Pergamon

0025-326X(95)00022-4

Marine Pollution Bulletin, Vol. 29, Nos 6–12, pp. 528–536, 1994
Elsevier Science Ltd
Printed in Great Britain
0025-326X/94 $7.00+0.00

Responsible Fisheries: An Overview of FAO Policy Developments (1945–1994)

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The paper outlines the evolution of fisheries development policies (aquaculture excluded), from an international perspective as seen within the various UN and FAO fishery committees. It begins with the first FAO Technical Committee on Fisheries in 1945 and extends through the various periods corresponding to post-war reconstruction (1945–1958), geographical expansion (1959–1972), establishment of a new economic order of the oceans (1973–1982), and transition towards global concerns (1983–1992). It underlines the gaps between government resolutions at the international level and effective implementation at national policy level. This identifies the elements to be considered in responsible fishing policies. Finally, the FAO International Code of Conduct for Responsible fisheries is presented as the conceptual framework for achieving sustainable fisheries development and UNCED's objectives within the framework of the 1992 Convention.

Fisheries, like all other production sectors, have to adapt to the new requirements of sustainability, following the 1992 UN Conference on Environment and Development (UNCED). New policy frameworks and the adoption of new approaches to policy implementation are required. This paper provides an historical perspective of policy developments within the international fishery forum of the United Nations Food and Agriculture Organization (FAO). It follows the progressive shift from a post-war focus on reconstruction and development in the North Atlantic, in the 1940s and 1950s, to a very active geographic expansion of fisheries to other areas and oceans in the 1960s, the commencement to a new economic order of the oceans in the 1970s and the emergence of global concerns about sustainability of fisheries in the 1980s. Based on this historical perspective, the paper proposes basic principles for modern fisheries policies and identifies action required for their implementation. Finally, the paper refers to the FAO International Code of Conduct for Responsible Fisheries as the international framework for practical implementation of the UN Convention on the Law of the Sea and the basis for a shift towards more responsible fisheries.

Evolution of Capture Fishery Policies

Since its foundation in 1945, the member nations of the FAO have been confronted with the difficult issue of sustainable fisheries development and management in a constantly changing environmental, economic and institutional context (Garcia, 1992). These developments can be divided into time periods delimited by major international events affecting fisheries policies.

1945–1958

Following the Second World War, a period of intense development of fisheries began and continued up until 1958, during which marine fish production increased from 17.7×10^6 t to 28.4×10^6 t. The main policy objective of FAO just after the Second World War was the reconstruction of European economies, including the fishery sector. The limitation of the European fisheries resource base and the dangers of overcapacity and overfishing were already formally recognized at the UN International Overfishing Conference held in London in 1946 as was the problem of managing common and freely accessible resources.

In April 1945, the first FAO Technical Committee reviewed the major problems affecting fisheries in the northern hemisphere (FAO, 1945). These problems included resource depletion (including whales), discarding practices, the lack of data for high seas management (i.e. all resources beyond 3 miles), the need for immediate fishery management measures as well as the ineffectiveness of regional fishery bodies. This FAO Committee recommended, *inter alia*, to increase co-operative and socio-economic research, to aim at maximum sustained production, to protect future supplies and to establish regional management councils. All of these recommendations are still valid today in the broader context of world fisheries but then no agreement could be reached on either international resources allocation or on direct limitation of fishing effort. The Committee did, however, note the availability of under-utilized resources in the southern hemisphere, which signalled opportunities for long-range fisheries expansion.

In response to the latter, Chile and Peru claimed a 200-mile territorial sea jurisdiction in 1947, and the concept of a 200-mile extended fisheries jurisdiction was embedded

in the Santiago Declaration, signed by Chile, Peru and Ecuador in 1952. The Declaration also established the Comisión Permanente del Pacífico Sur (CPPS). At the same time important resources such as the Hokkaido sardine, the North Sea and Atlanto-Scandian herring, and the California pilchard all decreased or collapsed. This underlined the need for more collaborative mechanisms for research in support of management, and were based on the models used by the International Council for the Exploration of the Sea (ICES) and the International Commission for North Atlantic Fisheries (ICNAF) (SOFA, 1956). FAO established its first regional fishery bodies, the Indo-Pacific Fisheries Council (IPFC) in 1948 and the General Fisheries Council for the Mediterranean (GFCM) in 1949. The International Technical Conference on the Conservation of the Living Resources of the Sea, hosted by FAO in 1955 again emphasized the need for improved data and management, especially in international fisheries and the requirement to base management on scientific evidence, putting the burden of proof on the managers. The special interests of the coastal state in high seas resources and the question of new entrants was also debated but without reaching an agreement. These questions were again debated at the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks (New York, 1993–1994).

