GLOBAL OVERVIEW OF MARINE FISHERIES

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EXECUTIVE SUMMARY

Introduction

After 50 years of particularly rapid geographical expansion and technical advances, and a several-fold increase in annual harvest, marine fisheries are at a crossroad. The sustainability of the present fishery system is being questioned as most fishery resources are either overexploited or fully or heavily exploited. Society has developed much greater awareness of environmental impacts. Consumers from the main markets are becoming aware of the role they can play by expressing their preferences through their purchasing behaviour. A number of eco-labelling schemes are being proposed and tested. There is hope that an ecosystem-based fisheries management (EBFM) approach might also be able to unlock some of the impediments that conventional management has experienced.

Fishery resources

Reported global production of marine capture fisheries has increased from 19 million tonnes in 1950 to about 80 million tonnes in the mid-1980s, oscillating since then around 85 million tonnes. The annual rate of increase of marine catches decreased to almost zero in the 1990s, indicating that, on average, the world oceans have reached their maximal production under the present fishing regime. The global proportion of overfished stocks has kept increasing for the last 25 years, even though the phenomenon may be slowing down. Among the 16 FAO statistical regions of the world's oceans, a quarter are at their maximum historical level of production, half are slightly below it and the remaining quarter are well below it. The rate of overfishing in the Pacific Ocean seems to follow the same trend as in the Atlantic Ocean, even though its tropical areas seem to be comparatively less pressured. There is some indication of improvement in the Northeast Atlantic. The information confirms the estimates made by FAO in the early 1970s that the global potential for marine fisheries is about 100 million tonnes, of which only 80 million tonnes were probably achievable for practical reasons.

Fishing industry

Since 1950, the fishing power of individual vessels has continued to grow, building on advances in technology. During the last few years, the numbers of vessels has tended to decrease in developed countries and to increase in some developing ones. Fishing technology has evolved dramatically since the early 1950s, improving safety on board, but fishing still produces more than 25 000 fatalities per year. Improvements have also reduced the environmental impacts of fishing but have significantly increased the capacity to catch fish. Employment in the primary capture fisheries and aquaculture production sectors in 1998 is estimated to have been about 36 million people, comprising about 15 million full-time, 13 million part-time and 8

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million occasional workers, of which it is estimated that about 60% are employed in marine fisheries. For the first time since the early 1970s, growth in employment in the primary sectors of fisheries and aquaculture may be slowing down significantly. The oceans' ecosystems contribute food for direct human consumption, and this practically doubled between 1950 and 1970, but has stabilized since then at 9.0 to 10 kg of fish per caput, despite world population growth. As total marine capture production stagnates, the per caput supply from marine capture fisheries is likely to decrease substantially, unless more effective management of capture fisheries and further development of aquaculture can increase production. While the reputation of fish as a healthy food has improved, there are concerns for fish quality.

Governance

There is no complete global inventory of fisheries management systems and approaches, by countries, stocks or fisheries. At national level, while most countries have in place some form of limited licensing scheme, they often experience great difficulties in effectively containing an expansion of redundant harvesting capacity. In several countries, access to marine fisheries resources continues to remain unrestricted. More recently, there is an increasing interest in rights-based fisheries management, including individual, company or community held quotas (IQs), both transferable or non-transferable. Several of the over thirty regional fishery bodies (RFOs) implement policies based on Total Allowable Catch (TAC) and national quotas with no capacity control. At all levels, these approaches are complemented by a series of technical measures to regulate vessels (e.g. power, size); gear (e.g. size, mesh size); area fished (e.g. closed areas) and fishing time (e.g. fishing effort ceilings, closed seasons); or catch characteristics (e.g. minimum landing size, stage of maturity, egg-bearing), etc. Some of the main challenges facing fisheries today include: overfishing, with the related issues of resources collapse and endangered species; overcapacity, with the related issue of subsidies; environmental impact of fishing; illegal, unregulated and unreported fishing (IUU); poor selectivity and discarding; the environmental state of the coastal zone; the integration of fisheries management into coastal zone management; fish trade and ecolabelling; the interface between fisheries management bodies and CITES; and the collaboration between regional fishery bodies and regional environmental conventions. A serious constraint is the inadequate enforcement of and compliance with management measures at both national and regional levels. The fisheries management context and framework have greatly improved through a range of initiatives at global, regional and national levels (e.g. the FAO Code of Conduct for Responsible Fisheries) but the societal request for EBFM raises significantly the complexity of future fisheries management.

Conclusion and discussion

The quality of the data on the state of the resources and the industry needs to be significantly improved for better monitoring and assessment of management performance. However, the information available points unequivocably to an increase of the proportion of overfished stocks and a spreading of overfishing across the entire world ocean. The sector's awareness has been raised and the industry is evolving positively, but at different speeds in different regions, influenced by the outcomes of more general processes concerning the use of sustainability indicators, the precautionary approach and ecolabelling. Faced with a series of international instruments adopted at the highest level, and with direct implications for fisheries, governments and their fisheries authorities are expected to foster a significant change, but How fast? At what affordable costs? With what resources? Through what pathway?

While there is no alternative to rationalizing the fishery sector and ensuring that it bears the costs of as many of its impacts as possible, considerable attention is needed to ensure that, in the process, fisheries are equitably treated in comparison with other land-based or sea-based sectors, such as agriculture, oil and gas industries, or tourism. This possible placement by society of an inappropriate burden on the fisheries sector as the driving force of degradation of marine ecosystems should not detract in any way from the urgent need for fisheries to act to correct the problems attributable to poor and irresponsible fisheries management practices. This paper, drawing heavily on principles already reflected in the Code of Conduct, highlights many areas where fisheries management and fisheries practice are failing. This conference represents an opportunity for a renewed commitment to remedy these problems. In order to do so, it is essential for the fisheries community to: (1) improve its own performance; (2) ensure that it is not unduly burdened; and (3) express demands for a substantial reduction in ocean degradation by other industries.

INTRODUCTION

[1] The world's marine capture fisheries are at a crossroad. They have evolved significantly during the last 50 years, facing the hard challenges of discovery, difficult working conditions, competition, changing demand, unpredictable ecosystems and uncertain political, social and economic environments. Marine capture fisheries management has struggled with the conflicting requirements of short-term benefits and social peace, on the one hand, and long-term sustainability on the other hand. The process of elaboration of a world charter for fisheries, which started in 1958 (with UNCLOS I) led, in 1982, to the adoption of the UN Convention on the Law of the Sea, which entered into force in 1994. In the mean time, another process developed to globally raise social and institutional awareness about the ecosystem, its needs, and the implications for human development. This process has accelerated since the 1970s, with the work of the World Conference on Human Environment (Stockholm, 1972) and the UN Conference for Environment and Development (UNCED) (Rio de Janeiro, 1992), followed by the work of the UN Commission on Sustainable Development (CSD).

[2] Nearly 10 years after UNCED, and more than half a century after the first technical meeting on fisheries (1946) of the Food and Agriculture Organization (FAO), and a few months before the UNCED + 10 Summit in Johannesburg, the 2001 Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem, for which this paper has been prepared, offers the very first opportunity to discuss, at world level, the cross-implications for the fishery sector of the processes mentioned above.

[3] As a contribution to the debate, this document presents a global overview of the historical trends and of the present situation of the sector, as a contribution to the Reykjavik Conference debate. It is intended by design to be mainly descriptive and not prescriptive. It offers, first, a global picture of the state of the biological resources, followed by a review of the fishery system (fleet, people, technology, production and trade, and its contribution to food security) and the evolution of governance, with its approaches, performance and level of preparedness to deal with ecosystem-based fisheries management (EBFM). The conclusion provides a very brief summary of the above, as well as a discussion on the quality of the data available, the validity and potential biases in the assessment given, and the need for a significant improvement in the monitoring of the sector.

1. THE STATE OF THE RESOURCES

[4] This section draws heavily on a paper prepared by the present authors – *Trends in world fisheries and their resources: 1974-1999* – and published anonymously in FAO, 2000a: 98-104.

1.1 Global situation

[5] Following the publication (Gulland, 1970, 1971) of its first global review of marine fish stocks, FAO's Fisheries Department has been monitoring the state of these stocks. The results have been published intermittently under the title *The State of World Fishery Resources, Marine Fisheries*, a document that describes and comments on the trends in the state and use of these resources. Below is a summary of the latest analysis, building on individual, national and regional reports on the state of resources, accumulated over the period 1974 to 1998, the last year for which information is available. If all "stock" items (590 in all) for which FAO had obtained some data are considered together to give a global view of the situation, in 1999, 149 appeared to be in an unknown state. Among the 441 for which status information was available, 4% appeared underexploited, 21% moderately exploited, 47% fully exploited, 18% overfished, 9% depleted and 1% recovering (Figure 1). In this paper we have used "Overfished" for stocks simply exploited beyond the level of maximum productivity and "depleted" for those that have been driven to extremely low levels. The former usually still support very active fisheries. The latter are closer to "economically extinct," hardly supporting a direct fishery.

