in various fisheries, which may be much more difficult, and in some cases impossible, for fishing people to adapt to. Fish species they have heretofore never seen may suddenly become abundant, while other species they have long relied upon may disappear. In some regions climatic and ocean-ecosystem changes may be the sole reason, but these changes may also be hastened, or prevented, by the *combined* effects of ocean-ecosystem change *and* fishing effort.

In sum, as global warming proceeds the management regimes that fishing people work within will likely present them with higher degrees of uncertainty than they have been confronted with before. This will heighten tensions between fishing people and fisheries managers, and likewise heighten fishing peoples’ uncertainties regarding their future investments in the fisheries.

1.4 Climate change and fisheries effects

Climate change and fishing effort will together prompt new and sometimes unprecedented ocean-ecosystem changes, but in ways that are currently difficult to forecast. Indeed, these two components influence ocean ecosystems in rather different ways. Climatic and environmental changes are generally more pervasive, whereas fishing activity is generally more selective, for example, by more often targeting larger individual fish or larger fish species.

Furthermore, fisheries scientists may be increasingly less able to provide credible assessment advice for preventing major fishery collapses as the climate moves farther from its

historic baseline. Heretofore, estimates of the abundance of fish species have been derived mainly from records of fish landings. But landings are usually as much influenced by economic factors, fishing methods, and fishing effort, as they are by climatic and ecosystem conditions. Therefore, fisheries managers who are poorly informed about changing ocean-ecological conditions, and who continue to rely on outdated data on landings, may unwittingly accelerate stock collapses and the disappearance of fish species where they have long been plentiful.

1.5 High Latitude Regions Will be Especially Vulnerable

A multitude of scientific reports have also suggested that the impacts of global warming will be especially severe in high-latitude regions--the recent report of the Arctic Council and the International Arctic Science Committee (ACIA 2004), for example. As the planet warms melting sea ice will infuse greater quantities of fresh water into ocean ecosystems. But more problematic, because sea ice reflects much of the sun's heat back into space, as it melts away ocean waters will be able to absorb more of the sun's heat. This feedback loop will accelerate the warming phenomenon and correspondingly accelerate the rate of sea-level rise. Clearly then, the pace and intensity of ocean ecosystem change in high-latitude regions will be especially pronounced.

The recent ACIA report, for example, concluded that the Arctic climate is changing almost twice as fast as the rate of climatic change at lower latitudes. And according to the 2001 IPCC reports, the greatest temperature increases over the last 35 years occurred in Arctic and sub-Arctic regions. In parts of these regions the

warming has been extreme--as much as 3.9 to 5.6 C (roughly 7 to 10 degrees F). Projecting this trend two to three decades into the future, such warming may prompt rapid disruption, alteration, or even collapse of various marine-ecological systems as they are unable to adapt as fast as the rate of change that is taking place.

1.6 Some Catastrophic Projections

Some especially catastrophic projections have also been proposed. These include extreme changes in climate regimes and ocean currents, extraordinary sea-level rise, and acidification of the ocean.

Regarding the first of these catastrophic possibilities, some scientists have proposed that the Gulf Stream may be significantly slowed, or even shut down, by an influx of cold fresh water from melting ice caps. Were this to happen a new ice age might ensue in Europe in less than 10 years.

Regarding the second catastrophic possibility, extraordinary sea-level rise, it has been suggested that widespread melting of ice in Arctic and Antarctic regions could prompt a 6 meter rise in sea level during the coming century, displacing roughly 50-70% of the world's human population which now lives in coastal zones. And even more modest rises in sea level would still be catastrophic for people living in many developing countries. For instance, the World Bank estimates that a one meter rise in sea level would turn at least 56 million people in the developing world into environmental refugees.

Regarding the third possibility, acidification of the ocean, depending on its degree this could also be catastrophic for many ocean ecosystems. Acidification of ocean

water is caused by increased CO₂ in the atmosphere, which produces increased carbonic acid in ocean waters. Thus, while temperature changes will vary considerably in different regions of the ocean, increased acidification and CO₂ in ocean water will likely be spread more evenly and pervasively throughout the oceans worldwide.

Especially at risk from acidification will be corals and mollusks, the so-called “marine calcifiers,” whose skeletons and shells are constructed from calcium carbonate. Significant acidification may therefore lead to a widespread decimation of tropical reefs around the world, as well as decimation of the many fish and other marine species that live around them. At the same time ocean acidification may reduce the general health and productivity of marine species found in temperate and high-latitude regions.

1.7 Conclusion

For the world’s fishing communities—from the smallest scale subsistence-oriented ones to the largest-scale industrialized ones--being able to adapt to future climatic and marine-ecological variability and change will be essential for sustaining their economies, societies, and general well being. It will also be essential for sustaining the world’s food supplies that are derived from the sea.

The IPCC working group on fisheries recently acknowledged that its forecasts regarding global warming’s impacts on fisheries were mainly informed by case studies that had focused on how ocean-environmental changes may have influenced fish stocks. And for now scientists will have to rely to a great degree on generalizations derived from case studies like these to help them propose how fishing people, and fisheries-

management organizations, should respond to the challenges posed by global warming.

1.8 Case Studies

In recent years a number of case studies have emerged suggesting linkages between fishing effort, environmental changes, and fishery collapses. Among these are studies documenting the collapse of the long-abundant herring stocks around Iceland in the 1960’s. Initially this collapse was thought to have resulted from over-fishing, but recent advances in the environmental sciences now support conclusions that the collapse was actually the result of excessive fishing combined with changed environmental conditions (Arnason 1995, Belkin et al. 1998, Dickson et al. 1988, Durrenberger and Pálsson 1989, and Hamilton et al. 2004).

Heretofore, because of the general deficit of information regarding the impact of ocean conditions on fisheries resources, as compared with the often more abundant data regarding fishing effort, the influence of ocean conditions on fisheries resources was little understood, and sometimes even overlooked as an important contributor to fishery collapses.

1.9 Case Studies from Iceland and Alaska

In 2001 through 2004, research was undertaken to explore how climatic variability impacts three fishing communities in high-latitude regions in Iceland and Alaska. This research entailed on-location field work as well as studies of meteorological data and various other archival sources. The research was supported by the U.S. National Science Foundation and the University of Colorado, and some of the results were recently discussed in

an article appearing in the journal, *Marine Policy* (McGoodwin 2007).

It was hypothesized that a better understanding of how fishing people in these high-latitude regions are impacted by and respond to climatic *variability* might provide clues as to how they might be impacted by and respond to climatic *change*. In turn, it was hoped this might help to propose fisheries-management policies that would give them better chances of making sustainable adaptations to the sorts of changes that climatic change will prompt in the future. More broadly, it was also hoped that what was learned might help to inform fisheries policies for high-latitude regions, which undoubtedly will experience significant environmental changes that are prompted by global warming.

Excellent meteorological data tracking climatic *variability* over many past years was available for both of the regions that were studied. On the other hand, definitive data regarding climatic *change* was virtually non-existent—which, unfortunately, is the situation regarding most of the world's fishing regions these days.

The three fishing communities studied were the following:

- A fully modern, industrialized, small, island fishing community in South Central Iceland, which targets a diversity of marine species. Both large-vessel and small-boat fishers are based in this community, and turn over virtually all of their catches to a local market for export abroad. Fishing activities are regulated by an ITQ system that is managed by Icelandic fisheries officials.
- A fully modern, industrialized, small-boat fishing community in Southwest Alaska that produces salmon in inshore bays and turns over virtually all of its catches to a local processing plant for export abroad. Fishing activity is regulated by a limited-entry licensing system in combination with periodic open and closed days in the local fishery, which is managed by Alaska fisheries officials.
- Four small isolated native communities in the same region of Southwest Alaska, which produce salmon migrating up rivers—their traditional and main dietary staple—entirely for meeting local subsistence needs. Fishers in these communities are required to apply annually to Alaska fisheries officials for cost-free subsistence fishing licenses, report their catches to help inform stock assessments, and are prohibited from selling their catches. Otherwise their subsistence fishing activities are essentially unregulated.

What was looked for in all of the foregoing communities was how climatic variability influences fishing production. But the researchers were soon reminded that even a seemingly simple and presumably empirical concept such as “fish production” is actually the result of many interrelated factors, including fish supplies, fishing conditions, market demand, market dynamics, distribution structures, linkages with larger economies, shifting political and economic forces, emerging legal and regulatory regimes, rapid technological change, changes in human values about life and work—and variations in climatic and marine-ecosystem conditions.

Attempting to conceptualize the links between climatic variability and human fishing activity therefore posed a daunting problem, because there were so many intervening variables. But however complex these relationships were, it still seemed reasonable to assume that climatic and marine-ecosystem variability must influence human fishing activity in some way, and the researchers wanted to discover how.

1.10 Findings regarding the fishing community in Iceland

- Fishers who worked in both large and small vessels stressed that the current ITQ regime afforded them little flexibility in being able to respond to variations in fish-stock availability. In essence, owners of quotas for certain stocks could not switch to fishing other stocks when the stock they “owned” was unavailable—not even when other stocks were available that nobody had any claim to.
- The fishing activities of small-boat fishers were greatly constrained by severe weather and sea conditions, whereas the large-scale vessels could fish in practically any conditions. Thus, the large-scale operators enjoyed a sizeable competitive edge over their smaller-scale counterparts by virtue of their being able to spend more time fishing, especially during Iceland’s severe winter months.
- The larger vessels could catch far more fish per crewman employed than the smaller vessels could, again giving them a significant competitive advantage over the small-vessel operators. For several past years this had progressively marginalized small-boat operators and increased local unemployment levels.
- Even if the ITQ regimes had so far prevented over-harvesting, most fish stocks were being harvested to near their theoretical limits. This left all fishers vulnerable to severe economic risks should ocean-ecosystem conditions bring about stock declines. Indeed, the current ITQ regime posed ongoing harvest pressures that would be difficult to reduce should changes in climatic and ocean-ecosystem conditions require it.
- In this semi-isolated island community, which is inordinately dependent on fishing industry, a lack of other local economic opportunities placed its inhabitants at great economic risk should ocean-ecosystem changes bring about declines in essential fish stocks.
- The local fishing community’s economic security was also threatened by its high degree of dependency on global fish markets, including markets which are greatly influenced by climatic variability in other distant parts of the world. Thus, when the El Niño Southern Oscillation drastically curtails Peruvian fish-meal production, Iceland’s local fishers who own quotas for species that are targeted for reduction will have a very profitable year. But oppositely, high-production seasons in the Peruvian fishery can render the Icelanders’ quotas for reduction species virtually worthless—no matter how abundant they may be. Thus, the local fishing community in Iceland is economically vulnerable to the effects of distant climatic events over which it exerts no control, and

which are also often difficult to forecast.

1.11 Findings regarding the commercial fishery in Southwest Alaska

- Despite a strictly enforced limited-entry licensing scheme, as well as a steady increase in recent years in the number of closed days to permit salmon escapement, salmon stocks in this region have been steadily declining over the past decade, confronting these fishers with declining yields. At the same time, due in part to the steady increase of inexpensive farm-raised salmon in various global fish markets, prices for their catches have also been depressed.
- Excessive fishing may be part of the reason for the steady decline of salmon stocks in this region in recent years, but changing ocean conditions can also be suspected, although definitive information about the latter remains elusive given the salmon's vast migratory range.
- The main means for combating the steady decline in salmon stocks has been to increase the number of closed days to permit salmon escapement. This has exposed these fishers to higher levels of risk, especially when the open days coincide with dangerous weather conditions. Faced with increasing economic pressures, many fishers feel compelled to go out when open days coincide with bad weather conditions, and several recent fatalities have been attributed to this increased pressure on local fishers. Moreover, inasmuch as global warming portends an increase in the frequency and intensity of coastal

storms, unless changes are made in the management system this problem may get worse in the future.

1.12 Findings regarding the native subsistence fishing communities in Southwest Alaska

- Although salmon stocks have been steadily declining in recent years there is little concern about this among the native subsistence fishers. Even at currently depressed stock levels more fish still ascend the rivers and streams than are needed to satisfy their annual subsistence needs. In essence their collective demand for the salmon resource continues to be small relative to its availability—a *situation having few parallels in most commercial fisheries nowadays.*
- Climatic variability did not seem to have much influence on these people's subsistence fishing production. Despite a decade of steady stock declines and great variability in climatic conditions over past years, they went about their subsistence fishing activities in essentially the same way year after year, producing approximately the same amount of salmon each year. This was a surprising finding, inasmuch as the researcher had assumed that climatic variations would influence subsistence fishing production levels.
- Regression analyses were run comparing the four communities' subsistence fishing production with cardinal climatic variables such as precipitation, temperature, and snowfall over a nearly 20-year period for which there was excellent meteorological data. The

analyses suggested that subsistence fishing production was only weakly influenced by variations in the foregoing cardinal climatic variables, with the linear regressions yielding r^2 values generally less than 0.2.

- Certainly climatic variations over the salmon's vast range must have influenced stock sizes. But local climatic variations little influenced these subsistence fishers' subsistence fishing production. This reaffirmed various ethnographer's observations regarding the long-standing persistence and resiliency of these people's subsistence economies.
- For now these native people have excellent food security. But otherwise their overall standard of living is low by most conventional measures. And their situation may change drastically, and quickly, should salmon stock levels fall below what they need to produce this key dietary staple.
- At present it is difficult to suggest how these native people would respond should salmon stocks fall below levels that are adequate to meet their subsistence needs. This is because they have many other and abundant wild food resources available to them in this region—a form of economic pluralism, at least in a dietary sense. But that too could change, and drastically, should climatic

and environmental change decimate these other food resources as well.

- In any event, catastrophic societal and economic disruptions would result from inundation of this low-lying region that is prompted by sea-level rise, forcing villagers to relocate to less familiar, and perhaps less naturally provident, new territories.

1.13 Fisheries policy recommendations based on the foregoing case studies

In the Icelandic community

- The ITQ system should build in a margin of safety by backing away from its current practice of fishing various species to near their theoretical limits. At the same time the government should sponsor more extensive monitoring of ocean conditions to try to anticipate emerging trends that seem to be prompted by global warming and ocean-ecosystem change. The ITQ system should also be made more flexible so as to permit quota owners to switch among species that are more or less abundant in various seasons.
- Clearly, large-vessel enterprises will be the most adaptable to the sorts of changes that global warming may prompt, by virtue of their ability to range over larger areas in practically all weather conditions, as well as their ability to mobilize capital to retrofit gear and take advantage of changing opportunities. Small-vessel operators, therefore, should be afforded extra fishing opportunities

to offset the limitations placed on them by bad weather conditions.

- A more diversified local economy should be developed to provide alternative opportunities for local fishers who experience reversals in the fisheries.
- Although the local community's participation in an aggregated global marketing system somewhat reduces its vulnerability to wide market swings, new means should be explored for reducing the economic risk of operators who target species whose market prices can be significantly influenced by climatic events taking place in distant other parts of the world.

In the commercial fishing community in Southwest Alaska

- More research is needed to determine the causes of stock declines in recent years, and this may require extensive and expensive monitoring over large trans-boundary ocean regions.
- The Alaska state government should pursue license buy-out schemes to reduce the number of limited-entry licenses. At the same time it should redouble its efforts to publicize the superiority of wild-caught salmon over farmed salmon, to justify higher prices for these fish in various export markets.
- The current system of prescribing open and closed days for fishing should continue to be predicated on what is needed to conserve salmon stocks. But this system should also be modified to ensure that open days do not coincide with dangerous weather conditions that might imperil local fishers.

In the native subsistence-fishing communities in Southwest Alaska

- At current stock levels the fishery is adequately managed and meets local subsistence needs, providing excellent food security.
- The native subsistence-fishing people in southwest Alaska manifest high capacities for adapting to their region's ordinary climatic and ecosystem variability. This adaptability and resiliency is a result of considerable cumulative experience from living in this climatically harsh region.
- Otherwise, the local economy does not provide an adequate standard of living in modern-contemporary terms, and in recent years as these people have become more aware of the world beyond their region this has been a source of increasing dissatisfaction and strain. Thus, greater efforts should be made to develop a more modern and diversified economy.

This low-lying region is highly vulnerable to catastrophic disruption caused by sea-level rise, underscoring an urgent need for projects that will plan for, and assist, in relocation and developing economic alternatives should that become necessary.

2. Relationship to the broader global ocean WSSD goals/targets

The WSSD goals regarding the oceans urge developing strategies for improving oceans governance while promoting sustainable fisheries, conservation, and promotion of marine biodiversity with regard for climate change.

The following are also offered as desirable goals:

- implementation of the FAO International Plan of Action for the Management of Fishing Capacity (FAO 1999) to better manage fishing capacity by reducing it where desirable to meet sustainability goals, as well as reduction of illegal, unreported, and unregulated (IUU) fishing;
- restoration of fish stocks to levels that can produce their maximum sustainable yields;
- assistance to developing countries to coordinate policies and programs at regional and sub-regional levels aimed at conservation and sustainable management of fishery resources;
- developing diverse fisheries-management approaches and tools, including ecosystem approaches, eliminating destructive fishing practices, and establishing marine protected areas consistent with international law based on scientific information.

Problematically, virtually all of the foregoing goals can be substantially confounded or even completely undermined by the climate-change scenarios that mainstream scientists have forecast.

Moreover, the high degree of uncertainty regarding various impacts on coastal people and ocean fisheries underscores the need for aggressive and heightened efforts in ocean-ecosystem monitoring, new basic research across a broad spectrum, and new structures for local, regional, and international cooperation.

For attaining WSSD goals regional fisheries management organizations (RFMOs) are seen as key vehicles. Thus, many of the responses to the impacts of climate change on fisheries should be jointly coordinated by various cooperating RFMOs. However, because of the global scope of this problem coordinated efforts by international organizations such as the Food and Agriculture Organization (FAO), as well as other international fora, will be required as well.

Regarding WSSD goals and capacity issues, climate change may transform some fisheries that are currently identified as suffering from overcapacity to a condition of undercapacity, while transforming other fisheries that are currently identified as candidates for capacity development to a condition of overcapacity. Thus, while the concept of sustainable capacity in a fishery will remain important, it must be understood that with climate change this must be perceived as a more dynamic and fluid concept, which is subject to continuing revision based on new information.

Because changes in fisheries ecosystems that are prompted by climate change may cause fish stocks to depart considerably from their historic baselines, addenda will likely be required to various international measures and agreements such as the United Nations Fish Stocks Agreement (United Nations 1995), the International Plan of Action for the Management of Fishing Capacity (FAO 1999), the Johannesburg Plan of Implementation of the World Summit on Sustainable Development (United Nations 2002), and the FAO Code of Conduct for Responsible Fisheries (FAO 1995) --among others. Thus, while the foregoing measures and agreements will still serve as

fundamental frameworks for addressing fisheries issues, they must also be augmented by taking into account the dynamics and impacts of climate change in marine ecosystems.