Finally, the UN Convention on Fishing and Conservation of the Living Resources of the High Seas was adopted in Geneva in 1958 (UNCLOS I) but it was not signed by some of the most important high seas fishing nations.

1959–1972

Between 1959 and 1972, fisheries rapidly expanded geographically and world catches increased from about 30 to 60×10^6 t. Developed countries and financial institutions focused attention on the assessment of world fisheries resources in support of the expansion process. Surveys were undertaken by FAO off West Africa, in the Bay of Bengal and off the Atlantic coast of South America. Long-distance fleets from Europe, the Eastern European countries, Japan, USA, Cuba, Republic of Korea and Ghana expanded their operations off north-west and south-west Africa and in the tropical oceans, supported by subsidy schemes. The introduction of synthetic fibres and engines in developing countries' subsistence fisheries increased their fishing power, while their traditional grounds were progressively being fished by modern vessels. Developing countries such as Peru, Chile, Morocco, Senegal, Ivory Coast, Ghana and Angola developed an industrial fishery sector. Valuable shrimp fisheries developed in Asia and the Near East (India, Kuwait, Pakistan) producing major national sources of foreign exchange earnings but contributing to overfishing (and discards) in the tropics.

Severe overfishing occurred in coastal areas of developing countries, marked by a series of fishery resources collapses (e.g. anchoveta in Peru). Independence of countries increased the demand for development assistance, technology transfer and training and increased the need for international co-operation.

During this period, two developing countries, Peru and China, appeared among the first four fish producers of the world while the North Sea remained severely affected by overfishing. The central issues of common property resources management and access rights were addressed in Scott and Christy (1966) but countries remained reluctant to take the measures required to correct the situation when national fisheries jurisdiction remained limited to 3 miles. The UN Convention on Fishing and Conservation of the Living Resources of the High Seas (adopted in 1958) was implemented only in 1966. This Convention, as well as the UNCLOS II Conference (Geneva, Switzerland, 1960), failed to agree on the breadth of national jurisdiction and therefore on the definition of the high seas area. Public concern for marine mammals and their obvious mismanagement grew rapidly, leading to the adoption of a 10-year moratorium on commercial whaling at the World Conference on Human Environment (Stockholm, Sweden, 1972). This signalled the beginning of an era during which the role of non-fishery users increased significantly in shaping international fisheries policies.

The Stockholm Conference defined the rights of mankind to a healthy environment and addressed issues which are still central to fisheries management today: natural resource limits, environmental degradation, demography, planning and management, institutional deficiencies, inadequate education, research and technology, international co-operation and equity.

The establishment of the FAO Committee on Fisheries in 1966, focused attention on international fisheries management and the role of regional fisheries bodies. FAO member states decided to develop a network of FAO regional fisheries bodies beginning with Latin America in 1961, and subsequently West Africa in 1967, the Indian Ocean in 1967 and the Caribbean in 1973. Regional bodies were also established for the management of Atlantic tunas in 1966 and the south-east Atlantic fisheries in 1969. In the late 1960s, the limitation and degradation of resources was generally becoming recognized but fishing nations were still unwilling to accept limiting fishing effort directly and opted for indirect controls through total allowable catches (TACs) and quotas. In so doing, the economic waste continued and conflicts increased from the inadequacy of access rights (Gulland & Carroz, 1968).

At the beginning of the 1970s, FAO predicted that many fisheries were no longer sustainable and that production levels could not be maintained without better management and an increased use of under-utilized resources (Gulland, 1971). The collapse of the Peruvian anchoveta in 1972, partly due to overfishing and to 'natural climatic variability' showed that a 200-mile fishery jurisdiction alone was no guarantee of sustainability and underlined the fact that environmental variability and data uncertainty had to be taken into account.

1973–1982

Between 1972 and 1982, a new international order of fisheries was progressively established and fisheries production increased from 60 to 68×10^6 t and the status of stocks deteriorated except in a few areas. The FAO Technical Conference on Fishery Management and

Development in Vancouver, Canada, in 1973 (Stevenson, 1974) followed the Stockholm Conference on Human Environment and, although not explicitly related to it, addressed many of the same key issues, e.g. the resource limits; the management failure and related over-capitalization, subsidies and economic waste; the conflict between management, development and technological change; the scientific basis for management; the need to integrate biological sciences with economics; the importance of regional co-operation; the relation between free and open access to overfishing; the competition between distant water and local fleets; the dangers of environmental degradation and the need for precautionary management, etc. The Vancouver Conference repeated and reinforced the diagnosis made and solutions already recommended by the FAO Committee in 1945.