[6] In an earlier review, and looking at individual types of resources, Garcia and Newton (1997) showed that the most pressured species groups (by decreasing order of pressure) were redfish, hake, Antarctic cod, lobster, prawns and shrimps, and cod. In contrast, the least pressured species were mackerel, bivalves, tuna, cephalopods and horse mackerel.

1.2 Global trends

[7] The process of development of the ocean's resources by fisheries during the last two centuries, and particularly since the second World War and since the mid-seventies during the period of establishment of the exclusive economic zones, appears as an exponential phenomenon of "colonization" and utilization that, obviously, cannot continue unabated (Figure 2). The most likely upper limit estimated by FAO (Gulland, 1971) for world sustainabale production is reached if discards and unreported catches were taken into account.

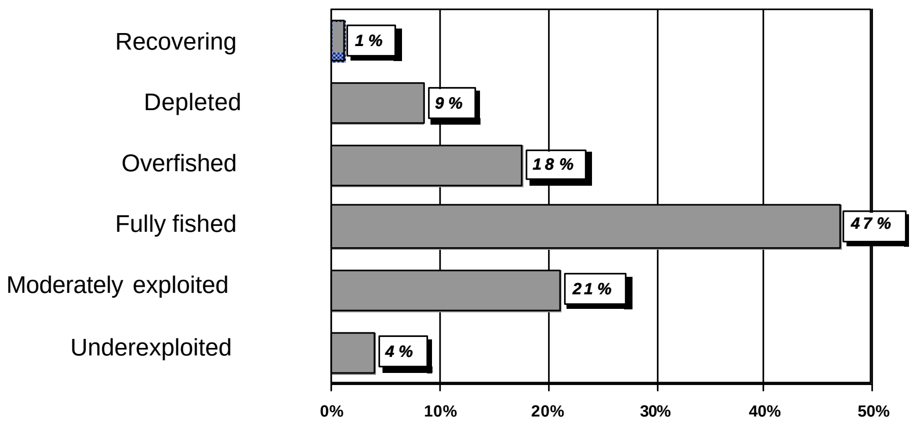

Figure 1. State of world stocks in 1999.

Notes: Stocks tagged as Underexploited (U) and Moderately exploited (M) are believed to be able to produce more under increased fishing pressure, but this does not imply any recommendation to do so. Stocks tagged as Fully exploited (F) are considered as being exploited close to their Maximum Sustainable Yield (MSY) or Maximum Long-Term Average Yield (MLTAY) and could be slightly under or above this level because of uncertainties in the data and in stock assessments. These stocks are in need of (and in some cases already have) effective control on fishing capacity. Stocks tagged as Overexploited (O) or Depleted (D) are clearly exploited beyond MSY level and in need of effective strategies for capacity reduction and stock rebuilding. Stocks tagged as Recovering (R) are usually very low compared to historical levels. Directed fishing pressure may have been reduced (by management or lack of profitability) but, depending on specific situations, these stocks may nevertheless still be under excessive fishing pressure. In some cases, their indirect exploitation as by-catch in another fishery might be enough to keep them in a depressed state despite reduced direct fishing pressure.

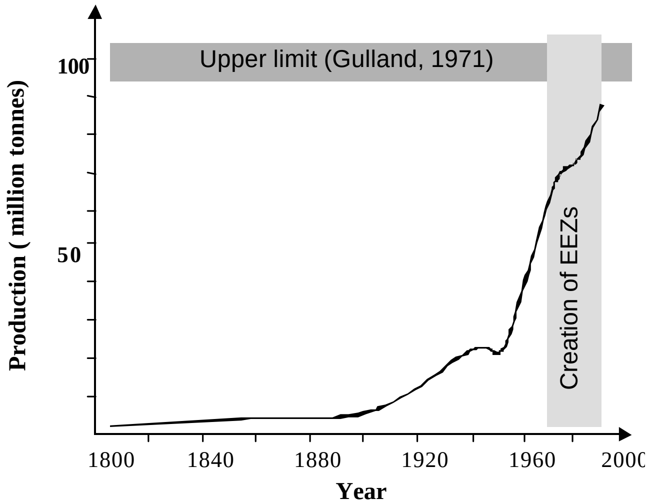

Figure 2. Trends in world production during the last two centuries (modified from Hilborn, 1990)

[8] The data available in FAO reviews since 1974 (Figure 3) show the impact during the last quarter century. It indicates that, in proportion, stocks at MSY level have slightly decreased since 1974, while stocks offering potential for expansion have decreased steadily.

[9] As would be expected from these trends, the proportion of overexploited stocks have increased from about 10% in the mid-1970s to close to 30% in the late 1990s. The number of "stocks" for which information is available has also increased during the same period, from 120 to 454. These trends reflect and confirm the conclusions of earlier analyses of different data at global or country levels (Figure 4). A brief discussion on the validity of the assessment is offered in the last section of this paper.

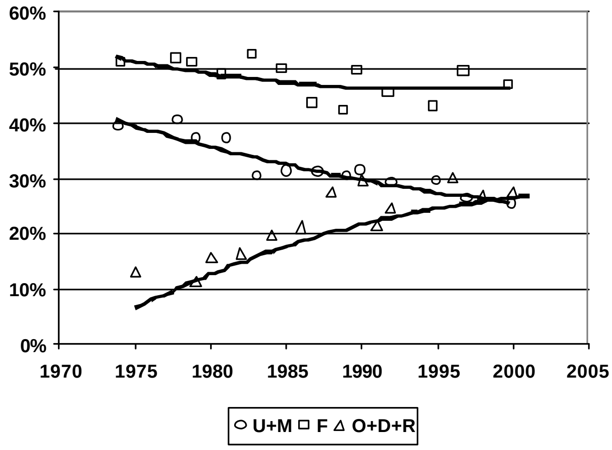

Figure 3. Global trends in the state of world stocks since 1974.

(**Notes**: For the meaning of U, M, F, O, D and R, see Figure 1)

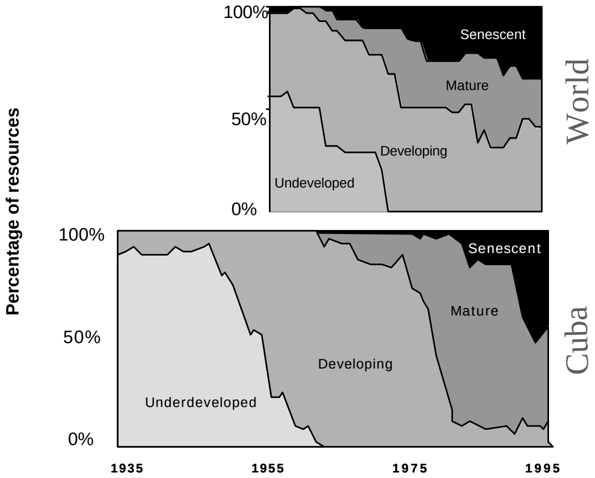

Figure 4. Percentage of the major marine fish resources in various phases of development worldwide (Top, from Grainger and Garcia, 1996) and in Cuba (Bottom, from Baisre, 2000)

1.3 Regional perspective

[10] The data available on the state of stocks can be examined by region and compared, keeping in mind that the quality of the data, the proportion of stocks for which information is available, and the relative size of these stocks vary between regions.

[11] As stocks produce less when systematically overexploited, the comparison between present and historical landings in a given region may provide some first crude qualitative assessment of the state of its stocks. The data available for 1999 for the 16 FAO statistical regions (taken from FAO, 2000b) of the world's oceans indicate that four of them (25%) are at their maximum historical level of production, eight (50%) are slightly below it and four (25%) are well below it (Figure 5). While this might result partly from natural oscillations in productivity from year to year, it seems that in most areas, overfishing is responsible for the decline.