As in the past, governments will still be required to provide financial support for fishing industries and communities to help ease their burden of adjustment and restructuring during times of change. But in the near future climate change may also pose heightened and even unprecedented changes in fisheries that will necessitate even higher levels of government support for adjustment and restructuring.

Moreover, climate change may cause harvest rights in certain fisheries to become less secure—indeed, even worthless should the species they confer rights to disappear or relocate to other regions. Harvest rights-based regimes work best in relatively stable ecosystems where the species that are targeted are available in fairly predictable and stable quantities over long time series. But climate change may seriously erode the predictability and stability of many fisheries. Thus, many harvest rights-based regimes, if they are to be sustainable in the future, will be required to increase their levels of flexibility, not only to anticipate unprecedented stock fluctuations, but also to adapt to the disappearance of some valuable species and the appearance of others that had heretofore been exotic.

3. Top priority policy issues

Top priority policy issues for the world's fisheries which will be impacted by climate change include: (i) the development of a global marine-ecosystem monitoring system to track

changes in marine ecosystems and fisheries resources; (ii) building capacities for fishing industries and communities to adapt to the foregoing changes; and (iii) building capacities at both national and international levels to help vulnerable coastal communities anticipate and respond to increased storms and flooding, as well as sea-level rise that necessitates relocation to less hazardous areas. Developing alternative sources of livelihood and food security will also often be important for these environmentally displaced communities.

4. Suggested goals, targets, and objectives for improvement.

Coastal States will still have the final authority concerning how they will monitor and adapt to the impacts of climate change in maritime waters under their sovereignty. But in marine waters beyond national jurisdiction all users will be required to work together more closely than heretofore to monitor and adapt to changes produced by climate change.

An important first step towards achieving these policy objectives will be the building of political awareness regarding the reality of climate change and its consequences in marine environments. In turn, this must translate into developing the political will to help impacted human communities and economies to adapt.

4.1 New Roles for RFMOs

Because RFMOs are the primary means for managing global fish stocks, RFMOs must be strengthened so they can help monitor and address various problems prompted by climate change. Addressing the consequences of global warming in the fisheries will therefore require strengthening of RFMOs

having global purview, increased communications and cooperation among RFMOs, as well as establishing new global-level organizations.

It will also be necessary for RFMOs to cooperate with other international organizations as an integral part of such efforts. Moreover, new RFMOs should be established to deal explicitly with climate change issues, especially in ocean realms having stocks that are not presently covered, so that all currently unregulated high seas fisheries are brought into a globally coordinated system that can deal with climate change.

Various global institutions and fora such as the FAO, UNFSA Review, International Maritime Organization (IMO), and Convention on Biodiversity can help to guide and support RFMO capabilities for dealing with climate change, as can improved inter-agency co-operation to promote policy integration on shared issues. In addition, further ratification and implementation of key governance mechanisms, such as UNFSA, would strengthen regional fisheries management in its ability to deal with climate change. In this regard, increased pooling of information and better use of information technology will also help.

The need for enhanced cooperation between RFMOs to deal with climate change arises not only from some fish species having distributional ranges that cover the convention areas of more than one RFMO, but also because climate change impacts will usually impact more than the convention areas of a single RFMO. RFMOs at all levels should therefore review current policies regarding pelagic and near-shore stocks, trans-boundary, and other stocks, and how

these may be influenced by climate change.

Many fisheries-management policies may need substantial revision as a result of distributional changes in fisheries resources that will be prompted by climate change, with steady-state models of stock distributions necessarily giving way to more fluid-state models that are frequently revised and updated. Recognition that some regions will experience increases of certain stocks, including heretofore exotic ones, while other regions will experience declines of stocks that have long been relied upon, will be an important part of this process. Thus, heightened levels of coordination and cooperation among neighboring countries regarding their respective EEZs, as well as among multilateral FMOs, will also be called for.

Moreover, RFMOs at all levels that are concerned with the small-scale fishing sector must likewise pay special attention to how climate and ecosystem change may impact that sector. Compared with larger-scale fishers, small-scale ones are generally less mobile geographically, and are especially vulnerable to ecosystem changes as well as the hazards to coastal communities posed by climate change. At the same time, they also comprise a decisive majority of the world's fishing people.

It will also be necessary for RFMOs to enlist the support of the market, as well as encourage industry-based initiatives to monitor and develop solutions to problems caused by climate change. Efforts to promote sustainable fisheries in the context of climate change can ultimately only succeed if the participants in the fisheries actively support such efforts. And that support is unlikely unless those who bear the

costs of the constraints on catch and fishing capacity, as well as the costs of monitoring and adapting to climate change, can expect to receive at least roughly comparable benefits.

RFMOs should also concede that attempts to restore fish stocks to their maximum sustainable yields will not be advisable where climate and ecosystem trends run counter to those efforts. They should also be aware that the currently high degree of uncertainty regarding the future impacts of climate change on the fisheries may require additional reductions of fishing capacity. This may be required to build in an extra margin of safety to ensure that fish stocks are not harvested in excess of their abilities to adapt to ecosystem changes that are being driven by climate change.

RFMOs should also anticipate that uncertain, chaotic, and even unprecedented ecosystem changes prompted by climate change may correspondingly promote increases in illegal, unregulated, and unreported (IUU) fishing activity.

4.2 With regard for high-latitude fisheries

Management policies for high latitude fisheries—which may already be experiencing rapid climate and ecosystem change—should promote greater degrees of flexibility, adaptability, and economic alternatives to reliance on traditionally utilized stocks. Otherwise, the more specialized the solutions a system develops for meeting its problems, the less flexibility it will have for responding to unprecedented problems that may arise in the future.

5. Recommendations for addressing priority issues and for progress toward achieving targets/goals

For the most part, the impacts of climate change and global warming on marine ecosystems will be trans-boundary and global in scope, requiring new initiatives at the international level to monitor, respond, and adapt to the changes it will bring about. This underscores the need for good governance and new policy initiatives at the international level.

All coastal States should incorporate the possible implications of climate change in their coastal, marine, fisheries, and development policies. At the same time they should undertake increased monitoring in order to know what changes are taking place in their marine ecosystems. .

Unless there is proper monitoring, planning, and adequate legal and regulatory structures in place at high levels to avoid or minimize damaging changes that climate change may prompt in marine ecosystems, such change may prompt unilateral, unregulated, and even chaotic responses in many parts of the world. This further underscores the necessity of global monitoring, as well as international oversight, coordination, and control, to ensure more orderly responses and adaptations to the consequences of climate change.

The current crises in many of the world's fisheries which have been brought about by biologically and economically unsustainable fishing practices, may now be further influenced by climate change. This adds a new factor which is mainly independent of the former unsustainable practices, which has

profound capacities to exacerbate these crises in some ocean regions, while mitigating or even absolving them in other regions.

5.1 A worldwide observation system should be developed that provides continuous time series of various types of environmental data to track climate change and its consequences in marine ecosystems.

This would be very expensive, requiring global international cooperation. The technology for doing it currently exists, and at present there seems no other way to reliably monitor and forecast the consequences of climate change in marine ecosystems.

Key variables that should be continuously tracked include the following: atmospheric CO₂ and temperature, ocean water temperature; ocean salinity and pH; dissolved CO₂ and oxygen in ocean waters; chlorophyll, mineral, and nutrient loads in ocean waters; wind and ocean current patterns; ocean ecosystem species compositions, distributions, and biomasses; changes in sea levels from historic norms; and changes in climatic variables, including frequency and intensity of storms.

Key parties and organizations for promoting and supporting the foregoing developments may include interested parties in the UN General Assembly, interested facilitators of the UNFSA, which urges States to cooperate to ensure conservation and optimum utilization of fisheries resources, various components of the FAO, and the Consortium for Ocean Leadership;

Particularly needed now is a cooperative international effort that will be comparable to—and even exceed—previous global-scale

monitoring projects: the International Geophysical Year (1957-1958), for example.

5.2 Regarding coastal-dwelling people:

Efforts should be made at both national and international levels to identify coastal areas that are imminently vulnerable to sea level rise, increased inundation, and/or increased storms. Additionally, national- and international-level programs should be developed to help people in these high-risk regions to relocate to more sustainable living sites. Furthermore, an integral part of these programs should be to increase economic pluralism in coastal communities that will have to be relocated, as well as for those that are unduly dependent on fishing activities.

5.3 Regarding fisheries research

Increased levels of support should be made available for basic research that explores how the consequences of climate change may be anticipated and adapted to by fishing communities. Promising research already underway includes studies based on historical climate change (e.g., the Medieval Optimum from ~AD 800-1100, and the Little Ice Age from ~1550 to 1850), paleoclimate information (e.g., the Altithermal ~4,000-8,000 years ago), and sediment studies tracking variability in marine life prior to fishing activity.

Given the current inadequacy of mainstream science to forecast the future impacts of global warming in certain marine ecosystems—a situation which is likely to continue until a worldwide monitoring system is in place—generalizations regarding impacts and adaptations to climate change by fishing communities will

still have to be drawn from case studies.

It will therefore be important to continue to build the store of case studies concerning how fishing people and coastal communities have responded to climatic and marine-ecosystem variability and change, but in such a way that they are methodologically comparable and provide scientifically replicable results. Thus, as such studies accumulate they should provide important clues concerning how fishing people should attempt to adapt to climate and marine-ecosystem change in the future, and in that way help to inform the development of more sustainable fisheries policies.

Increased levels of support should also be provided for promoting the theoretical development of fisheries models that integrate climate and ecosystem change and fisheries effects. These efforts should generalize from situations where good data already exists concerning the interactive dynamics of marine ecosystem change and fishing effort. Similarly, increased support should also be provided for studies of situations existing prior to fishing, as well as documented instances of stock increases or declines that cannot be attributed to fishing.

Additionally, support should be provided to assess the carbon footprint of every fisheries sector, from the smallest to the largest scale. This will be important if the fisheries are to be regarded as responsible players in addressing the WSSD goals for enhancing the sustainability of living resources. In this regard, research should also be promoted that explores ways of reducing the carbon footprint of the fisheries, for example by facilitating a return to greater reliance on sail propulsion where feasible.

6. Recommendations on how best the Global Forum can contribute to the identified priority goals and action plans.

At the national level most States are already working to address overcapacity, IUU fishing, destructive fishing practices, and other undesirable fisheries-management problems, while also promoting reforms and greater cooperation among RFMOs. Otherwise, the integration of these efforts with climate-change considerations has only just begun. Thus, the Global Forum conference in Vietnam provides an auspicious venue for underscoring the importance of making greater efforts in this regard.

The Global Forum can initially assist fishing industries and communities by raising awareness among the wider oceans community about the work that is already underway that focuses on the effects of climate change on fisheries. The meeting in Vietnam can also seek to identify linkages and co-operative approaches between efforts to combat the effects of climate change in fisheries as well as reduce the vulnerability of coastal communities. Similarly, the Global Forum provides an excellent venue for underscoring the importance of encouraging the political will that will be necessary for achieving adequate means for monitoring and adapting to climate change.

Indeed, because the Global Forum promotes advances in the global oceans agenda and integrated oceans management, it can also support fisheries-management initiatives that ensure sustainable fisheries that take into account global climate change. Additionally, it can provide a setting where public officials may work with private sector participants to find ways of mutually addressing these problems.

7. Conclusions and future projections

At the heart of anticipating and mitigating the impacts of climate change in fisheries will be the development of measures for monitoring and adapting to climate change at national and international levels. Not all measures will be applicable in every country, but each country's national plan of action should incorporate measures to deal with the impact of climate change in the fisheries in which its citizens are involved. At the same time, the fishing industry should be involved in developing these measures so that market based incentives and processes can be developed to support monitoring and adaptation efforts.

Effective monitoring and adaptation to climate change in fisheries in international waters that are beyond national jurisdiction will require heightened levels of cooperation among States. Over the past 25 years enormous progress has been made in defining the rights and duties of States over fisheries resources at the international level, with various initiatives and agreements in international fora helping to eliminate or at least mitigate many previous conflicts.

In the near future, however, the ocean and ecosystem conditions on which the foregoing agreements were predicated may be significantly changed by climate change, and where this occurs new and innovative cooperative efforts among States will be required. Indeed, the sustainable management of international fisheries may ultimately require the establishment of a new global convention for monitoring the marine-ecosystem impacts of climate

change, as well as suggesting changes in fishing approaches.

References:

- ACIA 2004. *Impacts of a Warming Arctic – Arctic Climate Impact Assessment*. Cambridge: Cambridge University Press (The ACIA report stems from the Fourth Arctic Council Ministerial Meeting, Reykjavik, Iceland, November 24, 2004).
- Arnason R. 1995. Icelandic Fisheries and Fisheries Management: Adaptation to a Limited Resource Base. Chapter VI, pp. 237-266 in Arnason R and Felt L, eds., *The North Atlantic Fisheries: Successes, Failures and Challenges*. Charlotte, Prince Edward Island: Institute of Island Studies.
- Belkin IM, Levitus S, Antonov J, and Malmberg SA. 1998. 'Great salinity anomalies' in the North Atlantic. *Progress in Oceanography* 41: 1-68.
- Dickson RR, Meincke J, Malmberg SA, and Lee AJ. 1988. 'The 'Great Salinity Anomaly' in the northern North Atlantic 1968-1982. *Progress in Oceanography* 20: 103-151.
- Durrenberger EP and Pálsson G. 1989. *The Anthropology of Iceland*. Iowa City: University of Iowa Press.
- FAO 1995. Code of Conduct for Responsible Fisheries.
- FAO 1995. International Conference on the Sustainable Contribution of Fisheries to Food Security. Kyoto, Japan, 4-9 December 1995. The Kyoto Declaration and Plan of Action, and summaries of technical papers presented.

FAO 1999. International Plan of Action for the Management of Fishing Capacity.

Hamilton LC, Jónsson S, Ógmundardóttir H, and Belkin IM. 2004. Sea Changes Ashore: the Ocean and Iceland's Herring Capital. *Arctic* 57 (4): 325-335.

IPCC 2001a. *IPCC Third Assessment Report: Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge: Cambridge University Press.

IPCC 2001b. *Climate Change 2001: Impacts, Adaptation & Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge: Cambridge University Press.

IPCC 2001c. *Climate Change 2001: Mitigation Contribution of Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge: Cambridge University Press.

IPCC 2007a. Climate Change 2007 - The Physical Science Basis: Working Group I Contribution to the Fourth Assessment Report of the IPCC.

IPCC 2007b. Climate Change 2007 - Impacts, Adaptation and Vulnerability: Working Group II contribution to the Fourth Assessment Report of the IPCC.

IPCC 2007c. Climate Change 2007 - Mitigation of Climate Change: Working Group III contribution to the Fourth Assessment Report of the IPCC.

McGoodwin, J. R. 2007. Effects of climatic variability on three fishing economies in high-latitude regions: Implications for fisheries policies. *Marine Policy*, vol. 31, issue 1, January, pages 40-55. Special Issue on Climate Change and Fisheries.

United Nations 1995. United Nations Fish Stocks Agreement (The United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks).

United Nations 2002. Report of the World Summit on Sustainable Development *Johannesburg, South Africa, 26 August – 4 September 2002*. A/CONF/199/20*. Annex, Plan of Implementation of the World Summit on Sustainable Development. Ch IV, Para 31(d).

Policy Brief: IUU Fishing

1. Introduction

The international community has experienced a growing incidence of fishing activity that does not respect applicable laws and regulations, including fishing rules adopted at the national and international levels. Examples of such activity include reflagging of fishing vessels to evade controls, fishing in areas of national jurisdiction without authorization by the coastal State, failure to report (or misreporting) catches, etc. Such irresponsible fishing activity directly undermines efforts to manage fisheries properly and impedes progress toward the goal of sustainable fisheries.

The term “illegal, unreported and unregulated fishing” – or IUU fishing – covers three main types of practice: (1) infringements against agreed rules on fisheries management/conservation in national and international waters; (2) high seas fishing in waters covered by Regional Fisheries Management Organizations (RFMOs) by vessels from outside that RFMO; (3) high seas fishing in waters outside RFMO coverage without regard to State responsibilities under international law. IUU fishing can occur in all capture fisheries, whether they are conducted within areas under national jurisdiction or on the high seas. IUU fishing poses a direct and significant threat to effective conservation and management of fish stocks, causing multiple adverse consequences for fisheries and for the

people who depend on them in the pursuit of their legitimate livelihoods.

IUU fishing also occurs in waters under the control of coastal countries. A large proportion is conducted by vessels registered in the coastal countries themselves, particularly in the form of underreporting or misreporting of catch. In other cases, foreign vessels fish without permission or in violation of the terms of access granted to them. This primarily harms the coastal countries in question and the responsible fishers who operate there. By eliminating IUU fishing in their own waters, coastal countries will be able to receive direct and immediate benefits, both now and in the future. An initial step for coastal States to take is to increase the penalties for IUU fishing, as research has shown that they are generally too low to provide an effective deterrent.

Another important facet to the fight against IUU fishing is the transshipping of harvests at sea. Because it is difficult to monitor, States should consider requiring that all transshipments take place in port or, at a minimum, require that transshipment at sea is done in accordance with proper controls and at locations where inspectors can be present. Some countries have already begun to limit and regulate access to their ports to control IUU fishing but port States will also need to require other foreign vessels involved in fishing-related activities, such as transport vessels, to provide information before entering a port and only grant foreign

fishing vessels access to its ports where it can conduct inspections to verify the nature of the vessel's fishing activities.

By impeding fishery management objectives, IUU fishing can lead to reduced biodiversity, the collapse of a fishery or seriously impair efforts to rebuild depleted fish stocks. This, in turn, may result in lost economic and social opportunities, both short-term and long-term, and may diminish food security. Current estimates of global IUU activity amounts to an annual market value of \$4.2 to \$9 billion (total value of global fish trade \$71 billion). These losses effect developing countries the most as they provide the majority of internationally traded fish products. Losses from Sub-Saharan African waters alone are believed to be around \$1 billion a year. Left unchecked, IUU fishing can completely negate the benefits of effective fisheries management.

Those who conduct IUU fishing are also unlikely to observe rules designed to protect the marine environment from the harmful effects of some fishing activity, including, for example, restrictions on the harvest of juvenile fish, gear restrictions established to minimize waste and bycatch of non-target species, and prohibitions on fishing in known spawning areas. To avoid detection, IUU fishers often violate certain basic safety requirements, such as keeping navigation lights lit at night, which puts other users of the oceans at risk. Operators of IUU vessels also tend to deny to crew members fundamental rights concerning the terms and conditions of their labor, including those concerning wages, safety standards and other living and working conditions.