During this period, the expansion process of fisheries was seriously constrained by rising fuel prices and the commencement of the need to negotiate conditions of access, all within a context of increasing real fish prices. In the early 1980s, world catches increased again due to favourable natural stock fluctuations of low-value small pelagic species (such as Peruvian anchoveta, Chilean jack mackerel, Japanese and Latin American pilchards), and the development of the Alaska pollock fishery. There was a last expansion of long-range fleets into the Indian Ocean, the South Pacific and the south-west Atlantic in search of high-value species (e.g. tunas, shrimps and cephalopods). These increases concealed the overfishing of many demersal resources (e.g. cod, hake, haddock, whiting, octopus, groupers, sea bream, Pacific Ocean perch, Chinese yellow croaker, large shrimps, etc.) and the ecological changes being imposed on fishery ecosystems (e.g. replacement of large, long-lived species by smaller short-lived ones) in the Gulf of Thailand, the North Sea and off West Africa.

The use of 'fishing licences' to constrain fleet sizes became generalized in the 1970s, especially for foreign fleets, as a large number of coastal countries extended their jurisdiction to 200 miles in anticipation of the outcome of the UNCLOS III process which started in 1973. Continental shelf areas which still remained freely accessible (e.g. off Western Sahara, Namibia and in the south-west Atlantic) became alternative fishing grounds for foreign fleets. Straddling stocks were put under severe pressure and high-seas fishing intensified on small tropical tunas, oceanic sharks, horse-mackerel, krill, oceanic squids, etc.

The work of the FAO regional fishery bodies in management was strengthened by (a) developing or enhancing their terms of reference related to management, and (b) establishing sub-regional committees with management competence for the Persian Gulf (1972), the south-west Indian Ocean (1980), the Bay of Bengal (1980), the Lesser Antilles (1980) and the South China Sea (1980). In 1977, an Advisory Committee on Fisheries Management (ACFM) was created by the ICES to streamline its management advice process. The Special Chapter in the State of Food and Agriculture 1980 (FAO, 1981) reviewed the implications of the 1982 Convention on the Law of the Sea on fisheries management. It recognized that free access had now virtually disappeared and urged states to take this opportunity to improve fisheries management. It noted that a number of issues had not been clearly resolved and some of these were to emerge again at UNCED, in 1992. Included among these were the determination of maritime boundaries, the degree of coastal state authority beyond their EEZ, the concepts of 'optimum yield' and 'surplus' and the management of shared, straddling and highly migratory resources. Recognizing the biological and economic deficiencies of the concept of Maximum Sustainable Yield (and of Total Allowable Catches determined on this basis), many States started considering the adoption of lower fishing mortality targets, which could be expected to improve economic and social performance of fisheries. Gulland (1982) calculated that better fisheries management could produce a net profit of US$500 million in the North Sea and US$1000 million in the whole of the north-eastern Atlantic.

As fisheries further intensified, the by-catch and discards (particularly in shrimp fisheries) became important issues. The natural fluctuations in species abundance (Csirke & Sharp, 1983) and the opportunistic nature of multispecies fisheries became recognized. However, the theoretical aspects of multispecies management were addressed with difficulty because the understanding of the scientific community remained insufficient for any practical application in the tropics and even in temperate areas. In the area of fisheries environment, FAO sponsored the organization of a series of meetings in 1974–1976 and the General Fisheries Council for the Mediterranean (GFCM) produced the guidelines on which the 1976 Barcelona Convention for the Protection of the Marine Environment was established. In 1982 the UN Convention on the Law of the Sea was adopted and opened for signature, marking the formal beginning of a new era, in a process of extension of national jurisdiction which had started decades before. In the same year, the proposed 10-year moratorium on whaling that had been recommended by the 1972 Stockholm Conference was finally adopted by the International Whaling Commission after 10 years of controversial political debate, scientific polarization and mismanagement. It took a few more years (until 1988) for it to be effectively implemented. National capacities in research and management progressed in developing countries, but too slowly in most cases to match the rapidly growing management needs.