[12] Considering each main ocean separately, total catches from the Northwest and the Southeast Atlantic are levelling off after reaching their maximum levels a decade or two ago. In the Eastern Central Atlantic and the Northwest Pacific, total catches are increasing again, after a short decline following their maximum production levels of a decade ago. Most of these changes result from increases in landings of small pelagic species. In the Northeast Atlantic, the Western Central Atlantic, the Northeast Pacific, the Mediterranean and Black Seas, the Eastern Central Pacific and the Southwest Pacific, annual catches have stabilized or are declining slightly, having reached their maximum potentials a few years ago. In the Southwest Atlantic and the Southeast Pacific (although in the Southeast Pacific the interpretation of historical trends is complicated by the importance of natural fluctuations (El Niño)), total annual catches have declined sharply only a few years after reaching their all-time highs. These last two areas have been seriously affected by the decline, and in some cases the serious depletion, of important stocks. Among such stocks are Argentine shortfin squid and Argentine hake in the Southwest Atlantic, and anchoveta and horse mackerel in the Southeast Pacific.

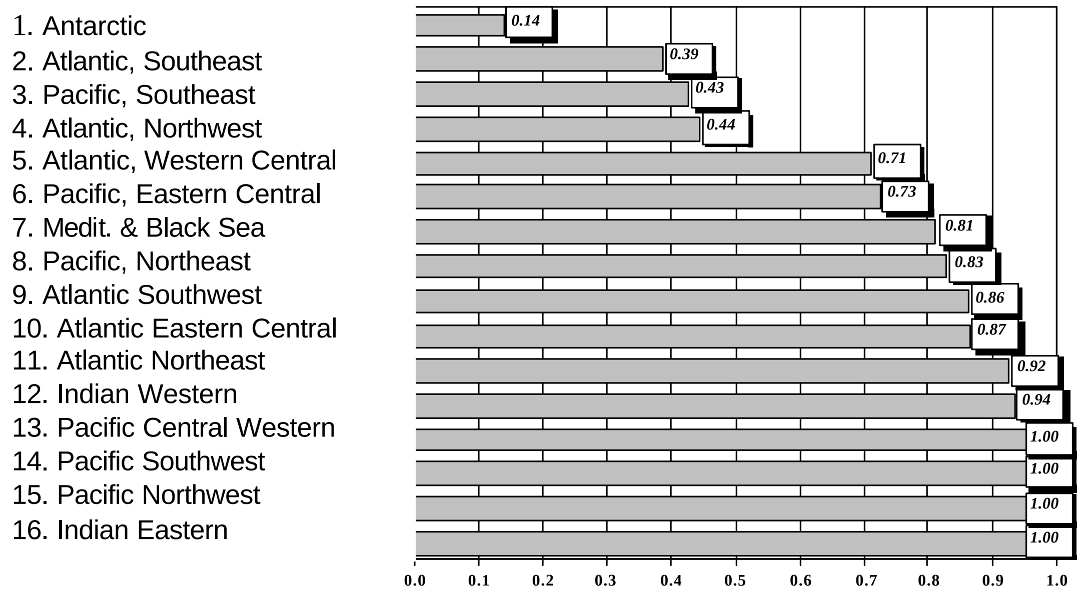

Figure 5. Ratio between recent (1998) and maximal historical production in FAO statistical areas

[13] The areas where total catches are still tending to grow, and where – at least in principle – there is the highest potential for production increases, are the Eastern and Western Indian Ocean and the Western Central Pacific. These areas tend to have a lower incidence of fully exploited, overexploited, depleted or recovering fish stocks, and a prevalence of underexploited or moderately exploited stocks, although they also have the highest incidence of stocks whose state of exploitation is unknown or uncertain and for which overall production estimates are consequently less reliable.

[14] For a more detailed and analytical diagnosis, the data used have been dis-aggregated by FAO region. The percentage of stocks exploited at or beyond levels of exploitation corresponding to MSY (i.e. F+O+D+R, reflecting roughly the need for capacity control) ranges from 41% for the Easter Central Pacific, to 95% in the Western Central Atlantic Ocean. Overall, in most regions, at least 70% of the stocks are already fully fished or overfished. The percentage of stocks exploited at or below levels of exploitation corresponding to MSY levels (U+M+F) ranges from 43% (n the Southeast Pacific Ocean) to 100% (Southwest Pacific and Western Indian Oceans). On the same figure, and as a measure of management and development performance, the proportion of stocks that are exploited beyond the MSY level of exploitation (O+D+R) ranges from 0% in the Southwest Pacific and Western Indian Ocean to 57% in the Southeast Pacific Ocean.

[15] The trend of the percentage of stocks exploited beyond MSY levels can be dis-agregated for the Atlantic and Pacific oceans. The cold-temperate and developed Northern areas (Figure 6) can be further distinguished from the tropical and less developed Central and Southern areas (Figure 7).

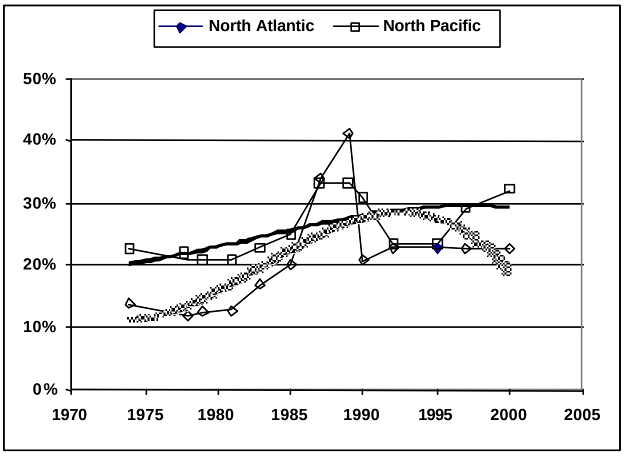

Figure 6: Trends in % of stocks exploited beyond MSY levels (O+D+R) in the Northern Atlantic and Pacific oceans (The trend line is a 3rd order polynomial)

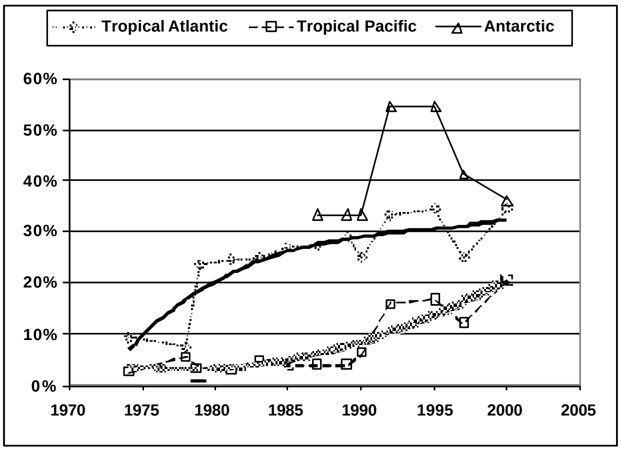

Figure 7: Trends in % of stocks exploited beyond MSY levels (O+D+R) in the tropical (Central and Southern) Atlantic and Pacific oceans, and the Antarctic

[16] In the North Atlantic (FAO Fishing Areas 21 and 27) and Pacific (FAO Fishing Areas 61 and 67), an increasing proportion of stocks were exploited beyond MSY level until the late 1980s or early 1990s (Figure 6). In the North Atlantic, the situation seeme to improve and stabilize in the 1990s, while in the North Pacific the situation seems to remain unstable. The percentage of stocks beyond MSY has been increasing in both tropical oceans (Figure 7). The increase might be reaching an asymptote in the tropical Atlantic (FAO Fishing Areas 31, 34, 41 and 47) but this does not seem yet to be the case in the tropical Pacific (FAO Fishing Areas 71, 77, 81 and 87) and the situation appears to be more severe in the tropical Atlantic. In fact a comparison of Figures 6 and 7 shows that the magnitude of the problem (as proportion of stocks beyond MSY levels) is rather similar for the tropical and northern regions of the Atlantic while, in the Pacific, the southern areas seem to be still less affected. For the southernmost part of these oceans (in the Antarctic) the situation appears indeed more serious, but improving (Figure 7).

[17] A further insight in the North Atlantic is provided by an analysis of the trends in the state of in the ICES area stocks since 1970, following the recent introduction of the precautionary approach in the analysis framework.

[18] The overall result of the analysis (Garcia and De Leiva, 2001, Figure 8) of the percentage of stocks in the various states defined conventionally as “good,” “bad” or in the “buffer” zone (stocks are in the “bad,” “buffer” or “good” areas depending on whether their spawning biomass and/or fishing mortality are beyond precautionary limits (overfishing and depletion), well within precautionary targets, or in the buffer zone between these two) indicate a clear worsening of the state of stocks until 1990, and an apparent improvement of the situation afterwards, with a

significant reduction in "bad" situations, a significant increase in stocks in the buffer zone, but still extremely few stocks in the "good" area.