Other rules that can be flouted by IUU fishers include those associated with food safety and aquatic animal health, potentially putting consumers and fish populations at risk in IUU fish importing countries.

In addition to its detrimental economic, social, environmental and safety consequences, the unfairness of IUU fishing raises serious concerns. IUU fishers gain an unjust advantage over legitimate fishers, i.e., those who operate in accordance with those standards. In this sense, IUU fishers are “free riders” who benefit unfairly from the sacrifices made by others for the sake of proper fisheries conservation and management. This situation undermines the morale of legitimate fishers and encourages them to disregard the rules as well. IUU fishing may promote additional IUU fishing, creating a downward cycle of management failure.

2. Relationship to the broader global ocean WSSD goals/targets

Working through Regional Fisheries Management Organizations (RFMOs), the Food and Agriculture Organization (FAO), and other international fora, there have been significant advances in the policy arena. There has been increased use of flag State control measures over fishing vessels, including registration requirements, specific authorization as a condition for fishing, vessel monitoring systems (VMS), and observer programs. The use of trade-related tools, including catch documentation schemes, trade-tracking measures and multilateral import prohibitions has also increased and the focus on port controls has gained

momentum through the adoption of the FAO Model Scheme, various RFMO measures, and the initiation of work to develop a legally binding instrument.

Efforts are underway to harmonize measures across regions and across RFMOs, including work toward combined “IUU” vessel lists. The harmonization of trade-related documentation continues to be refined, and there has recently been a decision to develop a comprehensive global register of fishing vessels under FAO auspices. All of this work has resulted in high-level attention to IUU issues, as seen in the 2005 Ministerial Declaration on IUU Fishing, the High Seas Task Force and similar initiatives.

3. Top priority policy issues

The overall policy objectives are (1) to prevent, deter and eliminate IUU fishing through the application and harmonization of measures designed for that purpose, and (2) to build capacity of developing States in support of their efforts to prevent, deter and eliminate IUU fishing. In order to reach these goals, there are a number of short and medium term initiatives that can be achieved.

4. Suggested goals, targets, and objectives for improvement

An important first step towards achieving these policy objectives is the building of political-level awareness of the problems that are caused by IUU fishing and the establishment of a firm commitment to combat IUU fishing. The immediate result of this effort

should be improved coordination among fisheries enforcement personnel, such as through the strengthened International Monitoring, Control and Surveillance Network For Fisheries Related Activities.

Other policy directions that need to be taken at the national, regional and global levels include the implementation of the FAO International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing (IPOA-IUU), and the development of a legally binding instrument designed to prevent the landing, transshipment and processing of IUU-caught fish in port. The presence of such a Port-State measure will be imperative in reducing the economic drivers behind IUU fishing activities. Nations should also consider the establishment of new RFMOs and arrangements that are designed to bring previously unregulated fisheries under multilateral management.

5. Recommendations for addressing priority issues and for progress toward achieving targets/goals

Although there has been substantial progress in moving forward the policy areas identified above, there are a number of key next steps that address these priority issues. In order to strengthen global monitoring, control and surveillance efforts, fishing nations should: (1) implement the commitment made in the 2005 Ministerial Declaration on IUU Fishing to have VMS on all large-scale fishing vessels no later than the end of 2008; (2) complete a legally binding instrument on port State

measures; (3) develop a comprehensive global register of fishing vessels; and (4) increase their participation in the International MCS Network.

The process of trying to achieve these efforts on an international scale has already demonstrated the difficulty that some countries have with making progress. They simply can not move forward to the extent required without addressing their domestic situation first. This includes, inter alia, the strengthening of national laws to reach IUU fishing activities carried out by their own nationals or beneficial owners who are using vessels registered in other States and the implementation of stronger controls to regulate transshipment at sea. In some States, the priority may instead be the strengthening of fisheries access agreements to provide additional assistance to coastal States in monitoring fishing within areas under their national jurisdiction.

On the regional level, there needs to be further harmonization of measures to combat IUU fishing across RFMOs. This process has begun to be discussed in some of the tuna RFMOs, i.e. harmonizing IUU vessel lists, but it needs to be further developed. In order to make these, and other measures, feasible for all Parties to implement, nations should assist in efforts to increase additional capacity-building for developing States, including through the Part VII Fund established under the UN Fish Stocks Agreement, FAO development assistance mechanisms, RFMO assistance vehicles, the World Bank and other multilateral donor organizations, bilateral funding and technical assistance programs. It will also be necessary to incorporate the

market as well through encouragement of industry-based initiatives to combat IUU fishing, such through the International Coalition of Fisheries Associations, the Coalition of Legal Toothfish Operators, and similar organizations.

6. Recommendations on how best the Global Forum can contribute to the identified priority goals and action plans

The Global Forum can initially assist by raising awareness among the wider oceans community about the work underway at the global and regional levels to combat IUU fishing. This includes raising awareness among developing States of the lost revenue and the resources that are available to them for combating IUU fishing, such as funds, technical assistance, the International MCS Network, and others. It would also be beneficial if the Global Forum could promote awareness of industry's role in market based approaches.

The meeting in Vietnam can encourage ratification of basic international fisheries instruments, such as the UN Fish Stocks Agreement and seek to identify linkages and co-operative approaches between efforts to combat IUU fishing and related issues, notably the need to reduce overcapacity in the world's fishing fleets.

The Global Forum might also do a service by fostering a dismantling of the term IUU into its component parts, as the term is commonly used to denote only illegal fishing and represents an

unwieldy, if related, bundle of issues that often each require a different approach.

7. Conclusions and future projections

At the heart of preventing, deterring and eliminating IUU fishing are measures on monitoring, control, and surveillance. The IPOA-IUU calls for a comprehensive tracking of fishing activities, development of control schemes, vessel and owner documentation, implementation of VMS and observer programs, training of officials involved in MCS, meaningful and effective MCS operations, promotion of industry knowledge and cooperation, outreach to national judiciaries, establishment of systems for acquisition, storage, and dissemination of MCS data, consideration of privacy and confidentiality requirements, and implementation of internationally agreed procedures for boarding and inspection regimes, where applicable.

The IPOA is merely a set of tools that are available for use in many different circumstances to combat IUU fishing. Not all of them will be appropriate for every country but each country's national plan of action should at least consider how each of the basic tools could be put to use in the fisheries in which their nationals are involved. The industry also needs to be engaged more effectively so that market based incentives and processes can be adopted - traceability, catch documentation - which raise the cost of illegal activity, squeezing it out of the market, and rewarding responsible operators and Flag States.

In an effort to further utilize market based approaches, the European Community has published a draft proposal "On a new strategy for the Community to prevent, deter and eliminate Illegal, Unreported, and Unregulated fishing." The proposal would require that all fisheries products (primary and processed) entering the EU market bear a certificate verifying that the fish or the fish input was legally caught. The certificate itself is similar to the documentation required by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the EU hopes it will have similar success.

Effectively preventing, deterring and eliminating IUU fishing in international waters requires cooperation among states. Such cooperation is also often required if action within waters under national jurisdiction is to be effective, due to the mobility of fishing vessels. The prospects of significantly reducing the incidence of IUU fishing will depend to a large measure on the extent to which states succeed in cooperating to put a stop to IUU fishing, in addition to implementing effective MCS measures within their own jurisdictions.

Policy Brief:

Regional Fisheries Management Organization (RFMO)

Reform

1. Introduction

At its session in 2005, the Food and Agricultural Organization's (FAO) Committee on Fisheries (COFI), called for the strengthening of all regional fisheries management organizations and for each to carry out an assessment of its effectiveness. This call was echoed in the Ministerial Declaration of the St. John's Conference on the Governance of High Seas Fisheries in May 2005, the report of the High Seas Task Force on Illegal, Unreported, and Unregulated Fishing in March 2006, and the report of the Review Conference for the UN Fish Stocks Agreement.

A number of regional fisheries management organizations (RFMOs) have already undertaken efforts to improve their structure, governance and functioning. In some cases the review has focused on updating and modernizing the RFMOs establishing treaty (as in IATTC, NEAFC, and NAFO). In others, the review has focused on improving the conservation and management measures under the RFMOs purview through broader application of the precautionary approach, increased reflection of ecosystem considerations, and better compliance by Contracting Parties (as in CCAMLR and NASCO).

The final report of the High Seas Task Force contained several recommendations for improving RFMOs, including developing a model

for improved governance by RFMOs, reviewing of RFMO performance, encouraging RFMOs to work more effectively together through better coordination and use of port and trade-related measures, and supporting initiatives to bring all unregulated high seas fisheries under effective governance. An independent, high-level panel, hosted by the UK Royal Institute of International Affairs published its report, "Recommended Best Practices for Regional Fisheries Management Organizations" in mid-2007.

The Panel's analysis indicates that there is clearly scope for more effective cooperation between members of RFMOs and between RFMOs themselves, particularly in the area of compliance and enforcement. Immediate practical steps that could be taken without changing existing paradigms include, for example, standardizing and sharing or consolidating vessel registers and information from vessel monitoring systems, as well as compiling and assessing scientific data on a global basis including on ecosystem based approaches and improved marine science.

This paper focuses on RFMOs. It sets out an overall policy objective regarding RFMOs, looks at the key policy directions since the Summit, and considers the relevant institutional structures, progress made and where actions can now be best focused. It

concludes with a number of suggestions as to how the meeting in Vietnam can assist, including in relation to IUU fishing and broader cross cutting issues such as poverty reduction and capacity building.

2. Relationship to the broader global ocean WSSD goals/targets

The WSSD oceans outcomes can be characterized as setting out a strategy for improved oceans governance, sustainable fisheries, and conservation of marine biodiversity. Regional fisheries bodies (which include regional fisheries arrangements as well as RFMOs) are seen as key implementation vehicles.

Working through these institutions and fora, there have been significant advances in the policy areas identified above. There has been substantial progress on global coverage of the world's oceans by RFMOs: the South East Atlantic Fisheries Organization; Southern Indian Oceans Fisheries Agreement; and the ongoing processes to establish new RFMOs in the southern and northern Pacific, including the adoption of interim arrangements. In 2006, the United Nations General Assembly (UNGA) Resolution on fisheries set out a framework to end destructive bottom fisheries by the end of 2008. In addition, a number of RFMOs have deepened their mandates to adopt ecosystem based and precautionary approaches in line with the United Nations Fish Stocks Agreement (UNFSA) and the UNGA fisheries resolution, while the Commission for the Conservation of Antarctic Marine Living Resources

(CCAMLR) has continued to develop leading approaches on fisheries and ecosystem management, compliance and enforcement.

At the 2006 UNFSA review, there was agreement on performance reviews of RFMOs and the strengthening of mandates; and a significant number of countries agreed to ratify UNFSA. The FAO, in 2007, also agreed to work on performance review and the strengthening of RFMOs. Since then, a number of RFMOs have begun to address directly the question of performance review, and the North East Atlantic Fisheries Organization has undertaken and completed a performance review consistent with the provisions of UNFSA. In January, 2007, at Kobe, Japan there was a joint meeting of tuna RFMOs, which agreed on co-operative approaches on performance review, IUU fishing and compliance and enforcement. A further meeting is planned in 2009.

3. Top priority policy issues

The overall policy objectives are (1) for RFMOs to become genuine cornerstones of *sustainable* fisheries management in the world's oceans, and (2) to contribute to the integration of fisheries with a broader understanding of the sustainability of the oceans and the Millennium Development Goals. In order to reach these goals, there are a number of short and medium term initiatives that can be achieved.

4. Suggested goals, targets, and objectives for improvement

The key policy directions required to achieve the above objectives begin with the strengthening of RFMOs by the modernizing of mandates and the adoption of performance review in the light of the principles and policies of the UNFSA and FAO Code of Conduct for Responsible Fisheries. Parallel with these efforts, new RFMOs should be established to cover areas of the oceans and the commercial stocks not covered presently (along with effective interim arrangements), thus bringing all unregulated high seas fisheries under effective governance.

It is also necessary for RFMOs to cooperate with other international organizations as an integral part of the global system for oceans governance. The use of effective global institutions and fora, such as FAO and the UNFSA Review, can help guide and support RFMO reform and strengthening, along with improved inter-agency co-operation, for example the International Maritime Organization (IMO) and the Convention on Biodiversity, to promote policy integration on shared issues. In addition, further ratification and implementation of key governance mechanisms, such as UNFSA and various FAO initiatives, would also benefit regional fisheries management.

Capacity building is also important, both for developing countries to participate meaningfully in RFMOs but also in terms of the ability of Secretariats to undertake necessary functions. Pooling of information, better use of information technology and improving mechanisms for transparency and accountability can all help in this regard.

The need for enhanced cooperation between RFMOs arises from the fact that some species of fish have a distribution range that covers the convention areas of more than one RFMO and that modern-day fishing fleets are highly mobile and may well target similar stocks in different parts of the world almost simultaneously. It is therefore essential that there is increased co-operation between RFMOs, especially when it comes to shared issues such as stock management, compliance and IUU fishing. Practical steps such as shared or consolidated vessel lists, better coordination of port and market measures (such as catch documentation schemes) and vessel monitoring systems can bring about significant improvements in compliance. For the same reasons there is also a need for improved collaboration between RFMOs and other regional fora such as regional seas conventions. These short-term steps forward would create the required impact on generating the political will that is necessary for reform.

5. Recommendations for addressing priority issues and for progress toward achieving targets/goals

Although there has been substantial progress in moving forward the policy areas identified above, there are a number of key next steps that address these priority issues. One important step is the intensification by RFMOs in implementing already existing processes. This includes further progress by all RFMOs on performance and strengthening in line with UNFSA and related model approaches as well as

maintaining momentum on extending RFMO governance to new areas and stocks and addressing destructive fisheries.

Concurrently, there should be efforts to continue building on more horizontal, partnership processes. Further joint meetings of RFMOs and the development of shared approaches (shared vessel registers, common catch documentation schemes and analysis of trade and finance flows) as stressed before, are a good example. This type of co-operation should also happen between RFMOs and other regional structures; e.g., NEAFC and The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) are developing a Memorandum of Understanding to promote cooperation on shared interests. Another possibility is the involvement of industry to promote issues as such as chain of custody. A chain of custody certification ensures labeled seafood can be tracked through the supply chain and provides a vital assurance for fish buyers seeking sustainable seafood.

Finally, there needs to be continued support for the development of underpinning strategic measures on information and compliance, linked to IUU fishing. This includes: the transformation of the FAO voluntary network on monitoring, control and surveillance into a more robust, resourced instrument; the development by FAO in conjunction with IMO of a legally binding instrument on minimum standards for Port State measures; and the development by FAO of a comprehensive global record of fishing vessels.

6. Recommendations on how best the Global Forum can contribute to the identified priority goals and action plans

The Global Forum can initially assist by raising awareness among the wider oceans community about the work underway by RFMOs and related fora and by building support from this community to these areas of work, including promoting capacity building approaches. By highlighting the short-term goals outlined above, the Forum provides the perfect venue to underline the importance of political will in achieving reform.

The meeting in Vietnam can promote best practices in RFMOs (possibly through a panel presentation on case studies) and highlight issues such as why some RFMOs work well, how interim arrangements were established, performance reviews, compliance, and capacity building. Representatives can then discuss how good practice contributes to broader oceans sustainability issues and governance, e.g. on biodiversity conservation and food security, recognizing that there are necessary limits to what RFMOs can achieve.

The Forum might also assist in identifying linkages and co-operative approaches between RFMO work and other issues/fora, notably IUU fishing, but also between cross cutting issues such as capacity building and poverty reduction.

7. Conclusions and future projections

Ongoing discussions about improvements to RFMOs have investigated a wide range of institutional and legal reforms. Over the last 25 years enormous progress has been made in better defining the rights and duties of States over fisheries resources at the international level. Initiatives and agreements in various international fora have made substantial strides in eliminating some of the previous disputes. Any remaining obstacles to effective management result primarily from an absence of political will to resolve management problems and a capacity barrier (e.g. enforcement, information) in using the tools available in international fishery instruments.

This does not mean that further challenges do not lie ahead. With increased globalization we see fleets that are increasingly mobile and an increase in the complexity of getting fish from harvest to markets. Further compounding overcapacity in the world's fishing fleet, it is becoming readily apparent that increased regulation in one area often just results in the transferring of capacity from one region to another. In some cases, management action in one region has had an immediate effect on other regions. If we are to achieve long-term sustainable management of international fisheries, the key challenge for the future will be to establish a globalized regime in which all nations have the incentive to cooperate.

In many ways, we are at a crossroads. Many national and multilateral fora responsible for fishery management are

under heavy criticism for failing to take decisions that the science tells us is necessary to ensure sustainability of fishery resources, or to take steps (many of which are widely acknowledged to be effective) to mitigate the impacts of fishing activities on non-target species and habitats. Maybe we need to take a more holistic approach to RFMO management and look at mechanisms to improve the economic returns to RFMO fisheries as a whole, such as more innovative approaches to the allocation and distribution of TACs or quotas, so as to improve the size of the economic pie.

References:

Recommended Best Practices for Regional Fisheries Management Organizations;
Michael W Lodge, David Anderson, Terje Løbach, Gordon Munro, Keith Sainsbury, Anna Willock, August 2007

<http://www.chathamhouse.org.uk/publications/papers/view/-/id/523/>

Recommended Best Practices for Regional Fisheries Management Organizations: Technical Study No. 1
Regional Fisheries Management Organizations: Progress in Adopting the Precautionary Approach and Ecosystem-Based Management;
Marjorie L Mooney-Seus and Andrew A Rosenberg, October 2007

Policy Brief: Overcapacity

1. Introduction/Background

Overcapacity¹ and overfishing are two of several often co-occurring undesirable outcomes of a common underlying management problem. The other undesirable outcomes include high levels of bycatch, adverse impacts on habitat, substandard vessel safety, lower product quality, poor economic performance, less viable fishing communities, non-compliance with regulations, and a fishery management regime that is unnecessarily complex, unstable, burdensome, contentious, intrusive, and costly.

The underlying problem is that, in the absence of well-defined property, use or harvest rights, fishers have no means of ensuring their share of catch unless they race for fish. In doing so, this competitive allocation creates incentives for individual fishers to increase fishing capacity and to take other actions that are not in the best interests of either the fishery as a whole or the general public. The negative results of this problem are exacerbated by inadequate information, monitoring, and enforcement, which, in part, can be due to the underlying problem. Basically, without well defined use rights or harvest privileges, the interests of individual fishers are not aligned with the sustainability objectives for

fisheries and fishers have little reason to support investments in the conservation and management of living marine resources.