1983–1992

Between 1983 and 1992 marine catches increased from 68×10^6 to about 85×10^6 t and the global concerns for environmental conservation and sustainability became progressively dominant considerations in fishery policy. This period started with the technical preparations for the FAO World Conference on Fishery Management and Development (Rome, 1984). It ended with the preparations for the UN Conference on Environment and Development (UNCED). An important role was played by the World Commission on Environment and Development ('Brundtland Commission', 1984–1987). It was essentially a period of transition. Several developed countries (New Zealand, Australia, Canada, Iceland), tried to limit effort and improve economic efficiency in

their fisheries through the use of individual transferable quotas (ITQs). Developing countries continued experimenting with the management of their newly acquired resources and the difficulty of related responsibilities, realizing that claiming an EEZ was certainly not sufficient to avoid overfishing and that controlling foreign fishing vessels was often easier than controlling their nationals.

The process of signature and ratification of the 1982 Convention proceeded slowly. The required 60 ratifications were obtained only on 16 November 1993 and the Convention entered into force 12 months later, on 16 November 1994. Previous to its entry into force, the 1982 Convention provisions covering fisheries had been considered international customary law, which had been reflected in national policies for several years. As straddling stocks continued to be put under severe pressure, several coastal States attempted to exercise greater control over exploitation in areas adjacent to their EEZs. Inadequacies in the management of international fisheries, and the negative role of many types of subsidies, stressed in scientific fora since the mid-1960s, were finally recognized in most inter-governmental fisheries management fora. The fact was also recognized that many national fisheries development policies had negative impacts on fishery resources, small-scale fishermen, national debt and the environment, which in turn had generated social unrest, conflict and illegal fishing practices. States started to address the need for more protection of sensitive non-target species, as shown by the international conflicts related to the use of large-scale pelagic driftnets and to the tuna-dolphin fisheries interactions. In the early 1990s, and following UNCED, international (and national) environmental management organizations started to broaden their agenda from environmental conservation to sustainable fisheries development. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) proposed, in 1991, to list the Atlantic northern bluefin tuna in its Appendix II. At the end of 1994, parties to the Barcelona Convention and to the Convention on Migrating Species (CMS) considered the addition of a protocol on fisheries to these Conventions.

National fisheries policies, which had included the creation of EEZs, the progressive replacement of foreign fleets by national vessels and joint ventures, and the obligation on foreign fleets to land their catch locally, contributed to a great increase in international fish trade at a faster rate than many agricultural products. Between 1980 and 1987, developing countries increased their international fish trade by 75% in volume and 100% in value, increasing the contribution of fisheries to their foreign exchange earnings. This evolution did not contribute to limitations on fishing effort. The world competition for access to markets intensified and concern was raised over the abuse of trade barriers for the purpose of conservation or of seafood quality standards for market protection.

At the FAO World Conference on Fisheries Management and Development (Rome, Italy, 1984), states recognized the major problems posed by current unsustainable fisheries development, their causes and possible solutions. The conference signalled clearly the end of the debate on the right of access to resources and of the freedom of fishing in the 200-mile zone. It also showed the beginning of a new economic battle between the new 'resources' owners' looking for markets and the traditional 'market owners' looking for renewed access to resources for their long-range fleets.

In June 1992, UNCED agreed to a set of principles for sustainable development and a framework for action (Agenda 21) with a full chapter of direct relevance to fisheries (Chapter 17) which, together with the 1984 FAO World Fisheries Conference provided the basis for development of sustainable fisheries in the 1990s.

Towards Modern Fishery Policies

The basic principles for sustainable fisheries development had long been internationally established, for instance, by the recommendations of the first FAO Technical Committee on Fisheries in 1945 or, more recently, in the Strategy of the FAO World Conference on Fisheries Management and Development (Rome, Italy, 1984). For a decade, FAO member States recognized the fundamental importance of this Strategy and allegedly adhered to it, but its practical implementation had not occurred as clearly demonstrated by the present state of the fishery resources. More recently, the International Conference on Responsible Fishing held in Cancun, Mexico in 1992, with the co-operation of FAO, elaborated a declaration containing a series of principles which were largely in harmony with the 1984 FAO Strategy. It emphasized the problems of environment, protection of critical habitats, reduction of by-catch and discards, reduction of environmental impacts of fishing and aquaculture, improvement of high seas management, and reduction of non-tariff barriers in international trade. The most recent of the international legal frameworks for sustainable use of natural resources was provided by the UN Conference on Environment and Development (UNCED, 1992). Its Agenda 21 and fundamental principles, contained in the Rio declaration are of particular relevance for modern fishery policies.

