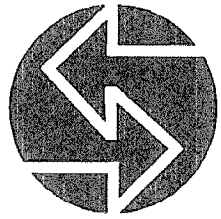


# MARINE FISHERIES AND THE LAW OF THE SEA: A DECADE OF CHANGE

## III. Current and future issues

The developments of the past decade have significant implications for the future management of fisheries and raise issues with regard to achieving increased benefits from existing resources. Many of the major challenges of the past decade will continue into the future, requiring significantly increased attention in order to prevent continued waste and conflict. Other developments are still emerging and are likely to lead to changes in various elements of fisheries, with positive outcomes in some cases and possibly negative ones in others.

### THE FUNDAMENTAL PROBLEM OF OPEN ACCESS

The single most important issue that must be resolved to deal with the current massive waste in fisheries is controlling open access. The extension of jurisdiction was a necessary, but insufficient, step in this process. Today, open access continues to exist within the common property zones of most coastal states as well as on the high seas.

The consequences of maintaining open access are extraordinarily damaging. As has been pointed out, they include the depletion of marine stocks, the dissipation of economic rents and increased conflict among users.

Conflict often occurs because of the lack of valuation of the resources. In the absence of exclusive use rights, the same stock of fish or same area of the sea can be used by different types of users. Users may be high sea fishermen from different countries, or fishermen from different villages, fishing in coastal waters; fishermen using different kinds of gear, such as trawlers and stationary gillnets or traps; they may be people with different values, such as commercial or recreational interests and fishing or mammal protection interests; or they may be groups using the environment for different purposes, such as waste disposal, coral mining and landfill. Conflicts between the different interest groups are becoming increasingly pervasive and severe.

Several studies of the amounts of rent being dissipated have been carried out on fisheries within national zones. "These estimates show that extraordinarily large economic returns are currently being wasted because of the open access condition, on the order of thousands of millions of dollars annually in resource-rich areas."[13] The losses of US$ 250 million per year in the Moroccan cephalopod fishery have already been mentioned. In the United States, the National Marine Fisheries Service has estimated that the current gross revenue from New England groundfish is about US$ 170 million. With proper management controlling capital investment in the fishery, the gross revenue could be US$ 200 million and the net revenue, which is currently dissipated, could be about US$ 130 million per year, or 65 percent of the gross revenue.

A summary of economic analyses of the amounts of potential or actual rents in Australian fisheries showed that the rents ranged from 11 to 60 percent of the gross revenues, with a weighted average of 30 percent.[14]

Some speculation can be made about the global economic waste in fisheries, based on the rough estimates of present costs and revenues and economic rents that might be produced under efficient fisheries management. As discussed in the section, Fishing costs and

[13] J.-P. Troadec and F.T. Christy, Jr. 1990. Temporarily out of stock: *a diagnosis and a strategy for international cooperation on fishery research.*

[14] D. Campbell and J. Haynes. 1990. *Resource rent in fisheries.* Canberra, Australian Bureau of Agricultural and Resource Economics.

revenues (p. 17), the current total costs in fisheries are estimated to amount to about US$ 124 000 million per year, producing a gross revenue in the order of US$ 70 000 million per year. Subsidies are presumed to cover most of this deficit. Estimates suggest that proper management of depleted stocks could increase global marine catch by about 20 million tonnes. With stock rehabilitation, gross revenues could rise to US$ 85 000 million at current prices. If the ratio of gross revenues to rents in the Australian fisheries is applied, it would mean that the annual resource rents for global fisheries would be about US$ 25 000 million per year. Removal of the subsidies of US$ 54 000 million per year would produce US$ 79 000 million in annual global net economic revenues, all of which are currently wasted. This estimate (minus the costs of management) represents the potential global economic benefits that could be derived from the removal of subsidies and the achievement of effective fisheries management.

It should be reiterated that these are rough estimates and are only intended to provide orders of magnitude. It should also be pointed out that nothing has been said about the costs of achieving these rents. These costs include the direct costs of administration, research and enforcement as well as the transaction costs of achieving the necessary adjustments in capital and labour and negotiating agreements among competitive users.

Despite their shortcomings, these estimates clearly indicate that the costs of present mismanagement in fisheries are extremely high. There is an urgent need to address the problems associated with free and open access and review alternative systems of property rights, including exclusive use rights, as are now being applied in a few countries such as Australia and New Zealand, as well as the Japanese community–based management system. It is equally urgent to begin placing appropriate values on the resources as a means for facilitating the resolution of conflicts. These interrelated steps are discussed more fully in the section on fisheries management.