Unfortunately, changing the management of fisheries in order to address the underlying cause of overcapacity becomes increasingly costly as the severity of those outcomes increases. The greater the adjustment necessary to capacity or catch to protect or rebuild fish stocks, the greater the impact of the adjustment and, consequently, the greater the resistance to it. However, the benefits from fundamentally changing a fishery's management regime to one based on user/harvest rights also increase with the severity of the problems facing the fishery. In addition, after the underlying management problem has been addressed, States and fishers generally will be better positioned to accept and adapt to catch reductions or other management actions that are taken to rebuild stocks and prevent/end overfishing of target or non-target species.

Several states have implemented well-defined rights-based management regimes, thereby resolving the underlying management problem and substantially improving the alignment of the interests of individual fishers with the objectives for sustainable fisheries. These successes have occurred for a diverse group of fisheries using various types of rights-based management systems that were designed in response to fishery-specific conditions, objectives and management capabilities.

¹ For this report, "overcapacity" is the generic term that means too much fishing capacity. The technical definition of fishing capacity is *the amount of fish (or fishing effort) that can be produced of a period of time (e.g. a year or a fishing season) by a vessel or a fleet if fully utilized and for a given resource condition.* (FAO)

The basic implications are as follows.

1. The failure to align the interests of individual fishers or groups of fishers with the sustainability objectives for domestic and international fisheries has provided reasons for them to individually maintain or increase fishing capacity when there is already too much capacity and to take other actions that prevent the attainment of those objectives.
2. Similarly, the failure to align the interests of individual States with the sustainability objectives for international fisheries has provided incentives for them to maintain or increase fishing capacity for their State when there is already too much capacity and to take other actions that prevent the attainment of those objectives. In both cases 1 and 2, these perverse incentives have resulted in inadequate investments in the conservation and management of living marine resources by fishers and States.
3. Looking at each category of problems that emerge when harvest rights are weak and trying to treat each separately without addressing the common cause is counterproductive and will result in the need for frequent management changes to prevent increasing disparities between the desired and actual outcomes. In addition, such a disjointed approach is not consistent with an ecosystem approach to fishery management.

Potential strategies for meeting those goals are discussed in this policy brief after an overview of the general status and trends in managing fishing capacity.

2. Relationship to the broader global ocean WSSD goals/targets

Assessing progress towards the WSSD goal of resolving the problem of overcapacity

Three years after the adoption of the International Plan of Action for the Management of Fishing Capacity (IPOA-Capacity), the Johannesburg Plan of Implementation of the World Summit on Sustainable Development (WSSD) - also known as the Johannesburg Plan of Action² - reinforced the international community's call to address and resolve the problem of overcapacity noting, *inter alia*, the essential role of sustainable fisheries in food security and economic prosperity. The Johannesburg Plan of Action also called for nations to put the IPOA-Capacity into effect by 2005 as part of actions aimed towards achieving sustainable fisheries.

This explicit linkage reflected global concern about addressing overcapacity in fisheries as a critical part of the international efforts to meeting the goals of the WSSD. Most importantly, the WSSD reflected the growing recognition that capture fisheries simply cannot contribute sustainably to economic prosperity and food security if the matter of overcapacity is not addressed.

3. Global/multilateral efforts to manage fishing capacity

Food and Agriculture Organization of the United Nations (FAO)

The IPOA-Capacity was adopted by the 23rd session of the FAO Committee on Fisheries (COFI) in February 1999 and endorsed by the

² United Nations 2002

FAO Council at the session in November 2000. The stated immediate objective is for "States and regional fishery organizations, in the framework of their respective competencies and consistent with international law, to achieve worldwide, preferably by 2003 but no later than 2005, an efficient, equitable and transparent management of fishing capacity"

In the half decade since the WSSD, efforts to manage fishing capacity have been based on four major strategies in the IPOA-Capacity:

1. the conduct of national, regional and global assessments of capacity and improvement of the capability for monitoring fishing capacity;
2. the preparation and implementation of national plans to effectively manage fishing capacity and of immediate actions for coastal fisheries requiring urgent measures;
3. the strengthening of regional fisheries organizations and related mechanisms for improved management of fishing capacity at regional and global levels;
4. immediate actions for major transboundary, straddling, highly migratory and high seas fisheries requiring urgent measures.

The FAO fishing capacity program has been focusing on both the "Urgent Actions" and "Mechanisms to Promote Implementation" that are mentioned in the IPOA-Capacity. FAO activities that are most directly linked to overcapacity include: the development and dissemination of substantive guidance on matters relating to the capacity issue; the development and dissemination of practical information relating to the definition, measurement and reduction of capacity;

development and dissemination of practical information about the fundamental linkages between overcapacity and fisheries management measures; practical information on working to address and resolve the many challenges presented by managing fisheries and the issue of overcapacity; and ways and means for addressing, reducing and minimizing the recurrence of overcapacity.

World Trade Organization (WTO)

Fisheries subsidies are being discussed in the current WTO round of trade negotiations. When the round was launched in 2001, the Doha Ministerial declaration mandated participants "to clarify and improve WTO disciplines on fisheries subsidies." From 2001 to 2005, the negotiations have therefore progressed from debating the need to further discipline fisheries subsidies to recognizing that subsidies that lead to overcapacity and overfishing must be disciplined.

While the round is not over, there has been considerable progress in the negotiations related to fisheries subsidies. The 2005 WTO Ministerial Conference noted that "there is broad agreement that the Group should strengthen disciplines on subsidies in the fisheries sector, including through the prohibition of certain forms of fisheries subsidies that contribute to overcapacity and over-fishing."

Within the ongoing negotiations, members remain divided concerning the approach to use. Some advocate a 'bottom-up approach' that would ban specific types of subsidies, such as those that directly contribute to increased fishing capacity. Others argue for a 'top-down' method that would ban all fishing subsidies save for some negotiated exceptions.

In addition, proposals concerning special and differential treatment (S&DT) for developing countries, and artisanal and small-scale fisheries are also being discussed. While the overall goal is for a level playing field in trade, the potentially positive environmental and distribution/equity impacts of special and differential treatment have resulted in support for S&DT from the environmental non-governmental organization (ENGO) community and some States.

A major reason for governments to provide financial support for fisheries is to help ease the burden of adjustment and restructuring during times of change. Indeed, some of the countries mentioned below that have moved to harvest rights-based fisheries management have, in various ways, worked with fishers and have used public funds to facilitate the transition.

4. Regional efforts to manage fishing capacity

The importance of Regional Fisheries Management Organizations and Arrangements (RFMO/As) in preventing or eliminating overfishing and overcapacity has been identified in both UN Fish Stock Agreement and the IPOA-Capacity. However, proposals to address overcapacity in these fora are often thwarted, and those that are adopted are not always binding and enforced.

Traditionally, RFMO/As have focused on determining appropriate catch levels (e.g. TACs) and, in some cases allocating this limited catch among countries, rather than managing capacity, and the limited recent attempts to manage the level of fishing capacity have not always been effective. As a result, many fisheries managed by RFMO/As have

overcapacity, particularly the highly migratory species (HMS) fisheries.

A summary of relevant activities taken by RFMO/As can be found in Table 1. The most common measure used by RFMO/As in their attempts to control the level of fishing capacity and therefore overcapacity has been the creation of vessel lists, in which Flag States identify the vessels authorized to fish in area waters. Although these lists may provide information on the fleets' physical characteristics that in part determine current capacity levels, vessels lists often do not reduce capacity and they do not prevent significant increases in capacity. At best, such lists usually have been relatively unrestrictive license limitation programs for international fisheries.

Some RFMO/As, predominately those for highly migratory species, have implemented or begun to discuss measures that could further limit but not prevent increases in fishing capacity and, therefore, overcapacity. However, to date, not one RFMO/A has implemented harvest rights-based measures (such as individual transferable quotas or enforced national, community or sector quotas) that could address the underlying management problem that is the source of overcapacity and the other often co-occurring undesirable outcomes.

It is widely recognized that the present worldwide tuna fishing capacity is in excess of sustainable catch levels. Despite this acknowledgement, there are few, if any, international tuna fisheries management organization with management measures that will prevent significant increases in fishing capacity.

Table 1. Summary of actions taken by RFMO/As to address fishing capacity

RFMO/A	Actions taken to address fishing capacity
CCAMLR	<p>Vessel registry for authorized vessels. Within 7 days of authorization, Flag States must provide detailed information on the vessel, including name of owner and pictures of the boat, to the Secretariat.</p> <p>Flag State must ensure that vessel can comply with the conservation and management measures prior to authorization.</p> <p>Entrants into new fisheries require Commission approval.</p>
CCBST	List of all vessels authorized to fish in CCBST waters
GCFM	<p>List of all vessels 15 meters and above. With the exception of vessels less than 15 meters, vessels not included in this list are not allowed to fish in GCFM waters.</p> <p>Flag States must ensure that vessels on the list are in compliance with conservation and management measures of GCFM and not IUU vessels</p>
IAATC	<p>Regional vessel registry of authorized vessels. Purse-seine vessels not included in this list are not allowed to fish in WCPFC waters.</p> <p>Prohibition on new purse seine entrants unless replacing existing vessels and does not increase total hold capacity. (2002 Resolution)</p> <p>Established a Plan for the Regional Management of Fishing Capacity</p> <p>Established target hold capacity level for purse seine fisheries (2005 Resolution)</p>
ICCAT	<p>Each Contracting Party (CP), Cooperating non-Contracting Party (CNP), Entity or Fishing Entity is required to submit the list of its large-scale fishing vessels (over 24 meters) that are authorized to operate in the Convention Area.</p> <p>CP and CNP in the Northern Albacore fishery large scale fleet to limit the fleet size to the average number vessels from 1993-1995 (1998 Recommendation)</p> <p>CP and CNP in the Bigeye Tuna fisheries to limit large scale fleet, based on gross tonnage, to 1991-1992 levels. (1998 Recommendation)</p> <p>Established a Working Group on Capacity, which met in the summer of 2007. (2006 Recommendation)</p>
IOTC	<p>Record of Vessels 24 meters and above (and 24 and below if outside EEZ)</p> <p>Parties with 50 or more vessels on the record of vessels to maintain fleets at 2003 levels (2003 Resolution)</p> <p>For swordfish and albacore, limit vessels by gear type to 2007 levels until 2010. (2007 Res XX)</p> <p>For tropical tuna, limit vessels according to gross tonnage to 2006 levels until 2009 (2006 Res XX)</p>
NAFO	<p>Vessel registry for authorized vessels over 50 gross tons. Vessels not included in this list are not allowed to fish in NAFO waters.</p> <p>Contracting Parties should only authorize those vessels that can implement conservation and management measure and report the Secretariat the name of authorized vessels.</p>
NEAFC	<p>Vessel registry for authorized vessels. Vessels not included in this list are not allowed to fish in NEAFC waters.</p> <p>Contracting Parties should only authorize those vessels that can implement conservation and management measures and report the Secretariat the name of authorized vessels.</p>
WCPFC	<p>List/record of authorized vessels. Vessels not included in this list are not allowed to fish in WCPFC waters.</p> <p>Flag States ensure that vessels on the list are in compliance with conservation and management measures of GCFM and are not IUU vessels</p> <p>Due to unsustainable capacity increases from 1999-2005, Flag States called to reduce overcapacity in their purse seine fleet by 12/31/07.</p>
LVFO	<p>LVFO Regional Plan of Action for the Management of Fishing Capacity in Lake Victoria (adopted March 2007)</p> <p>Development of agreed measures for implementing the RPOA-Capacity (underway)</p>

At a meeting of joint tuna RFMOs, held in Kobe, Japan in 2007, participants recognized the critical need to deal effectively with overfishing and overcapacity and agreed to work collaboratively to reduce capacity, where appropriate. Most RFMOs have begun the process of identifying and implementing more effective measures to control the fishing capacity of all or some of the tuna fleets operating in their respective convention waters.

For example, the Inter-American Tropical Tuna Commission (IATTC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT) have done that, respectively, through a regional capacity management plan and through the formation of a working group on capacity. Related recent actions by these two RFMOs are discussed below.

IATTC

In 2005, the Inter-American Tropical Tuna Commission presented its plan for regional management of fishing capacity. The objective of the IATTC Plan is to achieve, by 1 January 2006 or as soon as possible thereafter, an efficient, equitable and transparent management of fishing capacity in the Eastern Pacific Ocean (EPO), to assist in achieving long-term sustainability of the fishery targeting species covered by the Convention.

The management of fleet capacity will complement other measures taken to conserve the stocks of species covered by the Convention. CPCs³ and all participants in these fisheries should limit the total fleet capacity to the present level and to reduce it, as appropriate, in accordance with an agreed program. After any targets for the fleet capacity have been achieved, CPCs and all

participants in these fisheries should exercise caution to avoid growth in fleet capacity.

To date, this plan has assisted in framing discussions to restrain future growth in the fishing capacity of the IATTC fleets. Prior to the development of the Plan, the IATTC had established limits on the hold capacity for specific IATTC fleets and had taken other actions to prevent more rapid increases in fishing capacity.

5. National efforts to manage fishing capacity

At the national level, most States are working to address overcapacity and the other often co-occurring undesirable outcomes of a common underlying fishery management problem. Preliminary assessments of capacity at the fishery level have been undertaken by around three-quarters of States responding to a 2004 FAO survey, and all of the major producers responding to the survey had undertaken preliminary assessments of capacity.

The United States was the first country to develop its National Plan of Action for the Management of Fishing Capacity (NPOA-Capacity). Since it was issued in 2004, several significant actions have been taken to improve the management of the level and use of fishing capacity in US commercial fisheries, but it is difficult to identify actions that were motivated by the US NPOA-Capacity. In addition, the US National Marine Fisheries Service has developed and published guidelines on the design and implementation of Limited Access Privilege programs, pursuant to their domestic fisheries legislation.

Another State that has formally adopted a NPOA-Capacity and made it available to FAO is Namibia. However, many other States plan to develop a NPOA-Capacity and some States have taken actions to

³ CPC is the acronym originally used by IATTC to describe Contracting Parties, Cooperating non-Contracting Parties, Entities and Fishing Entities. It is becoming generic and, as such, also may include regional economic integration organizations.

improve the management of fishing capacity in the absence of such plans.⁴

States have used various combinations of the following four generic approaches in attempting to prevent/eliminate overcapacity: harvest rights or privileges for either a specific share of the allowable harvest or a specific area; buyback/decommissioning programs; license limitation or restricted vessel registration programs; and traditional harvest restrictions.

Three of the criteria can be used to evaluate those generic approaches:

1. Feasible and proven: They should be technically, politically, and economically feasible and should have a proven track record of capacity reduction.
2. Permanent effect: They should promote permanent reductions in overcapacity. A management system that adjusts capacity levels automatically to changes in target catch levels (e.g., TACs), and market and environmental conditions is particularly desirable.
3. Flexibility: Given the diversity of marine fisheries, effective reform programs should be adaptable to the unique needs and management capabilities of individual fisheries.

Although the effectiveness of a given approach will depend on a variety of factors, such as the biological, social and economic characteristics of the fishery and the specific application of that approach, the following brief evaluation of the four generic approaches using those criteria provides some insights concerning the merits of those approaches. The evaluation is based on numerous FAO, OECD and national reports, several of

which are included among the references at the end of this policy brief.

Evaluation of Harvest Rights-Based Programs

Harvest rights-based programs establish secure and enforceable harvest rights or privileges either to specific shares of the allowable catches or to specific aspects of the management of a specific area. The rights or privileges are granted, auctioned or otherwise sold to recipients who may be individual fishers, groups of fishers, or fishing communities. Therefore, this approach includes individual transferable quota (ITQ), regional fishery associations, fishing cooperatives, community quota, and sector allocation programs.

Establishing and enforcing secure harvest rights or privileges can address the underlying management problem of the absence of use rights and, therefore, substantially reduce overcapacity and the severity of the other often co-occurring undesirable outcomes that are the result.

This approach has been used successfully by a variety of States for various types of fisheries. It tends to provide a long-term solution because it addresses the underlying fishery management problem and can provide a mechanism for automatic adjustment to changing conditions. This is a flexible approach with specific applications being designed to reflect fishery-specific conditions, objectives and management capabilities.

For the fisheries around the world that have moved to harvest rights-based regimes - e.g. fisheries in Australia (ITQs and tradable gear unit allocations), Canada (enterprise allocations, communal commercial license, ITQs, and IVQs), Chile (Management and Exploitation areas for Benthic Resources (MEABRs), ITQs), Iceland (ITQs), Namibia (ITQs) New Zealand (the quota management system, which includes ITQs), South Africa (ITQs), USA (community development quotas, ITQs and harvesting

⁴ Such examples include Canada, Namibia, and New Zealand, where the respective governments have opted to pursue capacity management directly using management systems that address the underlying management problem.

cooperatives) – the transitions have not always been easy and have typically been driven by fiscal, commercial, and overfishing crises. Indeed, many of these States have used various decommissioning schemes (e.g., buybacks of vessels, permits and gear) complemented with retraining opportunities to expedite and mitigate the impacts of the change, with either private funds from the fishing industry or environmental non-governmental organizations (ENGOS) or with public funds.

In evaluating the effectiveness of harvest rights-based programs to eliminate and prevent overcapacity, it is important to remember that:

1. the reductions will not occur immediately unless done in conjunction with vessel buyback or other decommissioning schemes;
2. the rates and magnitudes of the reductions in fishing capacity will depend on the specifics of the program used to implement that approach, where the specifics will reflect multiple conservation, management, and social objectives⁵; and
3. the elimination of overcapacity still means that there will be occasional periods of excess capacity that may result from changes in market or environmental conditions (such as El Niño-Southern Oscillation (ENSO) events, but it does create the conditions to weather such fluctuations.

Nonetheless, over the long term, an effective harvest rights-based program will eliminate the race for fish and move the level of fishing capacity in the right direction and, therefore, tend to eliminate/prevent the chronic and high

rates of overcapacity that many fisheries exhibit and that prevent the attainment of the sustainability objectives for domestic and international fisheries.

Evaluation of Buyback/ Decommissioning Programs

This approach removes fishing vessels and, therefore, capacity from a fishery directly by means of a buyback or decommissioning of fishing vessels or permits. With this approach, vessel owners are compensated for removing their vessels from specific fisheries or, in some cases, all fisheries. The compensation can be made with funds from the commercial fishing industry, the recreational fisheries, ENGOS, the government, or some combination of the above.