The effective adherence to these numerous and converging principles would be expected to result in a drastic improvement in the resource base and economic situation of fisheries. But the task is immense and difficult, and the record of governments' past actions has not been very encouraging. A number of states, however, have started trials with effort limitation and resource allocation schemes. Large-scale adjustments have been made to the size of several long-distance fleets. The international development banks have become reluctant to finance further increases in fishing capacity but it is not yet clear as to whether they have finally accepted the need to support national efforts in fleet reduction schemes. The situation is becoming even more complex because as policy makers come to terms with fishery management, they must also integrate the new aspects of environmental management. The key problem of equitably allocating resources within the fishery sector will now be compounded by the broader problem of also allocating living marine resources to non-fishery users in an even more

complex and less mature legal and institutional framework.

Whereas these principles establish the frame and objectives for fisheries, little guidance is given as to how these can be applied in practice. The specific types of action required is described below.

Effort control and reductions

Fisheries must be rationalized to rehabilitate the resource base and improve economic performance, particularly through removal of open access conditions and the reduction of fleet sizes and fishing effort. The Rio declaration, however, recognizes that people are at the centre of the concern for sustainable development and entitled to a healthy and productive life in harmony with nature (principle 1). This suggests that fishery policies should ensure the protection of fishermen's sources of food as well as the development and improvement of their working conditions. It implies that fishermen might have to be compensated for the loss of access and/or that alternative employment must be generated.

Fisheries have, up to now, consumed more than the system produces, eroding the natural capital and threatening opportunities for development by future generations. The Rio declaration states, however, that the right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations (principle 3). The action required to reduce exploitation rates implies a large-scale reversal of the present situation and present generations may have to provide the capital required for corrective action. Rehabilitated fisheries will be, in most cases, more profitable operations than the existing subsidization of oversized fleets. This should be an incentive for development banks to provide the necessary initial capital, in particular for developing states.

The need to ensure global sustainability for fisheries on which both developing and developed countries depend, through trade, implies that major importing nations should help coastal developing countries reach sustainability through technical assistance programmes. At the same time distant-water fishing nations should ensure a more responsible conduct for their long-range fishing vessels.

Explicit resources allocation

Irrespective of what spatial or functional framework is taken for management of marine living resources (e.g. the coastal zone and related watershed, the EEZ, the sub-regional biological stock unit, the large marine ecosystems), the absolute requirements for ensuring long-term sustainability include the establishment of some form of property rights and the delegation of user rights in return for some form of payment. Institutions need to be established with geographical competence which reflects the geographical distribution of the resources and considers the interests of all the users concerned on an equitable basis. The implication for coastal and EEZ resources is inter-sectoral integration, integrated sectoral planning and development and explicit mechanisms for resources allocation, collection of user fees and resolution of conflict. The implication of this to the allocation issue in the high seas is even greater (Gulland & Carroz, 1968).

Reduction of waste and threat to endangered species

The problem of incidental catches was already identified in 1945 by the FAO Technical Committee on Fisheries and has recurrently been examined as a 'waste' problem. It now also emerges as a threat to endangered species and biodiversity, and it has to be taken into account in fisheries management and development as well as in fishing operations. The 1982 Convention included Articles for the protection of the environment, as well as for target and associated species taking their interdependence into consideration. As such it established the basis for ecosystem management, a concept now imbedded in the UNCED Agenda 21 for oceans with particular reference to Large Marine Ecosystems (LME). The scientific understanding, as well as the legal and institutional frameworks that would be adequate for implementation of ecosystem management, are simply inadequate. Notwithstanding, improvements can be made by promoting increased selectivity of fishing gear, more responsible fishing practices and better use of catches. In so doing, States will, however, have to take note of Principle 12 of UNCED which requires that '*Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction to international trade*'.

Management of high seas resources

A source of international concern for decades, many high seas stocks (including highly migratory and straddling stocks) are overfished and the status of many others is unknown (Garcia & Majkowski, 1991; FAO, 1993a). UNCED Principle 2 recognizes that '*States have the sovereign right to exploit their resources pursuant to their own objectives and the responsibility to avoid that their activities within their jurisdiction cause damage beyond the limit of national jurisdiction*'. Large-scale improvements are necessary to satisfy this principle and progress most probably will not be possible without agreement on overall effort controls, co-ordination of management schemes through international arrangements and agreements on resource allocation. The UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks (New York, 1993–1994) is attempting to develop a new regime for the high seas in the framework of the 1982 Convention FAO adopted in 1993. This includes an Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels in the High Seas, which will come into force when ratified by 25 countries. This Agreement should help the flag States, with assistance from the Port States, to improve the conduct of distant-water fishing fleets.