## SUPPLY AND DEMAND

### Resource effects

One of the particularly important characteristics of fisheries is that supplies of most wild stocks are naturally limited. Although the population of any individual stock may fluctuate in response to natural environmental changes at any time, there is a maximum yield that can be harvested on a sustained basis. Increased fishing effort beyond that point does not increase total catch and may, in fact, lead to lower annual yields. Demand for fish products, however, continues to increase as human populations expand and income levels change. The inexorable consequence is a general rise in the real prices of fish, as has been shown. To the extent that fisheries are unmanaged, the rise in prices may even cause a contraction in supply. This would occur if increasing prices were to push fishing effort beyond the point corresponding to the MSY, reducing future fish stocks even further with increased fishing effort.

On the other hand, when fish stocks are effectively managed through systems of property rights, the higher real prices increase the value of the resource itself, with benefits accruing either to the fishermen or to the management agency. In some cases, introducing more effective management leads to increased supplies and hence reduced prices.

Most major fisheries in the world have experienced significant losses in yields due to the depletion of the stocks. The rise in real prices increases the benefits of such measures but, simultaneously, increases the difficulty of their implementing them because of the incentive it provides to invest in excessive fishing efforts.

### Supply increases

*Aquacultural markets.* Although supplies of fish are limited in general, there are certain opportunities for reducing or removing the constraints. For some species, cultivation is possible through various systems. These range from extensive systems under which the sole intervention is the planting of seeds (as in oyster farming) to highly intensive systems which require interventions in reproduction, nutrition, the gene pool and disease and environmental elements (e.g. shrimp, catfish and carp in ponds and salmon in cages).

Cultivated products can be divided into four main groups. Some production is aimed at the high-income market, primarily, although not

exclusively, in developed countries. This currently includes salmon and shrimp but there is potential for other species such as sea bass, groupers and some marine flatfish. A significant part of total aquaculture production, in quantitative terms, is made up of molluscs, including clams and oysters (which have been farmed since the days of the Roman Empire), largely consumed in high-priced markets; and cockles and mussels, which are lower priced and consumed in developing as well as developed countries. The largest group includes freshwater finfish, mostly various species of carp which are grown in small farm ponds in developing countries. By far the greatest amount is produced in China whose total aquacultural production is estimated to account for 48 percent of the global production of all aquacultural products. The fourth major group includes seaweeds and other aquatic plants.

The total estimated annual production from aquaculture (from both fresh and marine waters) is currently more than 14 million tonnes. This figure, however, is somewhat misleading with regard to supplies of food for human consumption. The estimate for molluscs includes the weight of the shell which is about four times the weight of the meat. Seaweeds and other aquatic plants make relatively small contributions to human consumption. In addition, the production of shrimp and marine finfish uses relatively large amounts of other fish as feed. With regard to freshwater finfish, its contribution to food supplies is very large in Asia and significant in Europe and North America, but of only negligible importance in Africa. It is currently of small but growing importance in Latin America.

The increase in production of shrimp and salmon has been very rapid, leading to adjustments in the market which may restrain growth in the short term. There are also some indirect effects and production problems that need to be solved: for example, disease associated with intensive culture; pollution from excess feeding; obtaining regular supplies of high-quality feed and seed; and the maintenance of genetic diversity.

For shrimp, some of these problems are having major negative effects in several developing countries. Fairly large areas of mangrove swamps have been cleared for shrimp farms. The demand for seed has led to the intensive harvest of planktonic materials (although an increasing amount of seed is now being raised in hatcheries). The demand for feed is leading to biomass fishing. These developments tend to reduce the potential supply of fish that can be used as food for domestic consumption in developing countries, particularly for the low-income consumers. These issues are forcing many developing countries to rethink their policies aimed at expanding shrimp farming.

Overall, the rise in real prices stimulates further increases in aquaculture production. The greatest contribution to future supplies is likely to come from increases in freshwater finfish culture and, to a lesser extent, from the culture of molluscs. In Asia, this will require increased efficiency in present culture practices. In Africa, efforts to develop fish farming have been less successful than anticipated. Improvements will require new approaches that take account of the indigenous social and economic constraints.

*Development of new stocks.* Demand for fish is generally limited to a few hundred thousand species of marine organisms. There are certain characteristics that are important in affecting taste preferences: size, boniness, oiliness, flesh firmness, taste and colour. There are also important supply characteristics, such as ease of capture, ease of processing and perishability. Most of the thousands of species not consumed or used by humans at present are likely to remain unused, similar to weeds in agriculture. Changes in taste preferences and demand do, however, take place and there are some possibilities for increasing total supplies by the development of stocks of unconventional species and by technological innovations permitting the capture of stocks that are inaccessible to conventional gear.