The use of decommissioning schemes has increased in recent years. Although decommissioning promoted as a “win-win” solution, with reductions in capacity, less pressure on stocks, and increased profitability to the remaining fishers - the available evidence suggests that most vessel decommissioning schemes fail (Holland et al, 1999). It is also well recognized that decommissioning schemes may actually increase overcapacity as they inject new capital into the fisheries sector and are generally not introduced in conjunction with effective mechanisms to eliminate the incentives for fishers and countries to increase fishing capacity and to take other actions that prevent the attainment of the sustainability objectives for fisheries. In addition, the presence of latent capacity tends to increase the costs and decrease the effectiveness of this approach.

Although stand-alone buyback/decommissioning programs typically have not been effective for eliminating and preventing overcapacity and can actually cause an increase in fishing capacity, in some cases they have been used effectively to facilitate the transition to harvest rights-based

⁵ For example, some ITQ programs include constraints on transferability to meet distributional or social objectives such as preventing too much consolidation

programs that have addressed the underlying management problem.

Evaluation of License Limitation Programs

License limitation or restricted vessel registration programs restrict the number and, perhaps, the physical characteristics (e.g., length, gross tonnage, engine power, or hold capacity) of the vessels that can participate in a fishery. They do this by: requiring a license or permit as a condition for participating in a fishery; setting specific past and current participation requirements to obtain and renew a permit; and limiting the changes that are allowed to specific vessel characteristics through either modifying or replacing a permitted vessel.

This approach has been used widely and flexibly; but, unless the rules to obtain and renew a permit, to upgrade a vessels, and to transfer a permit to a replacement vessel are sufficiently restrictive and become more restrictive over time, a license limitation program will not necessarily reduce capacity, and capacity will tend to increase after any initial reduction as fishing technology improves and as the use of the unrestricted inputs is increased.

The basic problem is its failure to address the common underlying management problem of weakly defined harvest rights and, therefore, to remove the perverse incentives for fishers to increase fishing capacity. However, such a program can precede the transition to a harvest rights-based approach that will do both. For example by limiting the number of vessel owners in a fishery, a license limitation program can facilitate cooperative efforts to address the underlying management problems through the use of either contracts/agreements among the vessel owners or the standard fishery regulatory process.

Evaluation of Traditional Harvest Restrictions

Much of current marine fisheries management is based on this approach that includes most input controls as well as aggregate (e.g., fleet wide) output (total catch) controls that limit where, when, how much, and with what type and how much gear a fishing vessel can be used. Examples of such controls include TACs, aggregate or individual limits on effort, time and area closures, and various types of gear restrictions.

Therefore, this is an approach that has been used in virtually all managed fisheries to try to control the level or use of fishing capacity, as well as for a variety of other reasons, including the reduction of bycatch, the conservation of essential fish habitat, and the protection of endangered and threatened species.

This approach does not directly remove fishing vessels from a fishery, but limits the ability of each vessel in the fishery to harvest fish. The measures used with this approach often increase costs and reduce revenues, and, therefore, may have the cumulative effect of forcing some vessels out of the fishery; however, it also creates reasons for participants to overcapitalize.

The conclusions with respect to the three criteria are as follows: this approach has been used to try to control both the level and use of capacity and for other management purposes in most fisheries; because there are so many types of harvest restrictions, these measures are highly flexible; but these measures do not eliminated and prevent overcapacity unless they are very restrictive and made more restrictive over time.

This approach does not address the underlying management problem and does not respond automatically to changes in the target catch levels and either market or environmental conditions. However, if some of these measures are implemented in conjunction with a harvest rights-based

approach, they can contribute to an effective management regime that meets the objectives of sustainable fisheries.

6. Top priority policy issues

The failure to align the interests of individual States with the sustainability objectives for international fisheries has provided incentives for them to maintain or increase fishing capacity when there is already too much capacity and to take other actions that prevent the attainment of those objectives. Similarly, the failure to align the interests of individual fishers or groups of fishers with the sustainability objectives for domestic and international fisheries has provided incentives for them to maintain or increase fishing capacity when there is already too much capacity and to take other actions that prevent the attainment of those objectives.

In both cases, these perverse incentives have resulted in inadequate investments in the conservation and management of living marine resources by fishers and States. In addition, attempts to address the undesirable outcomes of these perverse incentives individually without eliminating or substantially reducing those incentives often have been counterproductive and have resulted in the need for frequent management changes to prevent increasing disparities between the desired and actual outcomes.

Therefore, the overarching priority policy issue is to identify and implement fishery policies and management systems that will contribute to the following four goals, preferably where successful strategies for one goal can contribute to meeting the other goals.

Goal 1: Substantially *decrease* the incentives for fishers to maintain or increase fishing capacity when there is already overcapacity and to take other actions that prevent the attainment of the sustainability objectives;

Goal 2: Substantially *decrease* the incentives for Flag States with fleets in international fisheries to maintain or increase fishing capacity in international fisheries when there is already overcapacity and to take other actions that prevent the attainment of the sustainability objectives for international fisheries;

Goal 3: Strengthen the Regional Fisheries Management Organizations and Arrangements (RFMO/As) in terms of their abilities to address capacity based on incentives.; and

Goal 4: Mitigate the effects generated by perverse incentives as part of moving to harvest rights systems.

4. Suggested goals, targets, and objectives for improvement

Strategies to substantially decrease perverse incentive for fishers

Moving to substantially reduce overcapacity

There is no need for fisheries managers and fishers to wait for a perfect “measuring stick” and perfect estimates of fishing capacity in a fishery, and in many cases fishery managers have taken actions to decrease fishing capacity in the absence of quantitative estimates of fishing capacity.

Ward et al. (2004) and others have identified qualitative measures of overcapacity and indicators of the presence of or increases in overcapacity. For example, there probably is overcapacity if: there is overfishing or if the quotas are exceeded consistently; the process for setting and allocating the allowable catch is contentious; there are significant compliance problems; or the fleets are idle for a significant part of the year or more than in the past.

Conversely, even very good estimates of fishing capacity for the commercial fisheries do not indicate if capacity should

be reduced, how much to reduce it, how to reduce it, and the urgency for reducing it.

These determinations generally will be more difficult for multispecies fisheries, rebuilding stocks, stocks subject to sharp environmental fluctuations, stocks with significant recreational catch, and stocks with significant incidental catch or bycatch. Yet, if and when the underlying absence of harvest rights problem that results in overcapacity and other often co-occurring undesirable outcomes is addressed effectively, the need for such determinations will be substantially reduced, if not eliminated.

Mitigating the undesirable impacts of reducing overcapacity

Fishing capacity cannot be decreased without either removing some fishing vessel and fishers from the fishery; therefore, it cannot be done without decreasing the ability of at least some vessel owners, fishers and others who provide them with goods and services to earn a living and provide food for their families. The cost borne by these individuals and fishing communities can be substantial, particularly when alternative sources of employment, income or food are not readily available to them.

In many cases, States have used a variety of programs to decrease the adjustment costs for these individuals. For example, with market-based solutions, such as ITQs, the vessel owners who leave a fishery after being granted ITQs are compensated for leaving the fishery by being able to sell their ITQs.

Buyback/decommissioning programs have also been used to compensate vessel owners who leave a fishery, but as noted above, it is difficult to ensure that such compensation is not used to increase the fishing capacity of another vessel in the same fishery unless the fishery is transitioned to a harvest rights-based regime. Even then, the capacity may simply be redeployed to other fisheries.

Retraining, unemployment and community development programs have been used to decrease the burden on a broader group of adversely impacted individuals.

Programs that decrease the adverse impacts or at least change the distribution of the impacts can decrease opposition to the reductions in fishing capacity. Similarly, temporary reductions in fishing capacity and catch to rebuild depleted stocks will be more acceptable if those who bear the cost of those reductions expect to receive sufficient benefits from rebuilding the stocks. Such an expectation can be increased through both the use of participatory harvest rights-based management and the empowerment of local communities to make the difficult decisions about managing their fisheries because fishers are more involved in deciding how to share the benefits generated by fisheries.

Addressing the redeployment of capacity

When boats are removed from one fishery, they often end up in another fishery, perhaps in another country and/or region, as fishers work to maintain their incomes and livelihoods. This issue, which can be a serious problem, calls for improved coordination at all levels of fisheries management – from locally to across RFMOs - particularly where gear types are similar. For example, being aware of the planned actions of other RFMO/As can be useful to a potentially impacted RFMO/A in determining the benefits of improving its management of fishing capacity.

Internationally, such redeployments can include capacity “transfers” even without change in ownership: fleets in some flag states have responded to domestic capacity reduction measures by moving large numbers of vessels to other flag states, while allowing the original owner companies to continue to own the vessels.

In recognition of this problem, some States that have used buybacks to remove vessels from one fishery have taken actions, such as scrapping or decommissioning the vessels, to prevent the vessels from being used in some or any other fisheries. However, before imposing a prohibition on the redeployment of vessels to other fisheries after they have been removed from a fishery as part of a fishing capacity reduction program, the broadly defined benefits and costs of such a prohibition should be carefully assessed.

Strategies to substantially decrease perverse incentive for flag States with fleets in international fisheries

Each RFMO/A should identify and implement an effective method or mix of methods for substantially increasing the reasons for Flag States with vessels that participate in the RFMO/A's fisheries to support the sustainability objectives for fisheries. Examples of such methods include establishing secure, enforced and durable harvest rights that are granted or sold to States, multilateral trade measures, and port state measures.

One of the key issues that will need to be addressed is the rights of States, often Developing States, to harvest or otherwise benefit from the fishery resources in their own EEZs and adjacent areas of the high seas. There are two aspects to this difficult allocation issue between those States and the often Developed States with the distant water fleets that continue to account for a large share of the total harvest in international fisheries. First, the allocation of either harvest rights for either explicit shares of the allowable catches or, as a proxy for this, to use a specific share of the total allowable number of fishing vessels, carrying capacity or effort. Also rules concerning whether the Developing States can use any fishing vessels to harvest fish or will be required to purchase vessels or the services of vessels that are already in the fishery.

A requirement to use existing vessels could substantially decrease the benefits to the Developing States adjacent to the fishing grounds of the international fisheries. No matter what methods are used in an attempt to meet the sustainability objectives for international fisheries, it will be very difficult to make real progress without addressing these two aspects of the difficult allocation issue. As with the establishment of domestic harvest right-based programs or other programs to reduce fishing capacity, compensation for the parties that are adversely impacted can facilitate the implementation of more effective measures to manage the level and use of fishing capacity in RFMO/A fisheries.

A related key issue for each RFMO/A is determining if each State will be free to use any share of the allowable catch it receives in a way that best meets its own objectives subject to some restrictions established by the RFMO/A or whether the RFMO/A would develop a one size fits all program, such as an ITQ program under which the fishers of all States would be managed. Whilst the former may encourage participation in such a scheme, it would not address issues of overcapacity or capacity management at the level of the recipient States. Nonetheless, the merits of both approaches should be evaluated.

If Developing States are going to avoid the mistakes already made by others, such as not preventing/eliminating chronically high levels of overcapacity in their fleets, they need to ensure that their fishing capacity management programs, including their ability to exert flag state controls, are adequate. The Community Development Quota systems in Alaska, USA, offer one of the best examples of where communities have benefited in terms of on-the-ground training, wealth, and sustainable harvesting as a result of transition to rights-based management and could serve as a model.

The Global Forum could suggest a schedule for meeting this recommendation and methods for assisting each RFMO/A to meet it.

Strategies to strengthen the RFMO/As

Several examples of ways to strengthen RFMO/As and, therefore, to increase the potential for meeting the sustainability objective in international fisheries are briefly discussed below. With most of these examples, there will be tradeoffs between the sovereignty of individual States and the sustainability of international fishery resources, but it needs to be remembered that the sovereign rights to participate in an international fishery with depleted stocks are of limited value.

The Global Forum could agree on the need to pursue these or alternative methods for meeting this goal and suggest a process and schedule for making progress on each priority method for meeting this goal.

Provide RFMO/As with the unambiguous authority to enforce their fishery policies and management measures on all fishing vessels and Flag States that operate in their fisheries

Ambiguities concerning the authority of an RFMO/A to take direct enforcement actions against any fishing vessel that is not fishing in compliance with the RFMO/A's fishing policies and management measures substantially decreases its ability to meet its fishery conservation and management objectives.

Therefore, providing clear authority to take such actions is an important step in strengthening RFMO/As.

Identify methods and technologies for improving RFMO/A monitoring, control, and surveillance programs

Adequate and affordable monitoring, control, and surveillance (MCS) programs are essential and the challenges and need for such programs can increase with right-

based management programs. Therefore, efforts to develop MCS programs that are more efficient and to share information on efficient programs should be encouraged. This strategy would also assist in improving the management of domestic fisheries.

Identify other methods for improving compliance with their fishery policies and management measures

The ability of an RFMO/A to hold its Contracting Parties accountable is critical for effective management and both the importance and challenges of having that accountability can increase with the use of right-based management measures.

Therefore, efforts to develop feasible, enforceable, and otherwise effective accountability measures and to share information on those measures should be encouraged.

Identify RFMO/A governance policies that can be barriers to sustainable fisheries

It is important to identify any RFMO/A governance policies that can be barriers to sustainable fisheries and, if there are any, to determine which can/should be changed. Examples could include operating by consensus, requiring unanimity or relying on nonbinding measures.

Therefore, efforts to identify such policies and feasible alternatives that decrease this problem while maintaining an acceptable balance in the trade-off between sovereign rights and sustainability should be encourage; and the results of such efforts should be made readily available to all RFMO/As.

Identify mechanisms for RFMO/As to coordinate their actions where appropriate

The challenges for RFMO/As include the mobility of both the fish stocks and the fishing vessels that pursue them. Because fishing vessels commonly participate in

the fisheries of multiple RFMO/As and because the RFMO/As face many common problems, improved communication, coordination and cooperation among RFMO/As can increase their potential to attain the sustainability objectives.

For example, if all the vessels in a fleet of 100 fishing vessels fished in the fisheries of two RFMO/As and if each RFMO/A decided to allow no new entrants in its fisheries but to allow for replacement vessels, that fleet could expand to 200 vessels with each vessel fishing in just one RFMO/A's fisheries, unless there was sufficient communication and coordination between the two RFMO/As.

Therefore, it is important to identify and support mechanisms for improving such interactions.

Determine if corporate governance is a feasible and better alternative to RFMO/A governance

If the governance policies of the RFMO/As are found to be substantial barriers to meeting the sustainability objectives, the exploration of alternatives, such as corporate governance, might be useful even if it is used only to identify any deficiencies of the current governance policies and feasible remedies.

7. Recommendations for addressing priority issues and for progress toward achieving targets/goals

The management of fisheries around the world has arrived at a critical juncture with biologically and economically unsustainable fishing practices in many of the world's fisheries. There is a profound link between the approaches to managing fisheries and fishing capacity and the way in which participants behave and conduct their fishing operations.

Efforts to limit catches sufficiently to end or prevent overfishing and to rebuild depleted stocks will only succeed if the participants in the fisheries actively support such efforts. And, that support is unlikely unless those who bear the costs of the constraints on catch and fishing capacity expect to receive at least roughly comparable benefits. Harvest rights-based approaches have been effective in gaining support for such constraints in many fisheries.

Very basically, there are only two categories of fisheries management approaches that are used to manage fisheries, they are (1) command and control approaches and (2) harvest rights-based approaches that are supplemented as necessary with additional management tools. The former consists of measures that are based on trying to prevent fishers from catching as many fish by, in essence, making it more difficult and more costly to operate. Unfortunately, when used as the primary or core means of management, these measures do little to address the underlying causes of overcapacity and frequently lead to overcapacity.

The core management measures in the second category of approaches focus on aligning the commercial forces that are part of the daily operations of fishers with the biological goal of sustainability. These "incentive aligning" measures are based on defensible harvest rights for the stakeholders, and they are being implemented in a growing number of fisheries around the world. Their implementation has often been more contentious because they clearly determine who can catch which fish; however, once implemented, harvest rights-based management systems (typically *supplemented* with input controls for additional reasons) have tended to eliminate or prevent the chronically high levels of overcapacity that had prevented the attainment of the fishery sustainability objectives.

Moreover, these measures work even when there is neither a quantitative assessment of fishing capacity or a determination of the optimum level of fishing capacity.

Therefore, the crucial strategic policy decision currently facing fisheries managers is how to initiate or accelerate efforts to identify and implement harvest rights-based approaches that are supplemented as necessary with additional management tools.

8. Recommendations on how best the Global Forum can contribute to the identified priority goals and action plans

In its work of promoting international consensus-building and cross-sectoral dialogue on ocean and coastal issues, especially among governments, nongovernmental organizations, intergovernmental organizations, the private sector, and scientific institutions, the Global Forum provides an excellent platform for recognizing and reinforcing global efforts to address the common source of overcapacity and the other often co-occurring undesirable outcomes of the underlying management problem.

Additionally, in its advocacy at the highest political levels, because the Global Forum can help reinforce knowledge, resources, and organizational action to advance the global oceans agenda and to promote integrated oceans management, it can serve to support ongoing fisheries management efforts relating to the issue of overcapacity. For example, it can reinforce the ongoing work to identify and implement mechanisms that will contribute to correcting the misalignment problem by proving both better information concerning the expected results of various fishery management policies and better incentives for States, fishery managers, fishers, and other participants in the

fishing industry or the fishery management process.

Efforts to increase political awareness of the common underlying management problems caused by weak harvest rights should be redoubled. It should be made clear that rigorous quantitative estimates of fishing capacity and overcapacity are not required to improve the management of fishing capacity. Participants can also increase general awareness of the wealth generated by transitioning to sustainable rights-based fisheries⁶, the broad range of rights-based management solutions that have been used successfully to address the common underlying management problem that results in overcapacity and various other undesirable outcomes; and the ability to adapt such solutions to address fishery-specific and user group-specific conditions, objectives and management capabilities.

In order to fully address the impediments to solving the underlying fishery management problem, the Forum provides a venue for public officials to work with private sector participants – especially fishers and ENGOs – to help ensure that capacity reduction efforts are carried out in collaboration with other fishers and fisheries, both within countries and/or international fora to mitigate the problems that can result (e.g., when the fishing boats removed from one fishery are redeployed to another fishery).

The Forum in Vietnam should consider approaches for improving the management of fisheries and fishing capacity globally, including the implementation of harvest rights-based measures or other measures that address the misalignment problem facilitated by (ENGO-funded) decommissioning

⁶ Because rights-based fisheries management systems increase the profitability of the fishery, the fishers have increased ability to pay for fisheries management and enforcement costs and, importantly, a reason to participate in the protection of their assets.

schemes, as well as the introduction of management schemes using units of effort that are effective proxies for actual harvest shares, including tradable gear or time units, if harvest shares cannot be monitored and enforced adequately.