Harmonization of environment and development

Principle 4 of UNCED requires that '*In order to achieve sustainable development, environmental protection must be an integral part of the development process*'. In addition, Principle 7 provides that States shall co-operate to conserve, protect and restore the health and integrity of the ecosystem. It is necessary to improve the fishing

industry's awareness of environmental issues but also to highlight, for environmental lobbies and for the public at large, the socio-economic implications (including food supplies and prices) of conservation and management in both the short and long term. Standards and criteria for acceptable levels of impact must be developed and agreed that satisfy both environmental and development concerns. The recognized uncertainty in fishery systems requires the adoption of more cautious management strategies. The practical implications of the Precautionary Approach for fisheries are being reviewed by FAO and the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks (Garcia, 1993, 1994). The approach is promising but also of concern if overstringent constraints are imosed on fisheries without explicit consideration of socio-economic implications and equity.

Precautionary approach

Cautious or anticipatory approaches to fisheries management have long been advocated but rarely applied in practice and modern fisheries policy will have to introduce them more formally. Principle 15 of UNCED is very clear in this respect and provides that '*In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities, Where there are threats of serious or irreversible damage to the environment lack of full scientific certainty should thus not be used as a reason for postponing cost-effective measures to prevent degradation*'. A precautionary approach to fisheries management should include, *inter alia* (a) step-wise development; (b) *a priori* effort limitations; (c) legal or financial 'expansion brakes'; (d) appropriate authorization for new vessels; (e) precautionary quotas; (f) total allowable catches set below the maximum sustainable yield (MSY); and (g) prior agreement on cautious management thresholds (e.g. minimum spawning biomass) at which management action is automatically taken, etc. (Garcia, 1993, 1994). Further efforts are required to clarify the practical implications of the approach and to promote it. A special technical meeting to be convened by Sweden in 1995, in close collaboration with FAO, will develop practical guidelines for the application of the approach to fisheries, including the introduction of species.

The information base

National statistical systems need to be upgraded particularly for artisanal and high seas fisheries. A major effort is necessary to improve and generalize the collection of socio-economic data. Fishery management-orientated research institutions and programmes require more substantial and coherent support to develop the necessary understanding and models to analyse options and forecast consequences of alternative management strategies, including potential consequences of climate change, in accordance with Principle 9 of the Rio Declaration.

Fishermen's participation

UNCED's Principle 10 states that '*Environmental issues are best handled with the participation of all concerned citizens, at the relevant level and that States shall facilitate and encourage public awareness*'. Principle 22 states, in addition, that '*Local communities have a vital role in management and development because of their knowledge and traditional practices. States should enable their effective participation in the achievement of sustainable development to be ensured*'. Policies aimed at improving EEZ fisheries management need to strengthen fishermen's representation in conventional management systems and to promote community-based management systems for artisanal fisheries. Failure to involve fishermen in decisions regarding their livelihood will result in increased management costs, reduced compliance and, ultimately, in management failure. This is not yet sufficiently and formally recognized in all countries despite the outcome of the Stockholm and Rio Conferences (in 1972 and 1992).

Other uses of marine living resources

Whereas fishermen's participation in management needs to be broadened, the inclusion of non-fisheries users' views, with an appropriate 'weighting factor', is required to meet yet undefined equity criteria. By the year 2000, 60% of urban populations (1800 million people) will be living less than 50 km from the coast and many more in settlements along rivers carrying pollution to the sea. This does not take into account rural settlements already established in coastal areas. In addition, it is estimated that 80% of present marine pollution comes from the land, sometimes distant, and affects people who live and depend on the coastal sea. In many areas, coastal rehabilitation is required even though, in oligotrophic marine areas, organic enrichment may have positive effects on production.

The problem, related to conflict with non-consumptive uses (e.g. tourism) and other sectoral uses, must be addressed in the context of integrated coastal areas management policies. There are two major requirements: (a) the need to allocate resources to valid alternative sustainable uses of those resources; and (b) the environmental degradation caused by unsustainable ones. The fishery community must become more aware of the threat to the sustainability of resources on which it depends from environmental degradation caused by other sectors and become more involved in the environmental debate. Although fishermen have long been the main users of the ocean, they are being progressively displaced by other sectors, without regard to their traditional rights. The economic displacement (and, in some places, the risk of elimination) of professional fisheries as an industry is clear and demonstrated by developments in inland waters during the last decades.