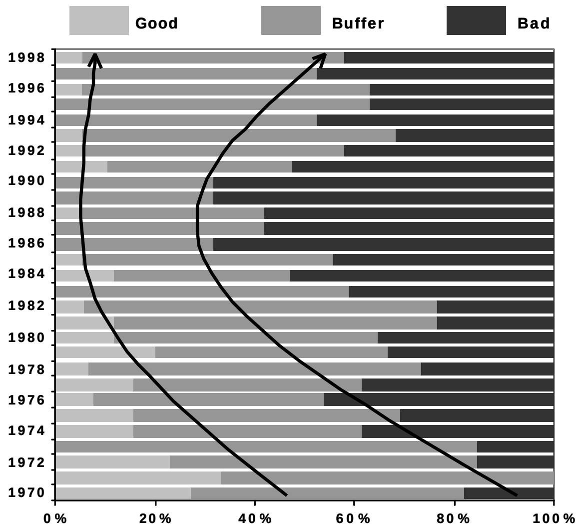

Figure 8. Evolution of the proportion of ICES stocks in the various states, 1970-98

2. THE FISHING INDUSTRY[1]

2.1 The fishing fleet

[19] There are, however, no totally reliable or comprehensive data on global fishing power or even of fleet size, while data for small-scale fisheries are scanty. The FAO analyses are usually based on the Lloyds Maritime Information Services and the FAO Bulletin of Fishing Fleet Statistics. Using these sources, and with some caveats, Garcia and Newton (1994) constructed a time series for 1970-1990 of total nominal GRT of the world fishing fleet, and GRT corrected for technological progress. Figure 9 presents a qualitative extrapolation of this data to illustrate the fact that the global fishing pressure on the ocean's ecosystems increased extremely rapidly between the 1950s and the 1990s through both geographical extension of fleet operating range (from 1950 to 1970) and adoption of new technologies. Technical improvements are continuing, increasing the fishing capacity of individual vessels, even though the total fleet size shows signs of stabilizing and, perhaps, even decline.

[20] During the last few years, the numbers of vessels have tended to decrease in developed countries and to increase in some developing ones. The data for the last few years reflect that, after years of fast growth in the 1960s and 1970s, the total fleet of large fishing vessels has tended to stabilize.

[21] The reality of this representation rests heavily on the validity of the correction factors taken by Garcia and Newton (from Fitzpatrick, 1996) to take account of the effect of technology improvements on fishing capacity. Nonetheless, a characteristics of many fisheries today, and more generally of the fishery sector, is the existence of significant overcapacity, coarsely estimated by Garcia and Newton, globally, from 30% (in relation to MSY) to at least 50% (from an economic perspective).

1. This section draws heavily on FAO, 2000b

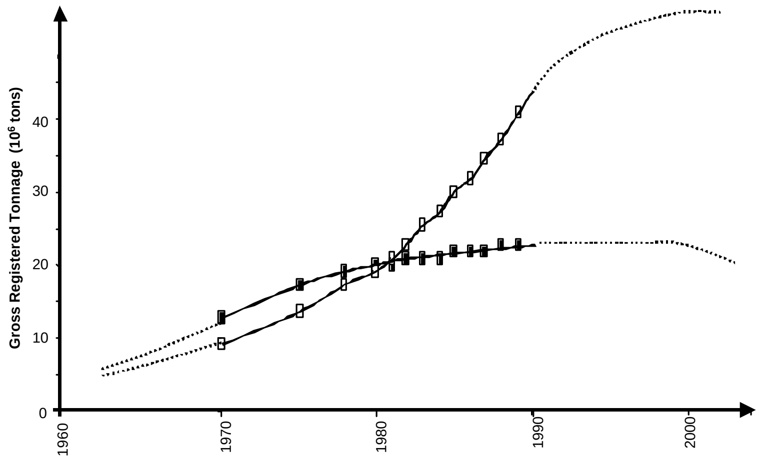

Figure 9. Likely trends in world fishing fleet size without (black squares) or with (white squares) correction for technological progress (extrapolated from Garcia and Newton, 1997)

2.2 The fishers

[22] The first-hand statistics available are scarce, incomplete and of low quality, and their cross-referencing in many publications makes them difficult to assess. According to FAO records, employment in the primary capture fisheries and aquaculture production sectors in 1998 was estimated to have been about 36 million people, comprising about 15 million full-time, 13 million part-time and 8 million occasional workers, of which it is estimated that about 60% are employed in marine fisheries. For the first time since the early 1970s, there is indication that growth in employment in the primary sectors of fisheries and aquaculture may be slowing down significantly (Figure 10). Berkes *et al.* (2001) refer to 51 million fishers in the world, of which 99% are small-scale fishermen and 50 million are in the developing world. Assuming an average household size of five persons, according to ICLARM (1999), 250 million people would be directly dependent upon the fishery for food, income and livelihood in developing countries, and some 150 million additional people would be dependent on associated sectors, such as marketing, boat building, gear making, and bait.

[23] Global trends or regional analyses of fishers' conditions are not readily available. It appears, however, that small-scale fisheries have evolved significantly during the last 50 years, acquiring technology, building up fishing power, developing modern entrepreneurial skills and, in some cases, powerful associative mechanisms. During the period, however, discrepancy and inequity has increased within the subsector, widening the gap between high-liners getting a larger share of the benefits than others, a phenomenon aggravated by inequitable access to capital and technology. Having little possibility to move (except for migrant fishing communities) small-scale operators have generally been hit more by resource depletion that larger fishing vessels, supported by governments, with more significant capacity to move to other stocks and areas. Finally, the pressure from over-dimensioned industrial fleets (local or long-range) has grown significantly, leading to increased rates of accidents and, sometimes, violent conflict.

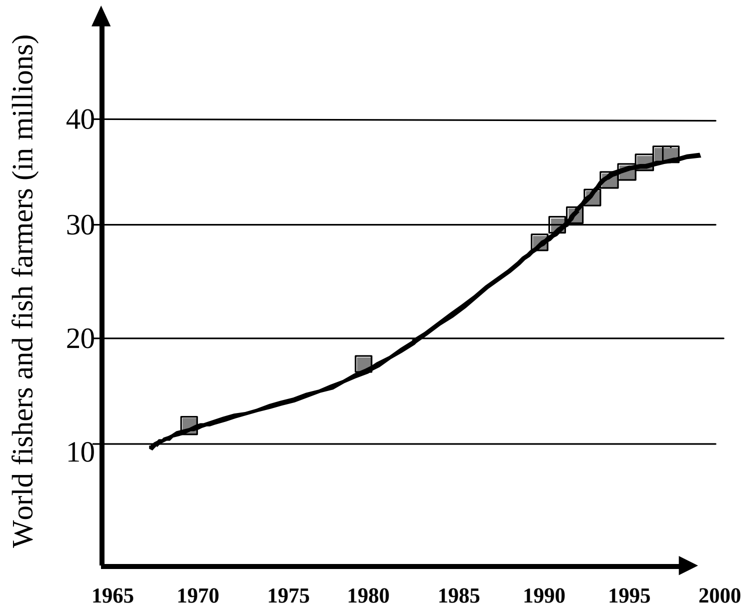

Figure 10. World fishers and fish farmers (including part-time and occasional workers) (from FAO, 2000a)

2.3 The Technology

[24] The fishing technologies used to catch fish, as well as handling, preserving and processing fish, have evolved dramatically since the early 1950s as the sector adopted technical innovations coming from other industries, including military technology. These improvements have increased the capacity to catch fish, farther away, and to preserve it on long journeys or process it on board. They have also improved safety on board, reducing the probability of casualties at sea in one of the most dangerous types of employment on Earth, with more than 25 000 fatalities each year (FAO, 2000a). Finally, some of the improvements (e.g. selective grids) have also reduced the environmental impacts of fishing. In the 1950s, the introduction of synthetic fibres, such as polyamide, polyester and polypropylene, to fishing gear improved fishing capacity significantly. More recently, the introduction of the Dynema fibre – a polyethylene of ultra-high molecular weight – has marked a new major improvement, reducing gear weight and fuel consumption, allowing increase in gear size, improving resistance and allowing for more effective exploitation of scattered fish concentrations (e.g. krill or mesopelagic fish), using “large mouth” trawls. The towing of two or more trawls simultaneously (multi-rig trawling), first used in the Gulf of Mexico shrimp fisheries in the early 1970s, was successfully introduced at the end of the 1990s into European fisheries for Norway lobsters (*Nephrops* sp.), deepwater shrimp and, to some extent, flatfishes. This technology was one of the factors in the rapid extension of tropical shrimp fisheries, increasing efficiency by 50 to 100 per cent. The introduction of electronic aids for navigation and fish detection, such as Global Positioning Systems (GPS), colour echo-sounders and multi-beam sonars, have greatly increased fishing capacity. In a similar fashion, satellite communications have made a significant impact on fisheries policing (Monitoring, Control and Surveillance (MCS)) and to safety on board in the form of Vessel Monitoring Systems (VMS) and the Global Maritime Distress Safety System (GMDSS). It is expected that, in the future, existing technologies, such as voyage data recorders (similar to aircraft flight recorders or black boxes) and Automatic Identification of Ships (AIS) will further improve MCS.