It is also important to allow the work of participants to feed into future work at the policy level, particularly within RFMO/As. To facilitate this, the Global Forum should recognize and support the ongoing work of the five tuna RFMOs and other regional fisheries organizations working to address the underlying misalignment problems. It can then seek to identify mechanisms for RFMO/As to coordinate their actions where appropriate and methods to provide RFMO/As with the unambiguous authority to ensure that all vessels and States that operate in their fisheries are subject to monitoring and enforce programs that effectively support compliance with their fishery policies and management measures, including harvest rights-based measures.

Furthermore, it may be useful to identify the RFMO/A governance policies that are barriers to sustainable fisheries and determine if corporate governance is a feasible and better alternative to RFMO/A governance.

9. Conclusions and future projections

This section is deliberately left open for discussion by the representatives at the 4th Global Forum in Hanoi, Vietnam.

References

- Beddington, J.R., D.J. Agnew, C.W. Clark. 2007. Current Problems in the Management of Marine Fisheries. *Science*. 22 June 2007: Vol. 316. no. 5832, pp. 1713 - 1716
- FAO. 1995. Code of Conduct for Responsible Fisheries. Rome.
- FAO. 2007 (forthcoming). Managing Fishing Capacity. *FAO Technical Guidelines for Responsible Fisheries*. No. 4, Suppl. 3 Rome.
- FAO. 1999. International Plan of Action for the Management of Fishing Capacity.
- FAO) 1998. Report of the Technical Working Group on the Management of Fishing Capacity, La Jolla, USA, 15-18 April 1998. FAO Fisheries Report. No. 586. Rome.
- FAO. 2000. Report of the Technical Consultation on the Measurement of Fishing Capacity. Mexico City, Mexico, 29 November to 3 December 1999. FAO Fisheries Report. No. 615. Rome.
- Cunningham, S and D Greboval. 2001. Managing Fishing Capacity: A review of policy and technical issues involved in managing capacity. FAO Fisheries Technical Paper 409. Rome.
- FAO. (forthcoming). Technical Guidelines for Responsible Fisheries – Fisheries Management Supplement 3: Managing Fishing Capacity. Rome.
- Grafton, R.Q., R. Hannesson, B. Shallard, D. Sykes, and J. Terry. 2006. The Economics of Allocation in Tuna Regional Fisheries Management Organizations. *Australian National University Economics and Environment Network Working Paper* EEN0612. http://een.anu.edu.au/download_file/s/een0612.pdf.
- Holland, D., E. Gudmundsson, and J. Gates. 1999. Do fishing vessel buyback programs work: a survey of the evidence. *Marine Policy*, 23(1): 47-69.
- Kirkley, J.; Squires, D.; Greboval, D. (ed.). 1999. Managing Fishing Capacity: Selected Papers on Underlying Concepts and Issues. FAO Fisheries Technical Paper No 386. Rome.
- Kirkley, James E., John M. Ward, James Nance, Frank Patella, Karyl Brewster-Geisz, Chris Rogers, Eric Thunberg, John Walden, Will Daspit, Brad Stenberg, Steve

- Freese, Jim Hastie, Stephen Holiman, and, Mike Travis. 2006. Reducing Capacity in U.S. Managed Fisheries. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-76, 45p.
- International Conference on the Sustainable Contribution of Fisheries to Food Security. Kyoto, Japan, 4-9 December 1995. The Kyoto Declaration and Plan of Action, and summaries of technical papers presented. AC442/E
- Hilborn, R. 2007. Reinterpreting the State of Fisheries and their Management. *Ecosystems* (2007) 10: 1362–1369.
- Metzner, R. 2007 (in press). "Property Rights and Institutional Arrangement in Southeast Asian Fisheries" in *Proceedings of the Poverty Reduction through Sustainable Fisheries: Emerging Policy Governance Issues in Southeast Asia, April 10-11, 2007*. SEARCA.
- Metzner, R. 2005. "Fishing Capacity and Fishing Aspirations: A Balancing Act" in Conference on the Governance of High Seas Fisheries and the United Nations Fish Agreement: Moving from Words to Action. 1-5 May, St John's, Newfoundland and Labrador.
- Metzner, R and JM Ward (comps). 2002. Report of the Expert Consultation on Catalysing the Transition away from Overcapacity in Marine Capture Fisheries. FAO Fisheries Report No. 691. Rome.
- OECD. 2007. Draft Report on Capacity Adjustment: The Political Economy of Decommissioning Programmes. TAD/FI(2007)12. Paris.
- OECD. 2006. Using Market Mechanisms to Manage Fisheries: Smoothing the Path. Paris.
- OECD. 2005. OECD Policy Brief: Subsidies: a Way Towards Sustainable Fisheries? Paris.
- Pascoe, S., JE Kirkley, D. Greboval, and CJ Morrison-Paul. 2003. Measuring and assessing capacity in fisheries: (2) Issues and methods. FAO Fisheries Technical Paper 433/2;
- Pascoe, S. and D. Greboval. 2003. Measuring capacity in Fisheries. Selected papers from the FAO Technical Consultation on the Measurement of Fishing Capacity, Mexico City, 1999. FAO Fisheries Technical Paper No. 445. Rome.
- Terry, J.M. 2007. An Assessment of the Use of Capacity Analysis in U.S. Federal Fishery Management. *Marine Resource Economic*, 22: 99-103.
- United Nations. 2002. Report of the World Summit on Sustainable Development *Johannesburg, South Africa, 26 August – 4 September 2002*. A/CONF/199/20*. Annex, Plan of Implementation of the World Summit on Sustainable Development. Ch IV, Para 31(d).
- UNEP. 2004. Analyzing the Resource Impact of Fisheries Subsidies, a Matrix Approach UNEP/ETB/2004/10.
- Ward, J.M., Kirkley, J.E., Metzner, R., Pascoe, S. 2004. Measuring and assessing capacity in fisheries. 1. Basic concepts and management options. FAO Fisheries Technical Paper. No. 433/1. Rome.

Policy Brief: Aquaculture

1. Introduction

Fish for food: A shift in reliance from wild stocks and capture fisheries to aquaculture?

Aquaculture has been around for centuries. Since remote Antiquity, mankind has mastered techniques to grow and cultivate fish and other living aquatic resources inland or near the seashore. However, until recent times, aquaculture has been shadowed and even dwarfed by capture fisheries, especially when the amount of catch began to increase hugely and steadily as a consequence of the combination of technological development and growth in demand for fish. From less than 4 million tonnes in 1900, catches increased to 16.7 million tonnes in 1950, 62 million tonnes in 1980, reaching a record high of 86.7 million tonnes in 2000.

Since then, the levels of catch are stagnating globally. It is generally estimated that about 50 percent of the stocks are fully exploited (with no room for further expansion and some risk of decline if not properly managed), 25 percent overexploited or depleted and only 25 percent moderately exploited or underexploited.

Wild stocks moreover are threatened by population pressure, illegal unreported and unregulated fishing, the dramatic increase of abusive fishing techniques and environmental factors such as pollution from sea or land-based sources and climate change. The resulting stock depletion not only can have dramatic implications for food security, especially for subsistence

fishers in developing countries who rely on fish as their main source of animal protein and income, but, it can also affect economic development and social welfare in many countries around the world.

Yet, not only capture fisheries are unlikely to recover adequately in the near future, but there is no indication that fish production from the capture will increase significantly in the short or medium run; it will remain unchanged, at best (Figure 1).

Meanwhile, owing to population growth and to an increased understanding of the human health benefits of increased seafood consumption, the world demand for fish continues to be on the rise. With improving incomes and well-being in many countries, primarily in South Asia, home to more than one fifth of the world's population, per capita fish demand is likely to expand further.

In light of this situation, while recognizing that the recovery of depleted stocks is urgent and avoiding depletion of still-healthy stocks is important, there is a growing awareness that only aquaculture can bridge immediately, and in the longer term, the gap between the maximum level of sustainable output from capture fisheries and the increasing world demand for seafood.

Aquaculture production has been growing in response to the growth in demand. There has been a momentous increase of aquaculture in the past thirty-five years from 9.9 percent of total production of fish, crustaceans

and mollusks by weight in 1970, to 29.9 percent in 2002, with mariculture representing still only 36.5 percent of that amount. Already, nearly 43 percent of fish consumed comes from aquaculture (FAO, 2006).

In addition, aquaculture's contribution to countries' economies is growing in importance. The world value of aquaculture output reached US\$ 70 billion in 2004. In some countries, this contribution to national economies represents an important share of their GDP. For example, in 1998, aquaculture added 4.96 percent to Vietnam's GDP. Since then, the value of Vietnam's aquaculture output has been increasing exponentially, at an annual average rate of more than 22 percent. Another significant example is to be found in the Chilean salmon (and trout) farming, which constitutes 79 percent of the total fish and fish products exported from Chile, bringing US \$2.21 billion in export revenues (from 387,141 tons exported) into the country's economy in 2006, and creating tens of thousands of direct and indirect jobs.

Thus, whilst capture fisheries are only expected to be responsibly and sustainably managed and resources conserved, there is an accepted and widespread expectation that aquaculture will and should be developed. These indeed are the same terms used in the 1995 FAO Code of Conduct for Responsible Fisheries and the semantic nuance is significant.

There are a number of important issues linked to that evolving role and growing importance of aquaculture. As noted above, these issues are no more circumscribed to inland waters or to the coasts: they concern the seas and oceans themselves. Of the 48.150.000 tons of fish produced from aquaculture

in 2005, 57 percent came from freshwater farming; the rest came from brackish water (8 percent) and from marine environments (35 percent) and, as stressed below, this proportion should increase considerably in the longer term.

2. Relationship to the broader global ocean WSSD goals/targets

The WSSD oceans outcomes can be characterized as setting out a strategy for improved oceans governance, sustainable fisheries, and conservation of marine biodiversity. Aquaculture can play a vital role in achieving these goals through sustainable economic development and environmentally friendly technologies, reduction in fishing pressure on living marine resources, and the rebuilding of depleted stocks.

3. Top priority policy issues

The main priority policy goals can be parsed into a range of specific concerns. They include issues related to: (1) availability and access to space and water; (2) availability and access to production inputs; (3) the trend towards marine aquaculture and sea-ranching; (4) the interaction between aquaculture and the environment; (5) technological development and access to financial capital; and (6) access to markets. Another important and cross-cutting topic is issues related to aquatic animal health and human health, including both sanitary and phytosanitary issues.

4. Suggested goals, targets, and objectives for improvement

Issues related to availability and access to space and water

Space and water are by far the most important production factors in aquaculture.

In freshwater or coastal aquaculture, with the possible few exceptions, there is little new land available for fish farming in most countries around the world. Land shortage is already acute in many countries, especially in Asia, the world's leading aquaculture producer. As aquaculture countries expand their production and new ones embark in this activity, land scarcity will become even more severe. Land availability and land use policies are likely to remain as major constraints to aquaculture expansion globally.

Different governments have taken different approaches to address the land issue. As is the case in Southeast Asia, one means has been to convert agricultural to aquaculture land where crops such as rice have failed to produce competitive returns. Aquaculture has also been integrated into existing farming systems, such as in sugar plantations. However, land conversion and crop integration have their own limits. Where there is no possibility of expanding aquaculture production through these means, one of the policies used to overcome this constraint is to promote intensification of land-based production. This approach will be re-visited in a different section.

Most nations have come to understand the importance for the farmer to secure a legal right to the land on which the farm is located, be it through ownership, a lease or similar legal arrangements. They also enact laws and regulations for farmers to have

access and right to clean water.

Another element commonly encountered in the legislative texts on the supply side of aquaculture is the permits and licensing systems. Permits and licenses enable Governments to assess the environmental sustainability of aquaculture proposals and to impose conditions that require the farms to be operated in a sustainable manner. They further provide farmers with clear rights to run aquaculture facilities as long as they comply with the terms of the permits, the relevant environmental laws and the applicable codes of aquaculture practices.

However, such is not always the case. In many countries, especially in the developing world, land rights are not clearly defined, which often leads to serious disputes. In other cases, the land acquisition process is usually long and fraudulent, which deters investors, thereby hampering the development of aquaculture. With the emergence of large-scale commercial farms in many parts of the world, these issues will need to be properly addressed for an orderly development of the sector. Even in developed countries, assessing the viability of an investment in aquaculture remains difficult. The lack of a comprehensive, stable governance structure for aquaculture impedes financial planning and investment in aquaculture.

In many countries, the use of freshwater in aquaculture gives rise to frequent conflicts. In addition to its use in aquaculture, freshwater plays an important role in human consumption and irrigated agriculture. For many, its use in aquaculture is a loss for agriculture, however, this is debatable. In many cases agriculture has been given priority in allocating water. Yet, the two sectors need not be mutually incompatible. There are policies to

encourage multiple use of water resources in many countries around the world. Local committees for water management have also been established in many countries to try to avert or resolve water conflicts as they occur, but as aquaculture expands, the problem of access to clean water is likely to become more acute and a serious limiting factor to aquaculture development; it may call for adequate policies at the national, regional and global levels to lessen or avert associated potential conflicts. However, in most developing countries, there is still a lack of modern water legislation for the allocation of water resources, especially during dry seasons or other times of water shortage, and for the control of water pollution which can be enforced at the insistence of the farmer.

In the case of marine aquaculture and sea-ranching, access to space is conditioned by one of the basic legal characteristics of the 1982 United Nations Convention on the Law of the Sea. That is, the division of seas and oceans into areas subject to different legal regimes. On the one hand, there are various areas under the sovereignty or national jurisdiction of the coastal State: internal waters, archipelagic waters, territorial sea, contiguous zone, exclusive economic zone and continental shelf. On the other hand, there are the international spaces, which include the high seas and the international sea-bed area. The development of aquaculture and sea-ranching will constitute an activity that will necessarily compete with others, especially those related to the utilization of resources both living and mineral. Competition will also occur with those activities related to navigation and communication. Whilst the coastal State will have the final

word in the maritime spaces under its sovereignty, it will have to take into account the rights and interests of other States in the exclusive economic zone in accordance with article 59 of the 1982 Convention on the Law of the Sea. In the high seas, all users are, in theory, on the same footing and would be in the obligation to negotiate the establishment of the necessary principles and rules applicable to this new activity (see below).

Issues related to availability and access to, and selection of, production inputs

Availability and access to production inputs such as seed and feed are important in the selection of species to cultivate. Where these inputs are available and affordable, other things being equal, often high value-species and sophisticated cultivation techniques are used, and higher output levels generally follow. In Africa, for example, the lack or limited access to good quality feed and seed has left farmers with no choice but to grow almost only plankton feeder or omnivorous species such as Tilapia (*O. niloticus*) and Catfish. This situation of inadequate inputs along with the lack of sound policies has left Africa lagging far behind the rest of the world in terms of aquaculture production.

Limited access to capital has resulted in limited farming of “high-value” species such as shrimp and abalone, which require important investment capital. In Taiwan and Thailand where feed, seed and capital are not an issue, shrimp farming has been extensively developed.

In general, producers might also respond to increasing demand by expanding appropriate technologies to cover diversification to new species or strains, especially those of high

commercial value. Diversification to high value species is already expanding in several places in the world, including in marine fish production in Southeast Asia with an increase of the number of farms for mariculture of high value species while farms producing low value species, such as cyprinids, are plummeting. China and the Philippines are good examples.

The farming of non-food species, such as ornamental aquaculture, is a still-ill-explored and yet promising side of the industry. In 2000, ornamental fish farming brought an estimated retail value of US \$3 billion into the world economy. Because of its potential for employment and income creation in rural and urban areas, and for generating foreign exchange earnings, Governments around the world are ever more promoting the culture and trade of ornamental fish. As the competition for the supply of food fish increases, it is likely that this aspect of aquaculture will grow in importance with the least competitive farmers in the production of table fish shifting to this new technology. The challenge will be for policy makers to curve and limit the expansion of the disease outbreaks which already threaten this industry.

As some production factors such as land and water become scarce, producers will probably turn to less land and water intensive farming systems, which will require intensive feeding and high quality seed. Indeed, intensification is becoming a growing phenomenon across the globe. But, because production costs generally rise with the level of intensification, not all farmers are expected to intensify. Instead, many may choose to reduce intensity and produce less output, but lower the costs and/or the

vulnerabilities to fish health and/or environmental problems. In the particular case of many developing countries, especially in Africa, limited availability and access to good quality seed and feed remain problematic and could put these countries at a comparative disadvantage. There is a need to rethink policies to address these issues.

The feed issue has also already risen in the developed world where it could become a major constraint to aquaculture expansion; fish feed has become and is likely to remain an important global issue. The problem stems from the reliance on fishmeal and fish oils to grow fish in many countries. With the predicted global increase in aquaculture production, the use of fishmeal in aqua feed is expected to increase by more than 5 percent (from 2.87 to 3.02 million tonnes from 2002 to 2012) while the demand for fish oil will increase by more than 17 percent (from 0.83 to 0.97 million tonnes) from 2002 to 2012 (Tacon et al., 2006).

However, there are good reasons to remain optimistic. The production of fishmeal and fish oil is expected to remain stable over the next decade. The share of fishmeal use by the animal production sector is expected to fall and the use of vegetable-based protein and oil to increase. Because of technological advances, there are expectations that feeding practices will become more efficient, thereby allowing the sector to use less feed. A combination of these factors implies that fishmeal and fish oil availability is unlikely to seriously threaten aquaculture development in the medium run. However, FAO (2006) cautions that this optimism should be taken cautiously. The demand for fishmeal and fish oil from developing

economies like China may have a big impact on the overall supply and demand of these feedstuffs. In 2003, China's share of the total global fishmeal imports was 22.5% (FAO, 2005).

There has been a good deal of effort in finding proper substitutes for fishmeal and fish oil from vegetable and terrestrial sources. Unfortunately, total replacement of fishmeal has so far been possible only for omnivore and herbivore finfish and crustaceans. There is a need for concerted global effort for more research in this area.

Finally, there are other dimensions of the use of fish in aquaculture that must be mentioned. First, the use of fish as feed. About six million tonnes of the so-called trash fish are used as direct feed in aquaculture annually, particularly in marine aquaculture. For instance, it is projected that by the year 2013, China alone would require 4 million tonnes of "trash" fish to sustain its marine cage culture. Yet, the supplies are declining; the use of "trash" fish in aquaculture does not look sustainable. There are also concerns that the continued use of "trash" fish may result in adverse environmental effects and biosecurity risks. Claims that the so-called trash fish should be used as human food are mounting. These concerns could put pressure on the use of fish meal, thereby limiting aquaculture expansion (everything else remaining the same).