Ocean enhancement

Future developments in fisheries, especially in the coastal waters and enclosed or semi-enclosed seas, will incorporate yield enhancement methods by release of artificially spawned and reared fry as well as habitat enhancement. In some areas and for some species, sea ranching is already well developed as a proven technology for increasing and sustaining yields of heavily exploited species, such as salmon or species under ecological stress like as sturgeon. These practices have far-reaching

implications for responsible fisheries and involve questions of ownership of the stock, economic returns to the stocking agency or country, impact of releases on wild genetic diversity, introduction of diseases, etc. It is also implicit from the experience in inland waters that adequate control of fishing is required to ensure that stocking yields maximum benefits. Furthermore, where several countries are releasing large numbers of juveniles into an open ocean system, the carrying capacity of the system could be exceeded thus resulting in decreasing return rates. The implication is that international agreements would be needed to decide on overall release levels and allocation of the resulting yields.

Preparation for global climate change

Although this issue may not be considered among the first policy priorities by many countries, global warming and sea-level rise will certainly affect fisheries, albeit to an unknown extent. Stocks will be affected in their localization, abundance, productivity and species composition. These effects will increase uncertainty in stock assessment and management as fishery research is not yet able to separate fishery impacts from environmental ones. As productivity changes, fishery management strategies based on catch controls will become even more inefficient than at present. Impacts on aquaculture potential will also be likely. Policy implications are not yet clear. The monitoring and forecasting components of fishery research need to be improved. Contingency plans are required but without a better forecast of the likely changes and their costs, little can be expected from Governments.

Conclusions and Policy Implications

During the last half century, coastal and fishing countries have essentially been concerned with their rights (as now contained in the provisions of the 1982 Convention). The content and outcome of international fishery policy fora since the late 1940s show that coastal countries have been mainly concerned with securing jurisdiction and access to their coastal resources. Distant water fishing nations, during the same period, have essentially tried to limit coastal countries' rights and to maintain acquired positions. In the process, all countries agreed on the need for research and management in order to achieve conservation but were unable to take the policy decisions that would have effectively ensured sustainability and stopped the spread of overfishing.

As a consequence, world fisheries are now in the same situation as the North Sea fisheries were in 1946, with most high value resources depleted and lots of related problems to solve . . . now there is nowhere else to go. In the last 20 years, the size of the world fishing fleet has grown at twice the rate of increase in catches, demonstrating a significant decrease in productivity per unit of capital invested. The operation of world fleets have been estimated to incur losses of about US$54 000 million yr^{-1} (FAO, 1993b). The cost of correcting present-day deficiencies in the fish capture sector has been estimated at US$7000–14 000 million yr^{-1} for the next 10–20 years. These approximate but high-estimates indicate that the cost of fisheries rehabilitation could be covered by the rents which would result from improved management and economic performance, which could be captured by an appropriate system of user fees. The fishing industry, in its presently poor economic state, is often not in a position to initiate the reconversion process; thus the intervention of development banks and States is necessary to pay the costs today for future benefits.

Without explicit and more effective intervention on the part of governments in the management of fisheries, the effect of an increase in demand for fish supplies will, inevitably, continue to lead to fishing further 'down the food chain' on smaller, opportunistic and short-lived prey species and juveniles of predators. These types of fisheries are highly unstable and unsustainable and, continuing with the present policies of free and open access to fisheries will only lead to further deterioration and instability of the resource base. There is already a sufficiently large number of examples of this pattern to affirm that this prediction is not theoretical but well grounded on empirical observations. The losses incurred through mismanagement are aggravated by environmental degradation, especially in the coastal zone where sectors are in conflict for scarce resources. Countries' fishery development policies have not been significantly influenced by the diagnosis and advice of biologists and economists, and the 1982 Convention, informally adopted for about a decade, has not been sufficient to ensure the required change towards sustainable fisheries.

The world population will reach 7200×10^6 in 2010. According to FAO (1993a), by then, at unchanged relative prices total demand for fish will reach 140×10^6 t, of which 110×10^6 t will be for human food and 30×10^6 t for fish meal. The supply may not be more than $115–120 \times 10^6$ t, about 100×10^6 t from capture fisheries and $15–20 \times 10^6$ t from aquaculture. This implies a deficit in production of $20–25 \times 10^6$ t which will cause price adjustments. It is difficult to forecast exactly how the world fishery system will react to this, but unless present policies are drastically changed the conditions are set for an acceleration in the degradation in the resource base.