2.4 Production and Trade

[25] Reported global production of marine capture fisheries has increased from 19 million t in 1950 to about 80 million t in the mid-1980s, oscillating since then between 78 and 86 million t, excluding discards (Figure 11). During the last five years, marine fisheries represented 67-73% of the overall fisheries production of 112 to 126 million t, including aquaculture.

[26] The current stagnation in marine production is illustrated by the trends in the annual rate of increase of marine catches since 1950 (Figure 12) shows that it decreased from about 6-9% per year in the late 1950 and early 1960s, to almost zero in the 1990s. This would indicate that, on average, the world oceans have reached their maximal production under the present fishing regime, in line with the conclusions reached in Sections 1.1 and 1.2 (for an earlier analysis, see Garcia and Newton, 1997).

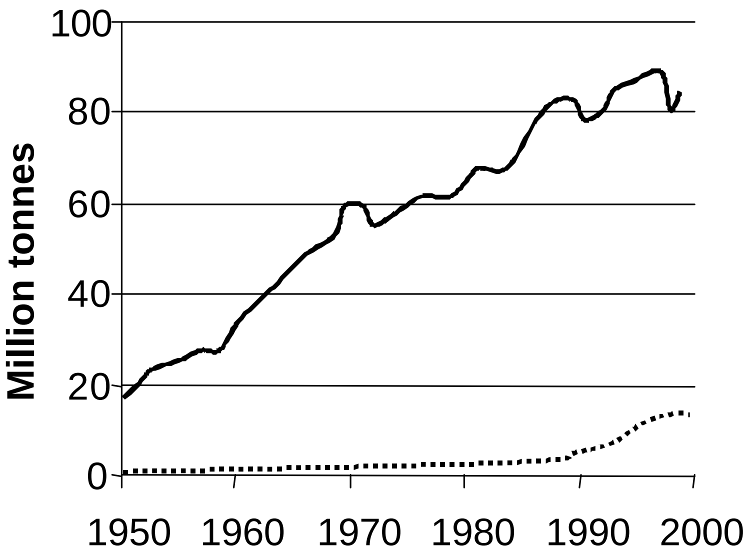

Figure 11. World marine capture fisheries (continuous line) and mariculture production (dotted line) (**Source**: FAO Statistics, calculated with data reported to FAO, discards excluded, smoothed by running average on 5 years.)

[28] Regarding the trends in species composition of the landings, Garcia and Newton (1997) underlined the large increase in the proportion of "miscellaneous marine fish" between the 1970s and the 1990s, reflecting "the trend in many fisheries towards large quantities of unidentified mixtures of fish with low economic value (sometimes called "trash fish") as a result of overfishing and reduction in the size of fish." They also stressed the significant loss of economic importance of many high value species, such as Atlantic cod, hake and haddock.

[29] Total fish trade increased from US$ 2 500-3 400 million in 1969-71, to US$ 53 000 million in 1999 (an increase from about 5% to 9% of total agricultural trade). With time, the growth in trade slowed from 19% annually in 1969-78 to 9% annually in 1979-90, and to 4% per year in 1991-1999. The contribution of the developing world to such trade has increased regularly since the 1970s. Their share in worldwide exports increased from 32% in 1969-71 to 44% in 1990 (Garcia and Newton, 1997) and to around 50% (or more in some years) in the 1990s. The lion's share of this trade is from marine capture fisheries. According to the statistics available in FAO, during the second half of the 1990s, the part of the harvest from capture fisheries internationally traded represented around half of the total capture fisheries production. The value of the exports from marine capture fisheries for the same period was around US$ 40 000-42 000 million.

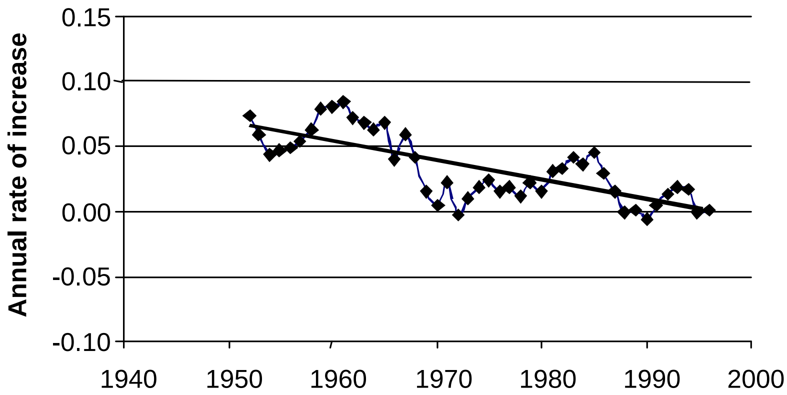

Figure 12. Evolution of the rate of increase of marine production 1950-1999 (smoothed on five values)

2.5 Contribution to food security

[30] The oceans' ecosystems contribute substantially to human food security. Coastal ecosystems are the source of more than 90% of the food provided by the marine ecosystem. Coral reefs, for instance produce 10-12% of the fish caught in tropical countries, and 20-25% of the fish caught by developing nations. As much as 90% of the animal protein consumed in many Pacific Island countries is of marine origin.

[31] Part of the production is directly used as human food and part is reduced to fish meal and oil used for raising cattle, poultry and fish. The reported production used for direct human food has steadily increased with time, practically doubling since 1950, and has been fairly stable at an annual value of between 9.0 and 10 kg of fish per caput since the early 1970s, despite world population growth. Since the early 1970s, however, the proportion of the marine reported production used directly for human food has declined from about 80% in the 1950s and 1960s to about 65% currently (Figure 13).

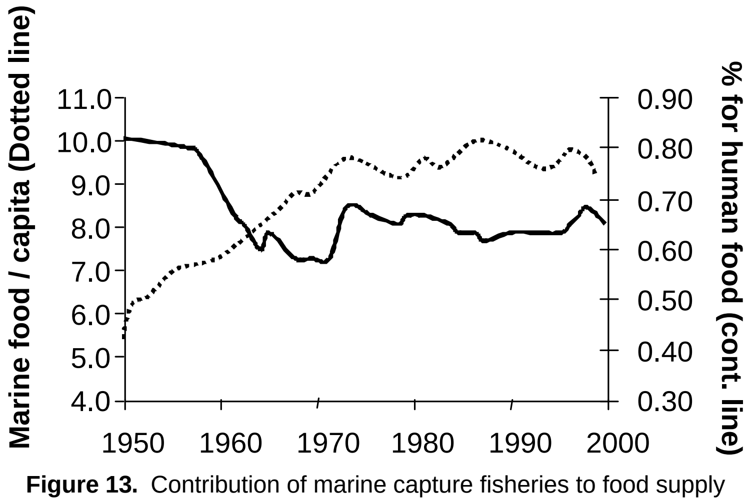

Figure 13. Contribution of marine capture fisheries to food supply

[32] In the future, considering that marine capture production cannot increase very much beyond present levels, while the world population will continue to grow (albeit at a slower rate), the per caput supply from marine capture fisheries can only decrease substantially. Maintaining the fish supply will require effective wild fisheries management and substantial development of aquaculture.

3. GOVERNANCE

[33] Considering that the main problem behind fisheries management is attributable to the inadaquacy of fisheries institutions and governance, this aspect needs to be covered in a global overview of fisheries. The problems, the main issues and the available solutions and pathways

are, however, too complex to be properly addressed in the context of this paper. We will therefore only attempt to briefly describe the situation with a broad brush, leaving to other papers prepared for this Conference the task of offering deeper insights and more detailed prescriptions.

3.1 Management approaches

[34] It is certainly not easy to describe in a nutshell the state and strategic trends in fisheries governance. The variance is high, even within a given EEZ. There is no complete global inventory of management systems and approaches, by countries, by stocks or by fisheries, and the trends differ between regions.