Second, the utilisation of fish from wild stocks as seed. For some species, capturing juveniles from the wild for fattening in pens or cages is progressively becoming a common practice in some regions. This method may lead to an additional pressure on these stocks, which can be considerable and can result in their

overfishing and depletion. A significant example is the capture and fattening of the blue fin tuna in the Mediterranean. A major problem in this "ranching" production is the unreported capture of juvenile fish, outside internationally agreed conservation and management rules.

Issues related to the trend towards marine aquaculture and sea-ranching

The expected high demand for fish will eventually trigger the increase in fish prices in the short run. As was the case with the shrimp fever in the 1980's, high prices will induce aquaculture entrepreneurs to look for new ways of meeting the high demand for fish.

Faced with limited possibilities of inland expansion due to the increasing land and water paucity, they are likely to move outward instead. One of the foreseen ways is to develop and widely adopt new production technologies such as sophisticated offshore cage culture and enclosure systems. The potential for offshore aquaculture is high worldwide, especially in North and Latin America, Asia Pacific, Europe and West and Southern Africa. Since offshore aquaculture is contained in the ambit of the coastal State's jurisdiction, it is up to this State to take the necessary action to define the applicable legal regime. An interesting example is the legal and regulatory framework being considered by the United States for offshore aquaculture in that country's Exclusive Economic Zone.

Another production technology which is likely to emerge at a wide scale as a consequence of land and freshwater dearth and the search for enough supply to meet demand, is sea ranching. This production system is likely to lead to a consolidated trend of

moving seaward and in deeper waters aquaculture operations and activities, which, for a long time, occurred close to the shore. The system is also likely to result in a higher utilization of marine species, such as tuna (in tuna farming). There are good reasons to believe that there will be installation of sea-farms in the high seas, beyond the 200 miles belt of national jurisdiction in a foreseeable future.

From a legal point of view the sea-ranching situation is quite different from marine aquaculture. Differences arise in terms of the actors involved, but also with regard to the applicable rules of law. In the movement that led to the negotiation and adoption of the 1982 Convention, there was indeed awareness of the possibilities that the advances in the field of marine aquaculture could bring. This was encouraged then, not only by the general atmosphere of technological optimism that characterized the 1960s, but also by the emergence of new experiments in sea farming. However, such a future was perceived to be so far away that the authors of the 1982 Convention did not take into account what was still a matter of speculation, when negotiating the provisions related to the legal regime of the high seas.

The legal issue that is raised in relation to sea-ranching on the high seas derives from the fact that, whatever their specific characteristics, the installations that will be established will necessarily constitute a prolonged, semi-permanent or permanent, occupation of the marine spaces concerned. The question, then, becomes an assessment of whether the provisions of the 1982 Convention are comprehensive and flexible enough to accommodate and regulate such a situation, which was unresolved by the negotiators.

Taking into account the radical differences between sea-ranching and marine capture fisheries, one possible approach might be to focus on the rules applicable to the installations themselves rather than to consider the purpose for which they will be put in place. Rather than treating these installations as a kind of moored “ships”, it might be more convenient and fruitful to regard them as belonging to the ambit of the new “freedom of the high seas” referred to in Article 87 of the 1982 Convention, that of constructing “artificial islands and other installations permitted under international law”.

What is missing in the Convention, however, is the guidance about how this rather general provision should be expanded for the purpose of its implementation. There is some urgency to have this regulation in place, since it is necessary to anticipate the need for a more precise and detailed regulation rather than wait for a disorderly and unregulated rush to occupy stretches of the high seas. For reasons of consistency, among others, the process for defining these rules should be at the global level rather than at the regional level.

Issues related to the interaction between aquaculture and the environment

Aquaculture, both inland and offshore, may be negatively affected by environmental factors. Pollution, both from the sea or land-based sources, is a threat to aquaculture. But, so are other factors such as climate change, the effects¹ of which may affect both the production environment and the produced species themselves.

¹Examples are, on the one hand, sea-level rise and flooding or, on the other hand, increased scarcity of water supply; storms and other meteorological phenomena.

Prevention of pollution and adaptation measures in relation to climate change must be actively pursued.

Aquaculture can be affected by the environment, but it may also have adverse effects on the environment and its ecosystems, including the fauna and flora of these ecosystems.

Indiscriminate destruction of mangroves and natural nurseries, propagation of diseases and parasites such as the salmon sea lice, genetic contamination of wild stocks by aquaculture escapees and pollution from outputs of nutrients are only but a few examples.

One should not be surprised of the negative publicity the sector has been subjected to, including in relation to the quality of the aquaculture product itself. For instance, it has been argued that farmed fish is fatty, dyed, polluting and stuffed with antibiotics, and that aquaculture is unsustainable (The Economist, August 2003).

The level of negative publicity of aquaculture seems to be over-inflated and unfair; observed incidents are often isolated cases. For instance, the output of pollutants (nitrates and phosphates) from aquaculture can be considered insignificant in terms of their contributions to nutrient loading in most regions of the world. Additionally, in recent years, important advances in minimizing the nutrient and organic inputs from aquaculture have been achieved.

In general, efforts aimed at promoting the application of an ecosystem approach to aquaculture as well as the development of standards and codes of practice that ensure the practice of environmentally and socially sound aquaculture by all stakeholders are under way. They are undertaken by, *inter alia*, farmer and consumer

associations, the civil society, institutional buyers and different interest groups. Unfortunately, critics of aquaculture continue to have the louder voice. Sensational negative media is likely to intensify as aquaculture activities expand further into the sea and intensify across the globe. The challenges are (1) for the sector not only to continue its efforts with a view at ensuring a sustainable and environmentally friendly aquaculture, but also to actively improve its public image and convince consumers of its merits and (2) for the development of governance structures that boost confidence throughout the value chain, from investors to consumers.

Issues related to technological development and access to financial capital

As farms intensify and diversify into production systems requiring sophisticated technologies, access to financial capital will be critical to the development of the sector.

Capital will be necessary not only to create, maintain and expand businesses, and increase efficiency in order to remain competitive at home and abroad, but also to meet seasonal operating cash needs. There will also be a need for aquaculture insurance as these high-tech investments will probably attract more risks than generally experienced in conventional aquaculture.

Unlike in the developed countries where access to financial capital might not be as big an issue, availability and access to financial capital can be a serious impediment to aquaculture development in developing countries. The capital market is poorly developed and prospective borrowers have difficulties meeting the banks'

standard lending requirements. The usual loans from informal sources are not only costly, but also limited and mainly intended for working capital needs and contingencies for micro-enterprises.

Governments in many countries adopt start-up policies aimed at providing financial assistance to jump start the industry because of the inability of potential entrepreneurs in infant industries to afford initial investment through their own equity or to obtain private funding. Assistance is also provided because as an infant industry, aquaculture may need support until it reaches a stage at which costs are competitive. If industries learn by doing, costs will decline with experience, and so the argument goes, such industries need government assistance in their early years.

Through expansionary policies, Governments also help farmers to grow. One of the commonly policies advocated by farmers is the use of subsidies. The argument is that with high costs of inputs, the industry may lack absolute and competitive advantage, and therefore fail to flourish. However, the high fiscal cost of subsidies, the investment disincentive they create for the private sector and the resulting distortions are forcing their curtailment worldwide.

Overall, provided that good governance and investment conducive policies exist, globalization should ease the issue of access to financial capital. By allowing capital flows from one country to another, globalization may enable capital intensive farming systems to also be established in developing countries as is already the case in countries like Uganda and Zimbabwe in Africa, and Chile and Honduras in Latin America. But, as

discussed above, not everyone agrees on who the real winners are from these investments. This could be one of the issues that research should clarify.

With regard to the particular situation of sea-ranching, the development of the sophisticated technologies that are needed will require enormous capital to purchase expensive and complex machinery, pay engineers and train workers. These large amounts of investment capital are not always readily accessible by individual farmers, especially those from developing countries. A possible inference from this scenario is that these new technologies are likely to be dominated by big corporations, either from and operating in the developed world, or from the developed world and operating in developing countries. One of the policy implications is the need for policy makers and development agencies to look for ways of availing such technologies to developing countries, especially those where a good percentage of the population depends on fish farming for livelihood.

Issues related access to markets

More and more aquaculture products are moving into international trade. As aquaculture grows, so will the need to trade. Access to markets will be a key to success for producers, and, hence, the entire sector. Unfortunately, important quantities of fish often fail to cross importing countries' borders where they are detained and then rejected or destroyed. Some of the difficulties faced by exporters include standards and safety regimes which can vary from one importing market to another (FAO, 2006). Many exporters often view this practice as a sheer way of shielding their domestic aquaculture industries from foreign competition, or

more bluntly, as a “non-tariff barrier” to trade.

As aquaculture develops worldwide and producers compete for higher market shares, these kind of accusations and counter-accusations are likely to increase in volume, which could block aquaculture from supplying enough fish to meet the growing shortfall as the world's wild fisheries become more and more exhausted. There have already been many instances where domestic producers in importing countries complained that imported aquaculture products were dumped into their national markets or benefited from illegal subsidies, prompting importing countries to set up measures against such imports. On several occasions, settlements of these disputes were only possible through the World Trade Organization (WTO).

Export promotion policies are commonly used to help producers compete internationally. Aquaculture is more and more becoming an international business, targeting export markets. It may cause a dynamic evolution of market shares internationally. Though globally insignificant, policy assistance is selectively provided to producers to help them compete internationally. These policies consist of tax holidays and tax exemptions on imported production inputs including equipment, machinery, broodstock, feed and fertilizers, exemptions from permit fees, as well as holidays and/or exemptions from sales and other local taxes.

On the demand side of the industry, Governments also intervene at the micro-level through marketing policies. Some establish market structures that permit hygienic

handling and selling of farmed fish. Others hold taste tests at government functions, produce recipe booklets and organize cooking demonstrations on radio and television, or provide transport and ice for the big buyers. By so doing, they hope to increase demand by developing new markets and/or expanding existing ones, thereby triggering more supply. Government interventions occur also through regulations of aquatic food safety.

Because of the globally increasing presence of aquaculture products that look exactly like their wild capture counterparts in international markets, strong arguments against the use of subsidies and other economic incentives in aquaculture can be expected to increase in the near future. The challenge for policy-makers, at this stage, would be to anticipate the growing international opposition to direct government transfers to producers and the use of other forms of instruments aiming at shielding them against foreign competition and propose policies and other arrangements which would regulate the use of these instruments internationally while allowing aquaculture to grow harmoniously.

There is also a need to anticipate attempts in using tariff and non-tariff barriers by some countries as a means of protecting their domestic aquaculture industries against foreign competition, and to support initiatives such as the development of internationally agreed on guidelines for the elaboration of transparent and non-discriminatory certification procedures and the harmonization of aquaculture quality standards.

5. Recommendations for addressing priority issues and for progress toward achieving targets/goals

The need for good governance and appropriate policies at the national and international level

As is the case in any other business, good governance (including political stability) and sound policies play an important role in aquaculture development. They assure and attract domestic and foreign investors, reduce transaction costs and enhance the competitiveness of the industry at home and abroad. Good governance and policies can influence both the supply and the demand side of the sector.

Countries should actively include aquaculture in their development agenda, promote sustainable aquaculture development, create investment friendly climate and supply good supporting infrastructure and emphasize research, technological breakthrough and information dissemination as development instruments.

Unless there is proper planning and adequate legal and regulatory structures are in place to avert potential environmental harm, there could be an unregulated, uncontrolled aquaculture development in many parts of the world, which, in turn, could lead to the industry's self-destruction. This implies that in countries with incipient aquaculture industries, governments will need to make substantial investments in research, technology development, building human and institutional capacity as well as governance arrangements for aquaculture. Such investments may not always be achievable. There is,

therefore, a need for the international community and development agents to explore the means of availing modern technologies and building capacity in developing countries for aquaculture to develop harmoniously.

Intergovernmental bodies, such as the "Network of Aquaculture Centers in Asia-Pacific (NACA) and the nascent "Aquaculture Network for the Americas" (ANA), can also play an important role as demonstrated by their recent efforts. Both seek to serve as vehicles for technology transfer and infrastructure capacity-building among their members, precisely to overcome, through pooled and shared resources, the obstacles enumerated above.

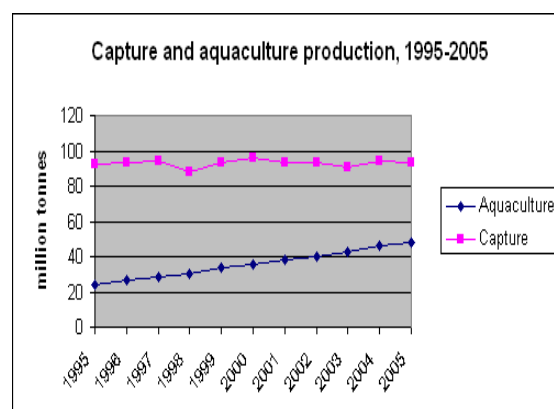
6. Recommendations on how best the Global Forum can contribute to the identified priority goals and action plans

This section is deliberately left open for debate by the representatives at the 4th Global Forum in Hanoi, Vietnam.

7. Conclusions and future projections

This section is deliberately left open for debate by the representatives at the 4th Global Forum in Hanoi, Vietnam.

Figure 1



References

FAO 2007. The State of world fisheries and aquaculture 2006. Rome, FAO. 2007.

Hishamunda, N. 2007. Analysis of commercial aquaculture development in Southeast Asia: a Policy perspective (in Press). 2007.

Hishamunda, N. 2007. Duty Travel Report to Chile. Rome, 2007.

Hishamunda, N. 2006. Global trends in aquaculture development. In David L. VanderZwaag, editor: "Aquaculture law and Policy" pp. 37-46. 2006.

Karakassis, I., Pitta, P. & Krom, M.D. 2005. Contribution of fish farming to the nutrient loading of the Mediterranean. *Scientia Marina* 69:313–321.

Pulvenis de Séligny, J.-F., *The Living Marine Resources and the Evolving Law of the Sea*, Paper presented at the Symposium organized by the Association internationale du droit de la mer and the Rhodes Academy of International Maritime Law and Policy in memory of Theodore Halkiopoulos (Rhodes, October 8-10, 2005)

Tacon, A.G.J., 2006. *Study and analysis of feed and nutrients for sustainable aquaculture development: A global synthesis*. Paper presented in FAO Expert Workshop on "Use of Feed and Fertilizer for Sustainable Aquaculture Development", Wuxi, PR China, 18-21 March 2006.

Tacon, A.G.J., Hasan, M.R. and Subasinghe, R.P., 2006. *Use of fishery resources as feed inputs for aquaculture development: trends and*

Policy Brief:

Tuna: A Global Sustainability and Governance Challenge

1. Introduction

Tuna is a large share of the volume and value of global fisheries that is under stress in all major fishing areas of the world. As one of the ocean's top predators and fastest swimmers, they are highly migratory across the world's oceans, fished in both domestic waters and on the high seas.

Being highly migratory, tuna and tuna-like species are managed by five Regional Fisheries Management Organizations (RFMOs)¹. The Convention Areas for these RFMOs include the EEZs of coastal States, but the treaties generally recognize that provisions will not prejudice the exercise of sovereign rights of a coastal State in accordance with the international law of the sea.

Depending on the size and species, an individual fish can be worth \$25,000 or more. Due to these factors coupled with the modernization of fishing fleets and the globalization of markets, tuna and related species are at increased risk of overexploitation. As a result of changes in fishing capacity and market demand, the global tuna harvest has gone from 0.5 million metric tonnes in 1950 to over 6 million metric tonnes by the middle of this decade.

Key species for commercial fishing include bluefin, yellowfin, bigeye,

albacore, and skipjack. According to the FAO, catches for key tuna species account for less than 5% of the total world marine fish harvest by volume, but the landed gross value is estimated to account for nearly 20% of the global marine total.

Except for the skipjack tuna fishery in some areas, the FAO considers most tuna stocks fully exploited, over-exploited, or depleted². The increased popularity of the sashimi-sushi markets is now considered to be one of the main causes of overfishing of this species, specifically bluefin tuna. Other factors that affect fishing activities include regulations, enforcement, and fishing costs, such as fuel. Soaring market demand for bluefin tuna has been blamed for their spawning biomass being reduced to 20% of 1970 levels³. The seemingly endless appetite for tuna has given way to the development over the last ten years of a "tuna ranching" industry that has now become a major factor in the exploitation of juvenile tuna stocks in the Mediterranean Sea. "Sea ranching" involves the capture of migrating juvenile bluefin tuna to fatten them in floating cages for a few months or up to two years.

Non-governmental organizations have been working to raise awareness among consumers that stocks are in trouble (e.g., through dissemination of information and promoting boycotts,

¹ International Convention on the Conservation of Atlantic Tunas (ICCAT), Inter-American Tropical Tuna Commission (IATTC), Western and Central Pacific Fisheries Commission (WCPFC), Commission for the Conservation of Southern Bluefin Tuna (CCSBT), and Indian Ocean Tuna Commission (IOTC).

² FAO. The state of world fisheries and aquaculture. Rome: FAO Fisheries Department; 2004 – 2005 and 2006

³ J.L. Jacquet and D. Pauly *The rise of seafood awareness campaigns in an era of collapsing fisheries* Marine Policy 31 (2007) 308–313

which call for supermarket chains, chefs, restaurant patrons and consumers to refrain from selling and consuming Mediterranean Bluefin tuna). The resulting level of awareness among the public and the impact such information has on consumer preferences and demand is both unknown.

Should member States of tuna RFMOs fail to reverse the declines in tuna stocks, there will be renewed calls not only for fishing moratoria, as is already the case, but also for strong controls on international trade in some tuna species. This raises questions about the potential future role for environmental conservation fora, such as the Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES), in governing trade in commercial species that have become endangered due to trade through institutional overfishing as well as IUU fishing. At the same time, the potential impact of a CITES listing would only apply to products traded internationally, not those destined for domestic consumption. While these fora could provide valuable tools for deterring overfishing, IUU fishing, or other harmful practices, it will be important to ensure that discussions are grounded by relevant fisheries expertise and respect the mandates and jurisdictions of international organizations charged with the responsibilities of managing this resource.