For many developing countries, fisheries policies have four main areas of concern: maximize employment, increase production, minimize increases in price to sustain food supplies to urban centres, and increase foreign exchange earnings. The explicit or implicit policy of the past to consider fisheries as an unlimited source of employment will require change, if the fisherman's status and livelihood is to improve. Over-capacity problems must be addressed and fishing costs must be brought in line with expected revenues.

The Declaration on Sustainable Development (1992) requires that '*States should reduce and eliminate unsustainable patterns of production and consumption*'. It is revealing in this report to note that the per capita consumption in developed States is 27 kg yr^{-1} compared with the 9 kg yr^{-1} in the developing countries who, in turn, provide more than 50% of the fish entering international trade.

With fish production stagnating since the early 1980s, many developing countries' fisheries have experienced economic degradation. Commercial fisheries have been forced to fish closer to shore where residual abundance is

greater, affecting subsistence and small-scale fishermen, exacerbating their poverty. In the severely overfished Asian countries, aquaculture (particularly shrimp farming) has become central to fisheries development policies. However, the culture of 1 t of high-value shrimp and other carnivorous species requires 3 to 4 t of fishmeal for feed. Even though progress has been made to improve further efficiency in feeds, present mariculture practices lead therefore to a transfer of fish-food resources from the poor strata of developing countries' populations to the rich ones. To the extent that cultured species are often exported, this also leads to a transfer of food-fish from developing to developed countries for foreign exchange.

The development of distant water fishing and international trade in fish and fishery products was the result of overfishing of developed countries resources and the gap between supply and demand in those countries. International trade expanded further in the 1970s, following the extension of national jurisdiction. With the increased concern for conservation of marine living resources, particularly those close to the rich countries, there is a risk that production of fish as food in these countries will decrease. The shortfall in demand will be satisfied *inter alia* by increased imports from developing countries, regardless of the state of the stocks and food requirements in the latter.

The present excessive extraction rates imply that resources are underpriced. The reliance by developed countries on imports when their resources are mismanaged and overfished would suggest that fish supplies from developing countries are less costly than equivalent supplies from developed countries and, possibly, that the former are even more underpriced. It is a fact that few developing countries succeed in drawing from fishing (e.g. through fishing fees and taxes) the means to manage their fisheries. To correct this situation developing countries would, in theory, have to impose environmental fees on fish (particularly those intended for export) in order to reduce international demand for fish and finance their fisheries management.

The present situation raises, in addition to the traditional issue of local resource sustainability, the question of overall sustainability of the world fishery system. It should be clear that the sustainability of developed countries' present system which relies heavily on imports of fish, also depends on the sustainability of the sources for such supplies. The implication of this is that international fish trade may appear to be one of the causal factors of overfishing in the short term.

Following UNCED and the ratification of the 1982 Convention, the international political landscape might be evolving in a favourable direction, with stronger commitment to sustainability and wider recognition of the responsibilities attached to the right to fish. In order to successfully implement more sustainable fishery policies, with the necessary ingredients identified above, more practical guidance than is presently available is required by policy makers. At the 1991 FAO Committee on Fisheries, and at the 1992 International Conference on Responsible Fishing in Cancun, States have decided that such guidance should be provided through an International Code of Conduct for Responsible Fisheries, supported by a set of guidelines and addressing the technical, scientific, biological, environmental, socio-economic, commercial, legal and institutional aspects of fisheries. The Code will address directly UNCED's Principle 8 which requires that '*States should reduce and eliminate unsustainable patterns of production and consumption*' with all of the implications for fisheries. It will aim, by assisting those responsible for fisheries, to elaborate policies leading to effective compliance with international fishery conventions (particularly the 1982 Convention) and other legal instruments with direct relevance to fisheries and aquaculture, such as those governing land and sea-based sources of pollution; protection of the marine environment, the atmosphere and endangered species; safety of life at sea, and conditions of work and service in the fishing industry, etc. The code will cover six major thematic areas related to: fishing operations, fishery management practices, fish processing and trade, aquaculture, fisheries research, and the integration of fisheries in coastal areas management.

Coastal States and distant water fishing nations are expected to agree upon and adopt the principles of the code and to apply it, on a voluntary basis, within EEZs and on the high seas. The code may be used simply as guidelines but parts of it may be used in the elaboration of fishery laws and regulations as well as bilateral and multilateral agreements. A first draft will be available for the FAO Conference in 1995 and, depending on the outcome of the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, the code could be ready for adoption in the following 1 or 2 years.

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