Within the past two decades, a number of stocks have been brought into production, including: Chilean jack mackerel in the high seas of the South Pacific; several stocks of oceanic squid; orange roughy from seamounts off New Zealand (currently overfished); and Antarctic krill (to a limited extent). These developments have occurred because of changes in taste preferences and technological innovations, such as large driftnets, which make it economically feasible to harvest low-density stocks.

The physical potential for development of unconventional stocks is very large, particularly from squid, Antarctic krill and mesopelagic species. Although squid, in certain regions, offer some opportunity for further economic development, it is unlikely that significant quantities of catch will be taken from krill and

*BOX 14*

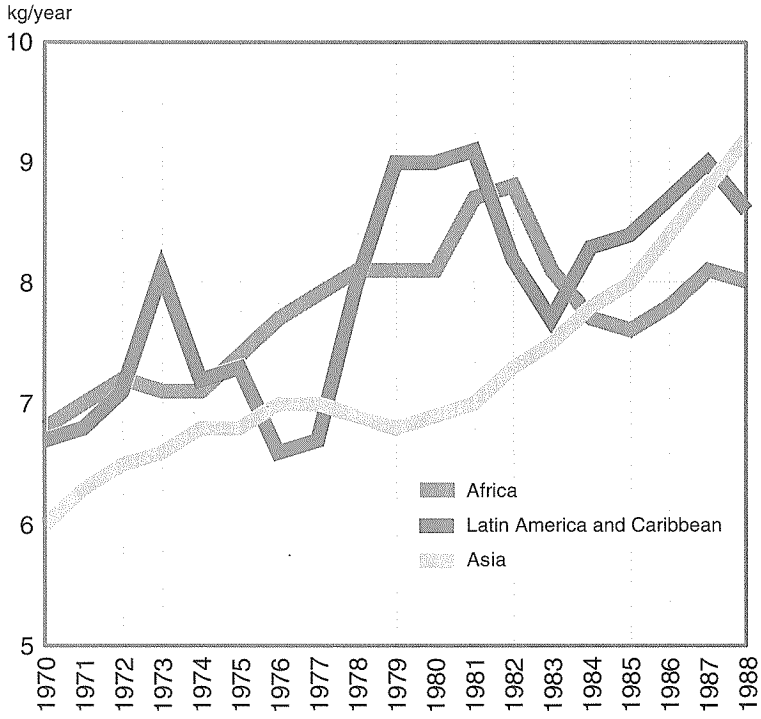
## The role of fish in food supply and nutrition

The use of fish as a source of food has increased steadily, rising from 40 million tonnes in 1970 to 70 million tonnes in 1989. Supplies for developing countries have risen more rapidly, at 4 percent per year, than those for developed states, at 1.6 percent per year.[1] Quantities available to developing countries, 36.2 million tonnes, exceed those for developed countries, which stand at 33.7 million tonnes. There are, however, considerable regional differences among developing countries. In 1989, supplies to Asian countries reached 26.4 million tonnes, more than five times those to African (4.6 million tonnes) and Latin American (3.7 million tonnes) countries. On a per caput basis, the developed countries have average supplies of 27 kg per year, as against an average of 9 kg for all developing countries. Fish as a source of food is critically important for developing countries where a large portion of the population receives most of its animal protein from fish. It is, therefore, disturbing to note some recent changes in fish supplies. Although per caput supplies rose in Asia by 33 percent between 1980 and 1988 (largely because of the burgeoning production in China), they fell by 1 percent in Africa and by 4 percent in Latin America and the Caribbean (see Fig. A).

[1] Supplies are estimated on the basis of the production of fish for food purposes from all sources (freshwater as well as marine), plus imports minus exports, and adjusted for changes in inventories.

Figure A

PER CAPUT FISH FOOD SUPPLIES
IN DEVELOPING REGIONS




*Source:* FAO

### A source of high-quality protein

Fish plays a vital role in feeding the world's population, contributing significantly to the dietary protein intake of hundreds of millions of people. On a global scale, almost 16 percent of the total average intake of animal protein was attributable to fish in 1988. Recent global statistics reveal wide variations in fish consumption, but people in developing countries are generally much more dependent on fish as a part of their daily diets than people living in the developed world. Only in a few developed countries, most notably Japan, does the population derive more than 20 percent of its total "meat" supplies from fish.