[35] Contemporary fisheries governance, with a key role given to scientific advice, has developed in the northern hemisphere, with mixed results, and from there has spread to the developing world, with even more mixed results. There is no universally successful management system, even though some key principles and factors of success have emerged. In most management systems, access is free and open and only subject to administrative registration of the vessel or vessel operator. A number of countries have limited-entry systems, which in most cases have failed to impede excessive fishing capacity. Relatively few countries have experimented with the use of fishing rights, including individual transferable quotas (ITQs), even though the approach is gaining attention and support. In addition, several technical measures have been tested, including: (1) selective grids and panels and square meshes to reduce by-catch and discards in trawling; (2) modified longline design and handling to reduce by-catch of birds (an International Plan of Action was adopted for the purpose by FAO in 1999); (3) discards bans; (4) flexible exclusion zones to protect juveniles; (5) limiting the number of authorizations to fish; (6) reduction or suppression of subsidies; (7) attempts to deal with fisheries within coastal area management plans; (7) reserved areas for small-scale fisheries; (8) marine protected areas (MPAs); and (9) artificial reefs as enhancement and anti-trawl devices. Zoning has been conventionally used, for example, to keep trawlers away from vulnerable coastal habitats and from conflicts with small-scale fisheries, but with little success in areas with large overcapacity. MPAs have become fashionable, particularly as a biodiversity conservation device, and if properly enforced may be more effective, particularly if fishing capacity could be controlled or reduced. Control and surveillance has been improved with the use of on-board observers and the development of VMS.

3.2 Management performance

[36] Altogether, the paradigm and the tools available have evolved positively during the last decades. Overall, however, despite some apparent success stories, fisheries governance failed to maintain stocks at their level of maximum productivity. It is generally agreed that the fundamental reason for the failure is the free and open access to the resources. The many other reasons often invoked, such as excess fishing capacity and effort, insufficient selectivity, poor policing and compliance, etc., tend to be a consequence of the open access situation. The main difficulty in deciding to limit access to fisheries is in the decisions regarding resource allocation, including the selection of the fishing-right-holders and the modalities of the right (price, duration, transfer, etc.). These necessary decisions, with significant long-term benefits for the State, the right holders and the consumer, have non-negligible short-term economic and socio-political costs, which many politicians find hard to face. Major challenges facing fisheries today include:

- overfishing, with the related issues of resource collapse and endangered species;
- overcapacity, with the related issue of subsidies;
- environmental impact of fishing;
- illegal, unregulated and unreported fishing (IUU);
- poor selectivity and discarding;
- the environmental state of the coastal zone;

- the integration of fisheries management into coastal zone management;
- fish trade and ecolabelling;
- the interface between fisheries management bodies and CITES; and
- the collaboration between regional fishery bodies and regional environmental conventions.

[37] The requested shift to EBFM does not really assist in resolving the problems. On the contrary, it significantly increases their complexity.

3.3 Implementation Problems

[38] Implementation of the agreed instruments and strategies and fulfilment of the high level commitments already made require guidance, political will and resources. The literature contains enough theoretical principles. The series of technical guidelines produced by FAO in support of the implementation of the Code of Conduct provide ample guidance usable for implementation of EBFM in areas such as: the application of the precautionary approach to capture fisheries (FAO, 1996a), the inclusion of fisheries in integrated coastal zones management (ICZM) (FAO, 1996b), and the use of indicators for the sustainable development of fisheries (FAO, 1999). Important concerns remain regarding practical implementation of all these instruments and commitments, namely:

- the lack of institutional capacity in the developing world, as well as in fishing communities facing decentralization,
- the impact of globalization on the fisheries environment and management;
- the equity implications (e.g. between poor and rich, or between developed and developing countries) of new developments, such as fishing rights or ecolabelling;
- the mismatch of boundaries between the ecosystem and the existing management jurisdictions in EEZs or regional fishery bodies; and
- the amount and type of science required as a basis for decision-making.

[39] Much has still to be done before all the necessary fishery management authorities are in a position to implement EBFM in practice. Changes are required regarding objectives, resource allocation, decision-making processes, enforcement, participation, decentralization, transparency, etc. To improve the situation and allow performance appraisal, the setting of sustainable development reference systems (for systems of indicators of sustainability, see Garcia and Staples, 2000) with appropriate indicators and reference points will be needed. In addition, the limits of the areas of competence of fishery bodies will need to be reconsidered to better match the ecosystems limits (Garcia and Hayashi, 2000), and agreements will need to be elaborated between fishery bodies (e.g. to deal with anadromous or highly migratory species), as well as between coastal countries (e.g. to deal with shared ecosystems).

3.4 Regional Fisheries Bodies

[40] There are 31 regional fishery bodies operating worldwide, 9 established under the FAO Constitution and 24 under international agreements between three or more contracting parties. Their mandates, membership and participation, decision-making procedures, modes of operation and outcomes were the subject of discussion in a recent meeting (11-12 February 1999) convened by FAO in Rome, in which 7 FAO and 10 non-FAO organizations participated. Some of the factors hindering progress in the effectiveness of regional fishery bodies are: the failure by some States to accept and implement relevant international instruments; a lack of willingness by some States to delegate sufficient responsibility to regional bodies; and a lack of enforcement of management measures at both national and regional levels. In the developing world, there is a lack of resources and capacity. Decisions are usually made by consensus, typically engendering "too little and too late" decisions. A number of the regional bodies refer to the precautionary approach, and some of them (e.g. NAFO and ICCAT) have formally started considering the practical means and implications of implementing it. The International Council for the

Exploration of the Sea (ICES), responsible for the assessment of the North Atlantic's resources and management advice, has been implementing it in practice since 1998.

3.5 Improved framework

[41] In many respects, the context for management has improved a great deal over recent years. Overfishing has been recognized, widely and formally, as a fact and as a problem calling for solutions. New and better policy frameworks have been agreed, and the Law of the Sea, despite its limitations, is an achievement with no equivalent. Since 1990, fisheries frameworks have greatly improved through a range of initiatives at global, regional and national levels: UNCED (Brazil, 1992); the International Conference on Responsible Fishing (Mexico, 1992); the 1993-95 United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Conference), which led to the opening for signature in December 1995 of the UN Fish Stocks Agreement; the 1992-93 negotiation of the legally binding Compliance Agreement, which was adopted in November 1993 by the Twenty-seventh Session of the FAO Conference; and the 1993-95 negotiation of the Code of Conduct for Responsible Fisheries, and its adoption by consensus in October 1995 by the FAO Conference. Since then, the Code has been complemented with a series of implementation technical guidelines, including those on integration in coastal areas management, use of sustainability indicators, and the precautionary approach. The Code's implementation has been strengthened through adoption of four International Plans of Action (IPOAs) to: (i) manage, control and reduce fishing capacity; (ii) manage shark fisheries; (iii) reduce incidental mortality of marine birds in longline fisheries; and (iv) deter, reduce and eliminate illegal, unregulated and unreported (IUU) fishing. A draft fifth IPOA aiming at improving global monitoring of fisheries status and trends will be considered by the FAO Committee on Fisheries (COFI) at its next session.

[42] In addition, the broader biodiversity and habitat considerations are being addressed, and the need to protect the ecosystem is broadly accepted as both an ethical principle and a fundamental need. New solutions are being tested, in many cases with success: on the one hand to control the amount of fishing (through fishing rights and capacity control) and, on the other hand, to preserve critical habitats and biodiversity (through MPAs). Participatory approaches, where fishing communities are involved in the planning, implementation and evaluation of management systems, are receiving increasing support and are being tested in many countries.

3.6 Ecosystemic considerations

[43] The concept of fisheries operating in an environment or an ecosystem is not new, but pressure is building up to make fisheries and fisheries management more "ecosystem-conscious." As this is the main subject of the Conference for which this paper has been prepared, this section does not pretend to be analytical or prescriptive. As part of the overview, it will only briefly describe how far the sector is prepared to move towards EBFM.

[44] Conventional fisheries management, as it developed during the last century, is firmly based on quantitative ecology and ecosystem considerations. At its foundation is the commitment to maintain stocks at their highest level of productivity, with the principle of rebuilding them as a priority when they are accidentally depleted – a *hard sustainability* principle. Management implementation successfully discovered the resources, developed the technology required to catch and utilize them, developed a very dynamic trade, maintained the fisheries terms of exchange in the developing world, improved food supply per caput despite population growth, and provided livelihoods to more than one hundred million people. Management failed, however, to maintain the resource base quality, allowing a degradation of the species composition and commercial value of critical habitats, and most probably a modification of the genetic composition. As negative feedback from the ecosystem to the industry and the consumers, resources and vessel performance declined, prices and costs went up, seafood quality and safety decreased, and the death toll remained high.