2. Relationship to the broader global ocean WSSD goals/targets

The WSSD goals for sustainable fisheries call for the implementation of fishery capacity management measures, the elimination of IUU fishing, the maintenance or restoration of depleted fish stocks where possible no later than 2015 and the elimination of subsidies that contribute to IUU fishing and overcapacity. Additional WSSD goals for which the fisheries sector has a responsibility to address include the goals for integrated oceans and coastal management, which call for the application of the ecosystem approach by 2010, and the goals for conservation of biodiversity, which call for a significant reduction in the rate of biodiversity loss by 2010.

3. Top priority policy issues

The challenges in the management of tuna fisheries include fleet overcapacity, institutional overfishing, IUU fishing, maintaining and restoring depleted stocks, and reducing bycatch of non-target tuna species and other species, such as sharks, seabirds, turtles, and mammals. Mechanisms by which some of these challenges can be addressed include the implementation of flag State, port State and market State responsibilities, as well as better data collection and information sharing regarding catches and vessels.

One of the top priority policy issues to address the problems in tuna RFMOs should be to improve the governance of each organization as well as compliance with existing policies and programs.

Management of Fishing Capacity

It is widely recognized that the present worldwide tuna fishing capacity is in excess of sustainable catch levels. Despite this acknowledgement, particularly through resolutions

encouraging no increase in capacity, there have been few decisions within tuna RFMOs aimed at decreasing existing fishing capacity. Also to be addressed is the issue of controlling other vessels that facilitate fishing on the high seas, namely transshipment vessels, supply vessels and others. It must be recognized as well that recreational fishing contributes to tuna mortality at a level that might be, as yet, not well documented as not all countries have implemented systems for monitoring and tracking their recreational fisheries.

Some initiatives have been undertaken by the Inter-American Tropical Tuna Commission (IATTC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT) to limit capacity to current levels, through a regional capacity management plan and through the formation of a working group on capacity, respectively. Despite these initial efforts, more work is still required to reduce overcapacity.

Increasing fishing capacity, through vessel construction and modernization, has often been linked with government subsidies. State members of the WTO are currently negotiating fisheries subsidies disciplines, the first sector-specific negotiations of this kind. Negotiations here will likely set a precedent for other sectors. The goal is to discipline subsidies that contribute to overcapacity, while recognizing the special and differentiated treatment required for developing countries.

Elimination of IUU Fishing and Institutional Overfishing

All tuna RFMOs are attempting to eliminate IUU fishing through increased monitoring, surveillance and reporting methods. Many more challenges remain as IUU fishing

activities are proving difficult to eradicate.

Some RFMOs have instituted catch documentation schemes to fight IUU fishing and in some cases have achieved a limited success in combating illegal activities. As noted above, ICCAT is making some progress in this direction to institute better catch documentation schemes. However, questions remain about the effectiveness of these schemes – especially if importing states do not cooperate.

Institutional overfishing (as opposed to IUU fishing), can be defined as overfishing that is effectively sanctioned by member States within RFMOs. Depending on the RFMO, there can be many causes of institutional overfishing, including inadequate investment in scientific advice, lack of explicit limits on fishing activity, decision-making processes that effectively allow member States to set fishing quotas higher than sustainable levels determined by science, lack of agreement on setting TACs, and lack of adequate member State control of and accountability for fishing activity by their fishing fleets to ensure that quotas are respected.

Institutional overfishing can be reduced by eliminating the failure to report catches and by including tuna farming as a capture activity. Presently, countries that fish tuna for tuna ranching operations are not required to submit data on these catches (The new ICCAT catch documentation scheme is intended to capture information on fish destined for farms, then harvested from farms). Other measures to improve management of tuna stocks include the enforcement of minimum size for

juvenile tuna. Finally, when establishing quotas, tuna RFMO should also take into account the interactions between tuna populations.

Strengthening of RFMOs

Maintaining and restoring of depleted tuna stocks should be a priority for all tuna RFMOs and scientific activities have been augmented considerably in the last few years.

A recent success story of restoring a depleted stock is the northern Atlantic swordfish managed by ICCAT. As a result of a stringent rebuilding plan, the 2006 assessment for Atlantic swordfish indicated that the biomass had improved greatly possibly due to strong recruitment in the late 1990s combined with reductions in reported catch in the early 2000s. The 2006 assessment estimated that the biomass for North Atlantic swordfish, at the beginning of 2006, was about 99% of the biomass needed to produce the ICCAT goal of maximum sustainable yield (MSY).

While the stock was considered rebuilt in 2006, the North Atlantic Swordfish TAC remained at 14,000t for both 2007 and 2008. Although the stock is now considered rebuilt to a level that would produce MSY, there are still concerns regarding overexploitation and fishing mortality. Given these concerns, ICCAT is continuing its rebuilding program through 2009.

In addition to concern over management of targeted commercial species, there is also a growing concern over bycatch of non-target and/or non-commercial species by gear used in tuna fisheries. Particular problems are shark, seabird and marine turtle bycatch in tuna long line gear and fish aggregating devices (FADs). To deal with these problems

successfully and thereby ensure tuna RFMOs are living up to their responsibilities to protect the ecosystem and biodiversity that support tuna species, these RFMOs will have to undertake new science over the coming years to understand the interactions that lead to this bycatch and other ecosystem impacts and members will have to agree on appropriate measures in the interim. This will not occur without effective strengthening of the organization over the long-term.

Developing Countries

Another critical challenge going forward will be addressing the expectations of an expanding and diversifying set of fisheries interests. In the case of developing States, they have indicated their interest – through UN fora, the FAO, the WTO and within RFMOs – in managing fisheries for longer-term sustainability while seeking to develop their fisheries sectors. Doing so requires access and allocation to high seas fish stocks (such as tunas), the right to use government subsidies to expand fishing capacity, and support from developed States for fisheries management, science, and enforcement infrastructure and expertise. The challenge will be to enable developing States to be responsible and beneficial partners for international fisheries and oceans governance reform.

4. Suggested goals, targets, and objectives for improvement

In order to achieve credible international fisheries governance both within and outside of (RFMOs) to combat IUU fishing, flag States, port States and market States must undertake complementary initiatives for the seamless identification of IUU

fish products through the value chain. Flag state measures are, of course, fundamental, but (recalling that IUU fishing is fundamentally an economically motivated activity), port State measures can also be an effective tool to prevent IUU fishing vessels from landing fish. Port State controls are, however, hindered when fish products are imported, exported or re-exported with minimal inspection. Market State measures can also be used to prevent IUU fish from entering into markets or international trade, provided that such measures do not undermine port and market access for legitimate fish products and that data and reporting mechanisms (such as catch documentation schemes and import/export documents) are reliable.

Multilateral initiatives intended to address IUU fishing are being undertaken with urgency, with mechanisms in place to create a binding legal instrument on port State measures and to develop criteria to assess flag State performance. These activities are in addition to various measures being implemented or considered by regional fisheries management organizations (RFMOs). Some countries have already introduced legislation that would attempt to restrict the entry of IUU product into their markets, although operationalization of this legislation remains unclear.

In January 2007, the Government of Japan hosted and chaired the first Joint Tuna RFMOs meeting in Kobe, Japan. Participants identified a range of challenges for the sector and eventually agreed that enhanced cooperation among tuna RFMOs can increase their effectiveness and efficiency, and provide improved management of all tuna stocks. As a result, a Course of Actions was

developed identifying areas for effective cooperation and coordination among the five tuna RFMOs to improve their performance. Unfortunately, to date there has been little follow-up activity on the Course of Actions both within tuna RFMOs, and by member States. More work remains on coordinating efforts to address the challenges that fall under the purview of the State members themselves.

5. Recommendations for addressing priority issues and for progress toward achieving targets/goals

Progress requires:

- adopting effective management measures (both for successful rebuilding of depleted stocks, healthy stocks and the yet-to-be managed stocks) that adhere to the best scientific advice provided;
- adopting capacity control measures that ensure a State's fishing capacity is commensurate with the State's quota (fishing opportunity);
- adopting penalties for non-reporting and non-compliance;
- promoting compliance with, and the strengthening of, MCS measures, including vessel monitoring systems (VMS) and observer programmes;
- promoting the common criteria for performance reviews of RFMOs and best practices as one tool to guide the

strengthening of these organizations;

- ensuring effective coordination, collaboration and cooperation among the tuna RFMOs;
- developing a legally-binding port State instrument and ensure its ratification by all RFMO members; and
- implementing market measures that are consistent with international trading rules and ensure a level playing field among States.

6. Recommendations on how best the Global Forum can contribute to the identified priority goals and action plans

The Global Forum can:

- consider how tuna RFMOs can better collect data and develop scientific advice;
- develop guidance for how member States can make decisions on access and allocations for tuna resources;
- consider how member States can improve monitoring, control and surveillance efforts; and
- consider what fisheries management and non-fisheries management tools can be used to build tuna stocks and reduce overfishing/IUU fishing.

7. Conclusions and future projections

Should tuna RFMOs fail to address the problems of institutionalized overfishing, IUU fishing, and a lack of adherence to science advice, and in doing so fail to reverse the downward trends of tuna stocks, there will be renewed calls not only for fishing moratoria, as is already the case, but also for bans on international trade in some tuna species unless they can be proven to be harvested in a sustainable manner.

This raises questions about governing trade in commercial tuna species that have become endangered through institutional overfishing as well as IUU fishing, and the difficulties that this will entail for sustainable fisheries, such as ensuring tracking and traceability for all fish caught and certifying, to the satisfaction of the importing State that the fish were caught in a sustainable manner.

RFMOs can be the most effective institutions by which to ensure conservation and management goals are met for the sustainable use of commercially harvested fish species. A failure of tuna RFMOs to address the issues identified above could result in a loss of credibility for the entire RFMO system.

References:

[to be added]

Steering Committee, Global Forum on Oceans, Coasts, and Islands*

Co-Chairs

Biliana Cicin-Sain, Director, Gerard J. Mangone Center for Marine Policy, University of Delaware (also Head of Secretariat, Global Forum)

Patricio A. Bernal, Executive-Secretary, Intergovernmental Oceanographic Commission, UNESCO, Paris, France

Veerle Vandeweerd, Director, Environment and Energy Group, United Nations Development Programme (UNDP)

Governmental

David Balton, Deputy Assistant Secretary for Oceans and Fisheries, Bureau of Oceans, U.S. Department of State

Phil Burgess, Director, Cetacean Policy and Recovery, Department of the Environment and Water Resources, Australia

Nguyen Chu Hoi, Director, Institute of Fisheries Economics and Planning, Ministry of Agriculture and Rural Development, Vietnam

Aldo Cosentino, Director-General, Directorate for Nature Protection, Sea Protection, Ministry for Environment and Protection of the Territory, Italy

Margaret Davidson, Director, Coastal Services Center, National Oceanic and Atmospheric Administration (NOAA), USA

Antonio Diaz de Leon, Director-General, Environmental, Regional Integration and Sectoral Policy, Environment and Natural Resources Ministry (SEMARNAT), Mexico

Ambassador Angus Friday, Chair, Alliance of Small Island States (AOSIS), Permanent Representative of Grenada to the United Nations

Gi-Jun Han, Ministry of Maritime Affairs and Fisheries, Republic of Korea

Elie Jarmache, Chargé de Mission, Secrétariat Général de la Mer, France

Magnus Johannesson, Secretary-General, Ministry for the Environment, Iceland

Ambassador Jagdish Koonjul, Mauritius, former Chair, Alliance of Small Island States (AOSIS)

Gerhard Kuska, Associate Director and Director of Ocean and Coastal Policy, White House Council on Environmental Quality, USA

Tom Laughlin, Deputy Director, International Affairs Office, National Oceanic and Atmospheric Administration (NOAA), USA

Haiqing Li, Deputy Director-General, State Oceanic Administration (SOA), China

John Low, Adviser to the Minister of Marine Resources for the Cook Islands
Rejoice Mabudafhasi, Deputy Minister of Environmental Affairs and Tourism, South Africa

Jan Mees, Director, Flanders Marine Institute, Belgium

Guillermo Garcia Montero, President, National Aquarium, Havana, Cuba
Magnus Ngoile, Team Leader, Marine and Coastal Environmental

Management Project (MACEMP), Ministry of Natural Resources and Tourism

Rolph Payet, Advisor to the President, Seychelles

Lori Ridgeway, Director-General, International Coordination and Policy Analysis, Department of Fisheries and Oceans, Canada, and Camille Mageau, Director, Marine Ecosystems Conservation Branch, Department of Fisheries and Oceans, Canada

Mario Ruivo, Intersectoral Oceanographic Commission, Ministry of Science, Technology, and Higher Education, Portugal

Indroyono Soesilo, Chairman, Agency for Marine and Fisheries Research, Department of Marine Affairs and Fisheries, Indonesia

Ambassador Enele S. Sopoaga, Tuvalu, Former Vice-Chair, Alliance of Small Island Developing States (AOSIS)

Chris Tompkins, Independent Consultant

Intergovernmental

Salvatore Arico, Programme Specialist, Ecological Sciences, UNESCO

Julian Barbiere and Stefano Belfiore, Intergovernmental Oceanographic Commission, France

Chua Thia-Eng, Partnership in Environmental Management for the Seas of East Asia (PEMSEA), IMO/UNDP/GEF, Philippines

Anjan Datta, Global Programme for the Protection of the Marine Environment from Land-Based Activities, The Hague

Ahmed Djoghlaif, Executive Secretary, Convention on Biological Diversity

Al Duda, Senior Advisor, International Waters, Global Environment Facility (GEF)

Serge Garcia, Independent Consultant, and Former Director, Marine Fisheries Resources Division, Food and Agriculture Organization (FAO)

Marea E. Hatzios, Senior Coastal and Marine Specialist, Environment Department, The World Bank

Indumathie Hewawasam, Independent Consultant

Andrew Hudson, Principal Technical Advisor, International Waters, UNDP/GEF

David Johnson, Executive Secretary, OSPAR Convention, London

Vladimir Mamaev, GEF Regional Technical Advisor, UNDP, Europe and the CIS, Slovak Republic

Franklin McDonald, Adviser, UNEP Caribbean Environment Programme (UNEP/CEP), and former Director, National Environmental Policy Agency, Jamaica

Vaclav Mikulka, Director, UN Division for Ocean Affairs and the Law of the Sea

Ali Mohamed, Coordinator, Coastal and Marine Secretariat, New Partnership for Africa's Development (NEPAD), Kenya

Satya Nandan, Secretary-General, International Seabed Authority, Jamaica

Tiago Pitta e Cunha, Member, Cabinet of Fisheries and Maritime Commissioner, European Commission

Mary Power, Director, Resource Mobilization Office, World Meteorological Association

Cristelle Pratt, Director, South Pacific Applied Geoscience Commission (SOPAC), Fiji

Diane Quarless, Chief, Small Island Developing States Unit, UNDESA

John Richardson, Head, Maritime Policy Task Force, European Commission

Anne Rogers, United Nations Department of Economic and Social Affairs (UNDESA)

Eduard Sarukhanian, Director, World-Weather-Watch-Applications, World Meteorological Organization (WMO), Switzerland

Alan Simcock, Independent Consultant

Dann Sklarew, Director and Chief Technical Advisor, GEF, IW:LEARN

Asterio Takesy, Director, Secretariat for the Pacific Regional Environment Programme

Khulood Tubashat, Advisor, The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA)

Chika Ukwe, Industrial Development Officer (International Waters), United Nations Industrial Development Organization (UNIDO)

Marjo Vierros, Visiting Professor, Institute of Advanced Studies, United Nations University, Vancouver

Eugenio Yunis, Chief, Sustainable Development of Tourism World Tourism Organization

A.H. Zakri, Director, Institute of Advanced Studies, United Nations University, Yokohama

Nongovernmental

Milton Asmus, International Representative, Brazilian Agency for Coastal Management

Awni Behnam, President, International Ocean Institute, Malta

Charles A. Buchanan, Administrator Luso-American Development Foundation, Portugal

Torkil J. Clausen, Managing Director, DHI Water Policy and Senior Adviser, Global Water Partnership

Simon Cripps, Director, Global Marine Programme, World Wide Fund For Nature (WWF) International

Richard Delaney, Executive Director, Center for Coastal Studies, Provincetown, Massachusetts, USA

Annick de Marffy, former Director of Division of Ocean Affairs and Law of the Sea (UNDOALOS), United Nations International Consultant

Sylvia Earle, Chair, Deep Ocean Exploration and Research (DOER), and Explorer-in-Residence, National Geographic Society

Charles Ehler, Consultant to UNESCO
Julius Francis, Executive Secretary, Western Indian Ocean Marine Science Association, Tanzania

Matthew Gianni, Political Advisor, Deep Sea Conservation Coalition, Netherlands

Vladimir Golitsyn, Professor of International Law, Moscow State University of International Relations

Lynne Hale, Director, Marine Strategy, The Nature Conservancy

Art Hanson, former Ministerial Ocean Ambassador, Department of Fisheries and Oceans, Canada, member of the Canadian Foundation for Innovation (CFI)

Gregor Hodgson, Director, Reef Check

Paul Holthus, Independent Consultant

Gunnar Kullenberg, Independent Consultant and former Director, Intergovernmental Oceanographic Commission (IOC)

Dan Laffoley, World Commission on Protected Areas-Marine, IUCN

Carl Lundin, Head, IUCN Marine Programme

Dawn Martin, President, Sea Web, USA

Gerald Miles, The Nature Conservancy, Pacific Region, Brisbane, Australia

Iouri Oliouline, Executive Director, International Ocean Institute, Malta

Pietro Parravano, President, Institute for Fisheries Resources, World Fisheries Forum

Sian Pullen, Independent Consultant, New Zealand, and former Head of European and Middle East Marine Program, WWF International, UK

Victoria Radchenko, Director, International Ocean Institute, Ukraine

Tony Ribbink, Director, Sustainable Seas Trust

Evelia Rivera-Arriaga, Centro de Ecología, Pesquerías y Oceanografía del Golfo de México (EPOMEX), Mexico

Nirmal Jivan Shah, Chief Executive, Nature Seychelles

Alan Simcock, former Executive Director, OSPAR, and former co-chair, UN Informal Consultative Process on Ocean Affairs and Law of the Sea

Nancy Targett, Dean, University of Delaware College of Marine and Earth Studies

Kristian Teleki, International Coral Reef Action Network, Switzerland

Hiroshi Terashima, Executive Director, Institute for Ocean Policy, Ocean Policy Research Foundation, Japan

Grant Trebble, African Marine and Coastal Resource Over-exploitation Prevention Strategy (AMCROPS), South Africa

Philippe Vallette and Manuel Cira, NAUSICAA, France, and the World Ocean Network

David VanderZwaag, IUCN Specialist Group on Ocean Law and Governance

* Please note: Members of the Steering Committee participate in their individual capacities.