A source of high-quality protein, fish supplies 29 percent of the total animal protein in the diet of Asian populations; the contribution to the diet of Africans is also important, about 19 percent. In Latin America, intake of fish as the main source of animal protein is sharply lower at about 8 percent (Fig. B). Programmes to develop domestic consumption, increase aquacultural development and improve the diets of the rural poor are encouraging

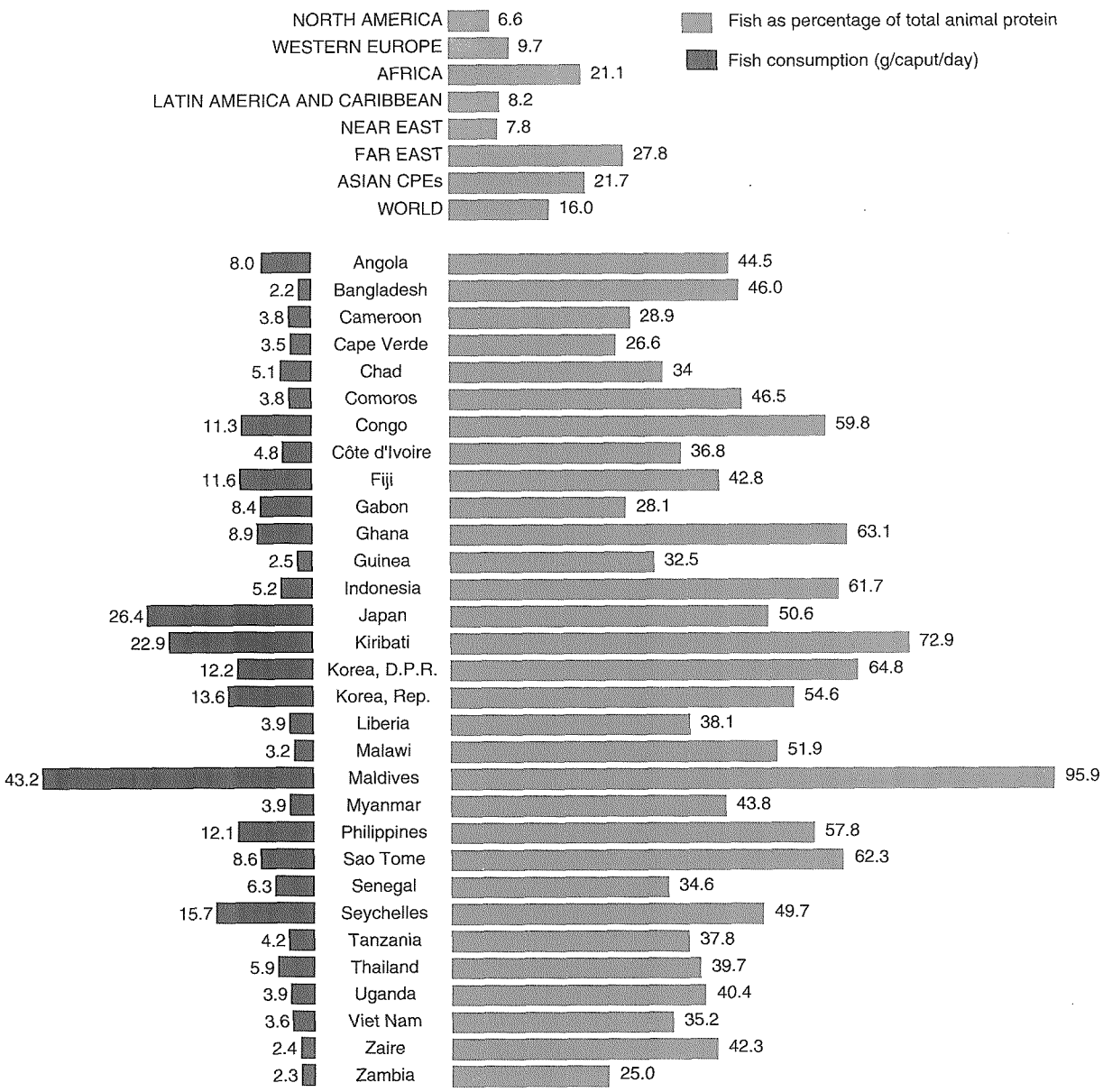
consumption of more nutritious, low-cost fish products in this region.

While overall world consumption is on the increase, fish plays a less central role in the diets of developed countries. In North America, it contributes only 6.6 percent of the total animal protein intake; in Europe and the USSR, intake is almost double at 12 percent. Demand is expected to increase in the developed countries over the next decade as the nutritive and health values of fish — especially its role in lowering blood cholesterol levels and as a low-fat and low-calorie food — are more widely promoted.

Figure B

CONTRIBUTION OF FISH TO DIET, 1987-89

(Regions and selected countries)




*Source:* FAO

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