[45] Awareness has been growing in various (mainly developed) countries and regions since the Second World War, with a strong acceleration since UNCED in 1992. Most fishery commissions and arrangements largely ignored ecosystem concerns when they were established (with CCAMLR as a notable exception) and remain slow to adjust their agendas, objectives and instruments. However, since the early 1990s, a number of global initiatives of importance for an ecosystem-based approach to ocean fisheries management have been undertaken following UNCED, including the Global Plan of Action for the Protection of the Marine Environment (GPA, 1995); the Convention on Biological Diversity (CBD, 1992); the Jakarta Mandate on Marine and Coastal Biodiversity (CBD-JM, 1995); the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA, 1995), which has broadened its mandate to cover aquatic resources; the International Coral Reef Initiative (ICRI), and its three operational units, the Global Coral Reef Monitoring Network, the International Coral Reef Information Network and the International Coral Reef Action Network (ICRAN); the Global Ocean Observing System (GOOS); the Marine Protected Areas initiative; and the Large Marine Ecosystems (LME) concept and projects.

[46] In addition, the pressure for more EBFM echoes the global consensus developed at and since UNCED, towards the sustainable development of the oceans, as development is considered sustainable (ecologically and socially) only if both human and environmental well-being are ensured, recognizing explicitly the link between the human and environmental elements of the ecosystem and the need for an acceptable balance between them. It is probably fair to assume that the two apparently independent processes (on indicators and ecosystem management) and the process for implementation of the precautionary approach will combine their effects towards the emergence of EBFM. In general, however, the coordination between the environment and fisheries ministries is generally less than optimal, and the implications of these new arrangements, and institutions for fisheries are not yet fully understood.

3.7 The FAO Code of Conduct

[47] While there is not yet any specific global framework for EBFM, the existing fisheries frameworks already contain provisions and guidance related to sustainable development and, more specifically, to ecosystems. The FAO Code of Conduct intends explicitly to conserve aquatic ecosystems (Article 6.1), promote "protection of living aquatic resources and their environments and coastal areas" (Article 2) and "respect biological diversity" (Code Introduction). The protection and conservation of the ecosystems are objectives of the FAO Code of Conduct (Article 2(g): to "... promote protection of living aquatic resources and their environments and coastal areas") and are reflected in its General Principles (Article 6.1: "States and users of living aquatic resources should conserve aquatic ecosystems"). More specifically, it provides for:

(i) assessment of impacts on target stocks, associated or dependent species (Articles 7.2.3; 12), including before introducing any new fishing method or operation in an area (Articles 8.4.7; 12.11);

(ii) monitoring of the environment and of the impacts on it (Articles 8.4.7; 10.2.4; 12.11);

(iii) reduction and minimization of environmental impact (pollution, discards, ghost fishing) on target and associated, dependent or endangered species (Articles 7.2.2; 7.6.9);

(iv) protection and restoration of critical habitats such as wetlands, mangroves, reefs, lagoons, nursery and spawning areas from degradation, destruction, pollution, etc., from human activities (Articles 6.8; 7.6.10);

(v) prohibition of destructive fishing (Article 8.4.2);

(vi) allocation of rights subject to ecosystem conservation (Article 6.1);

(vii) maintenance of the quality, diversity, and availability of resources (Article 6.2);

(viii) restoration/rehabilitation of populations and stocks (Articles 6.3; 7.2.1);

(ix) assessment of relationships among the populations in the ecosystem (Articles 7.2.3; 12);

(x) improvement of selectivity (Articles 8.5.3; 12.10);

(xi) reduction of impacts on target and non-target stocks (Articles 6.2; 12.10);

(xii) conservation of biodiversity and population structure (Articles 6.6; 7.2.2);

(xiii) prevention of overfishing and overcapacity (Article 6.3);

(xiv) protection of endangered species (Article 7.2.2);

(xv) assessing of gear impact of gear on biodiversity and coastal communities (Articles 8.4.8; 10.2.4; 12.5);

(xvi) assessing impact on non-fishing activities (Article 12.5);

(xvii) assessing impact of climate change (Article 12.5);

(xviii) adopting measures to maintain or restore stocks at levels capable of producing maximum sustainable yield (Article 7.2.1);

(xix) apply widely the precautionary approach (Article 7.5.1); and

(xx) ensuring a level of fishing commensurate with the state of fisheries resources (Article 7.6.1).

4. CONCLUSIONS AND DISCUSSION

4.1 The resources

[48] Altogether, the latest information available on the resources and on the fisheries, by fishery, region, or globally, tends to confirm the earlier FAO estimates (Gulland, 1971) of a potential for marine fisheries of about 100 million t, of which only 80 million t is probably achievable for practical reasons, including the difficulty of optimizing the use of every wild stock. It also confirms that a large proportion of the resources are now highly stressed. The overall judgement or perception that one has on the state of world resources depends on whether one views MSY as a target to reach (a conventional view of the fisheries development phase) or a limit to be avoided (a more recent view developed during the UN Fish Stock Conference). If “fully fished” stocks, exploited close to MSY, are considered as “in trouble” because, without appropriate management, they are the probable candidates for overfishing in the near future, then a majority (75%) of the stocks appear either fully exploited or overexploited and require either strict capacity and effort control to stabilize levels of exploitation (to MSY) or effort reductions to rebuild stocks (to at or above MSY level) (see Figure 1). If, on the contrary, they are considered as “in good shape” because after all they comply with the UNCLOS requirement of being at or above the MSY level of abundance, a majority (72%) of the stocks appear in good shape and show no sign of overfishing. The same reasoning affects the perception of the state of stock when dis-aggregating the information by FAO region (Figure 14). The relative importance of the dark (i.e. “bad”) and the clear (i.e. “good”) areas depends one views of fishing around MSY as a desirable goal (Figure 14A) or an undesirable one (Figure 14B).

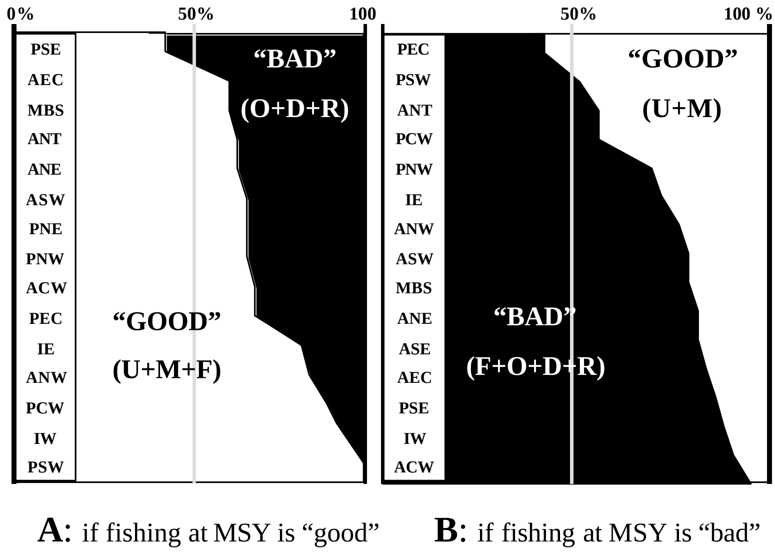

Figure 14: Proportion of stocks that are in "good" or "bad" state by FAO region depending on whether fishing around MSY is considered advisable or not.

[49] An important point, however, is that 28% of the world stocks appear overfished (Figure 3), regardless of the point of view, and need urgent action for rebuilding. A further point of concern is that between 1974 and 1999, there was an increase in the proportion of stocks classified as "exploited beyond the MSY limit," i.e. overfished, depleted or slowly recovering, pointing to a failure of management to cope with fishing capacity. When the information is stratified by large oceanic region, the North Atlantic and North Pacific show a continuous aggravation of the situation until the 1980s or early 1990s, with possible stabilization thereafter, particularly in the North Atlantic. In the tropical and southern regions of these oceans, the situation seems to be still aggravating, except perhaps in the tropical Atlantic, where stabilization and possibly some reversal might have started.

4.2 Validity of the assessment

[50] Being based on a sample of the world stocks, severely constrained by availability of information to FAO staff, the conclusions have to be considered with caution. A key question is: To what extent does the information available to FAO reflect reality? There are many more stocks in the world than those to which FAO refers. In addition, some of the elements of the world resources referred to by FAO as "stocks" are indeed conglomerate stocks (and often multi-species). One should therefore ask what validity a statement made for the conglomerate has for individual stocks (*sensu stricto*). We are generally confident that the global trends we observe in landings reflect trends in the monitored stocks, because the general trends are in agreement with detailed analytical reports and from similar studies conducted at a "lower" level, usually based on more insight and detailed data. As an example, an analysis made by Baisre (2000) on Cuba's fisheries, using the same approach as Garcia and Grainger (1996) for the whole world, led to surprisingly similar conclusions (Figure 4), using less coarse aggregations, even longer time series, and with more possibility of "double-checking" the conclusions against conventional stock assessment results.

[51] There is of course the possibility that stocks become "noticed" by scientists, become documented, and appear in the FAO information base only when they start getting into trouble and scientists, having accumulated enough data, start dealing with them, generating reports of intense fishing or overfishing that FAO can access. This could explain the increase in the proportion of stocks exploited beyond MSY since 1974. This assumption, however, does not hold, for at least two reasons:

- The number of "stocks items" identified by FAO but for which there is not enough information has also increased significantly with time, from 7 in 1974 to 149 in 1999, clearly showing that new entries in the system are not limited to "sick" fisheries.
- From the 1980s, based on the recognition of the uncertainties behind identification of the MSY level, and recognizing also the declines due to decadal natural fluctuations, scientists have become more and more reluctant to definitely classify stocks as "overfished." The apparent "plateauing" of the proportion of stocks with excessive exploitation in the northern regions of the World Ocean may in part be due to this trend.

[52] Natural variability is an important potential source of bias in assessments. During the last two decades, the existence of natural oscillations in marine ecosystems composition and productivity, independent of fishing, but probably modified by it, has been definitively recognized. The FAO Expert Consultation to Examine Changes in Abundance and Species Composition of Neritic Fish Resources (San Jose, Costa Rica, 1983) (Sharp and Csirke, 1983) was an important step in that direction following the recognition of synchronous changes of abundance in a number of important sardine stocks (Kawasaki, 1983). The report more recently produced for FAO by Klyashtoryn (2001) illustrates very clearly the fact that the historical trends in world catches of important variable marine resources of the northern hemisphere (mainly small pelagic and semi-pelagic species, but including cod) are closely related to natural long-term climate oscillations. The extent to which these oscillations, now recognized as more general than previously thought, may have affected some of the scientific assessments on which this review relies is not known.

[53] One criticism of modern assessments is that the data available for most stocks under-estimate grossly and greatly the "pristine" levels of abundance and hence the present degree of degradation of fishery resources (Pauly, 1995). More recent papers proposing the same view argue also that overfishing is the main cause of degradation of the state of world stocks, above pollution and all other forms of human intervention. There will certainly be a heated debate around these assertions, and efforts are being made to collect as much historical data as possible to confirm or confute them. If they are correct, however, they would imply that the present assessment might still be too optimistic.

[54] The high pressure exerted on stocks has ecological effects, which have been repeatedly stressed and are demonstrated by the change in quality (species composition, size, commercial value, trophic level) observed in the landings, largely reflecting changes in the resource base (Lock, 1986; Caddy, 1993, Garcia and Newton, 1994; Pauly *et al.*, 1998; Pauly and Palomares, 2000; Caddy and Garibaldi, 2001). Few resources could support higher fishing pressure and these tend to be prey species for which an increase in exploitation may lead to questionable ecological consequences, including for predator stocks that society would like to see rehabilitated. There is practically no other fishing area or resource of significance to be discovered. The world's oceans are exploited from the poles to the tropics, the littoral to the open sea, and the surface to the deep bottom. Deep-sea resources on slopes and sea mounts are already under heavy pressure (and possibly overfished in many areas) and their low natural productivity and resilience puts them in serious danger. There is hardly anywhere else to go to employ existing excess fishing capacity.

4.3 The fishing industry

[55] Despite the obvious problems in the resource base, marine fisheries have become an important source of economic and social development in the coastal areas, where they are, however, competing with other activities for resources and for space. They provide:

- **food**: total production and production per caput has been maintained at the cost, however, of a decrease in the quality of the harvest and with growing support from mariculture and coastal aquaculture;

- **revenues**: fisheries are a source of revenue for hundreds of millions of people, a large proportion of them poor or very poor, and are an important source of foreign exchange for many developing countries;
- **employment and livelihood**: particularly in poor coastal areas and for the poorest strata of the population;
- **recreation**: sport fisheries provide a significant contribution to recreation and tourism; and
- **data**: despite the ongoing debate on the quality of the fishery data, fisheries have contributed a quantity of information that has hardly any equivalent in any other sector and is extremely valuable for the monitoring of the sector and the resources upon which it depends.

[56] Technical progress continues to improve safety on board, as well as capacity to fish and, in the absence of effective management mechanisms, continues to fuel overcapacity. Governments have started grappling with the issue and an International Plan of Action for the Management of Fishing Capacity was adopted at FAO in 1999. The issue of subsidies to the sector and their impact on capacity and sustainability have become an important and sensitive issue. Illegal fishing is a significant component of the overfishing and overcapacity problem, and an International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing was also adopted in FAO, in 2001.

[57] It is not possible in such a short paper to do justice to the complex changes occurring in the sector. It is also not easy to summarize the sector's evolution as it is rather heterogenous and its trends depend on the regions, and sometimes on the resource types concerned. The relative political support that the small-scale and industrial sectors enjoy depend on countries. In general, however, the sector is not very strongly organized and lobbies are weak or non-existant. The result is that the capacity of industry to influence government decisions affecting them directly or indirectly is limited. This could become a problem at a time when governments will have to decide in which sector to put the coming "environmental bill." Large and vertically integrated food companies and major supermarkets are playing a growing regulatory role in supplies and prices. The sector has developed an awareness of the environmental issues and is getting more involved in the international debate, e.g. attending more regularly the FAO COFI meetings or being deeply involved in the debate about the pro and cons of ecolabelling. In the coming evolutionary process of fisheries governance towards EBFM, a much greater involvement of fisheries will be essential.

4.4 Governance

[58] The management approaches currently in use reflect largely the paradigm developed in the 1940s and 1950s, with improvements due to scientific and technical progress. It is generally recognized that that the main problem for fisheries management is the inadequacy of fisheries institutions and governance. It is generally science-based (at least theoretically) and the dominant situation is that of free and open access to the resources. A number of alternative measures have been tested in the last two decades to limit fishing effort and capacity, but there is, as yet, no general consensus. In general, as demonstrated by the state of the resources, management performance is rather poor. The main problems relate to overfishing, endangered species (and the interaction with CITES), overcapacity, subsidies, environmental impact, IUU, selectivity and discards, the need for integration of fisheries management into coastal zone management, and the prospect of ecolabelling. Progress is slowed by ideological positions and perceived consequences of the shift to "harder" and more limited fishing rights, and the so-called "privatization" of fisheries. Generally viable solutions have still to be found for small-scale fisheries, and developing countries need collaboration aiming at faster capacity building. The clearly demanded shift to EBFM and wider application of the precautionary approach, supported by generalized used of sustainability indicators systems, requires more investments in governance, better science, more efficient decision-making, more deterrent enforcement, higher levels of participation,

decentralization, transparency, as well as a better matching between jurisdictions and ecosystem boundaries. There is no doubt that management must change and there is agreement on the general long-term goal. The questions are: Through what pathway? How fast? and At what affordable cost? The Law of the Sea is the foundation on which to build the new system of governance, and the FAO Code of Conduct is recognized, generally, as the operational instrument for its practical application within the UNCED principles. The regional fishery management organizations and arrangements have been recognized as the central institutions for fisheries governance, but they will have to improve their performance to reduce potential duplication and conflicts with environmental institutions and organizations.

4.5 Need for improved information

[59] It is clear that the monitoring of the state of fisheries and their resources (and environment) needs to be substantially strengthened in the interest of the sector itself, for better informed and improved governance as well as for more transparency and better public information. No matter how and how much the baselines might need to be "corrected" to better gauge the system, the fisheries management dashboard should be better able to reflect the state of its main components. The FAO data is usually taken as the reference source for global information, but it has its shortcomings. Efforts are being made to improve the data, assisting individual countries in revising their data collection systems, elaborating manuals and providing training courses. In addition, and in order to improve quality, timeliness, and transparency, FAO has started the development of a global, cooperative, Fisheries Resources Monitoring System (FIRMS), connected to the FAO Fisheries Global Information System (FIGIS), with a view to better mobilize the competences and information available in the regional fishery commissions and national centres of excellence.

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