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Fish: The tragedy of the oceans

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Abstract

In 1989, when the sea catch topped 86m tons, growth in sea fishing stopped. In 1990 and 1991, the world catch began to shrink. Experts at the Food and Agriculture Organization (FAO) now believe that the limit to sustainable landings of wild fish was exceeded decades earlier. In more and more waters, too few fish have been left in the sea to maintain spawning stocks. There are no more waters and few species that have not been explored. The world's fleets say they operate at a loss - \$22 billion in 1989, not counting capital expenditure or profit from unreported illicit catches. Almost all of the 200 fisheries monitored by the FAO are fully exploited. Governments have encouraged excess by subsidizing fishing fleets, often as a form of regional aid and in response to falling catches. In addition to overfishing, development and pollution are reducing stocks. Managing fisheries has proven difficult because many boats are kept in business by subsidies, and each boat has a powerful motive to overfish. There is a need for radical, tough regulation of the industry.

Full Text

SEA fishing grew rapidly in the decades after the second world war. Mechanised fleets increased the fishermen's catch in traditional rounds and then carried them to distant waters for more. After the catch had trebled to over 60m tonnes in only 20 years, fishing developed more slowly in the 1970s and 1980s, like the rest of the oil-shocked world economy. In 1989, when the sea catch topped 86m tonnes, the growth stopped.

In 1990 and 1991, the two most recent years for which the Food and Agriculture Organisation (FAO) has figures, the world catch began to shrink. It has not been a dramatic fall--only a few percent overall. But experts at the FAO, in common with many fisheries scientists, now believe that the limit to sustainable landings of wild fish was exceeded decades earlier. In more and more waters, too few fish have been left in the sea to maintain spawning stocks. Fishermen are living off capital, consuming the resource that should yield their catch.

When catches of the most valuable fish in northern waters, such as turbot and halibut, started to fall, fleets began instead to chase other species that had been thrown back as "trash" only a generation before--whiting spiny dogfish and others. They also fished distant waters and found massive catches of a low-value species. The FAO notes that it was these short-lived fish--such as Alaska pollack, Peruvian anchovetta and Japanese pilchard--that swelled the world catch in the 1980s. But the trend was masked because catches were measured in tonnes, not dollars.

The world's 3m or so trawlers, purse-seiners and gill-netters cannot hope for further gains of that kind. There are no more waters and few species that have not been explored. The world's fleets say they operate at a loss: \$22 billion in 1989, not counting capital expenditure or profit from unreported illicit catches.

Almost all the 200 fisheries monitored by the FAO are fully exploited. One in three is depleted or heavily over-exploited, almost all in the developed countries (see map on final page). Although fishermen still catch relatively few of the 15,000 species of fish extant, most of the remainder are expensive to catch, unappetising, or both.

New technology means that fishing is no longer limited by the captain's skills and the crew's strength. A vessel can now trawl four nets where once it set only one. With cheap nylon filament, it can set (albeit illegally) up to 40 miles (65km) of gill-nets a day. Thanks to refrigeration, mother ships can freeze and process hundreds of tonnes of fish before returning to port. Spotter planes and helicopters search out fish. Directional sonar lets captains "see" shoals of fish and even distinguish between species. Satellites help vessels lay their nets precisely where fish have schooled in the past.

The rich countries' fleets have outstripped their fishing grounds' capacities by such a long way that Iceland and the European Union could cut their fleets by 40%, Norway by two-thirds, and all three would still catch as much fish as they do today. Governments have encouraged this excess by subsidising fishing fleets, often as a form of regional aid and in response to falling catches.

MUDDYING THE WATERS

Overfishing is not the only threat to the world's fisheries, although it is the most severe. Development and pollution are also reducing stocks. According to Paul Brouha, director of the American Fisheries Society, 11m-15m salmon once spawned in the Columbia river system. Now there are only 3m, of which 2.75m come from hatcheries. So much of the river system has been dammed that only 250,000 salmon can find their way back to old spawning grounds.

According to a recent study*, three-quarters of the American catch comprises species that depend upon estuaries (often as a habitat for juveniles, which can safely feed in the allows). But estuaries are themselves vulnerable. Almost a third of the world's 5.5 billion people live within 60 kilometres of the sea, polluting inshore waters with effluent from industry and farmland. Lagoons and wetlands are filled to make land; mangrove forests are cut down; fresh water is siphoned off upstream, affecting the salinity of estuaries and the growth of young fish.

For all the damage that they cause, overfishing and pollution rarely lead to extinction (though even this is possible for a few large, slow-growing and valuable species, such as the bluefin tuna). Nor, at least for many years yet, will fish be off the menu for those who have enough money. Indeed, as the price of fish climbs and biotechnology develops, the most valuable fish will increasingly be farmed. Aquaculture yielded more than 12m tonnes in 1990, and is rising by more than 10% a year. Fin-fish make up almost 70% of the total; shellfish, a quarter; and shrimp about 6%. But intensive fish farming tends to damage coastlines. And, though the technology is developing rapidly, the FAO doubts whether farmed fish will account for more than 12% of world fish consumption by the end of the century.

It would be wrong, however, to think that "wild" fish matter only to fishermen. A shortage has other economic and social consequences. Fish prices have been rising since the early 1980s (see chart [chart omitted]). Fish is the most important source of animal protein in some countries, especially poor ones. Moreover, as overfishing spreads to poorer countries, the effects may be more severe than in the richer ones. This is partly because overfishing threatens to engulf local fisheries more rapidly, and partly because more jobs are at stake: artisanal fisheries employ 20 times as many people as the industrial fisheries that are replacing them, according to London's Panos Institute; and fishermen tend to live in places where few other jobs are available.

CUTTING NET LOSSES

It is an avoidable problem. Overfishing is waste on a grand scale. American fishery managers estimate that the United States' catch is almost half as valuable as it could be if fish stocks in federal waters were allowed to recover. The EU has said that its waters could, if properly regulated, yield a further \$2.5 billion-worth of fish a year. The FAO has estimated the annual loss worldwide at \$15 billion-30 billion.

Such figures have strengthened the arguments of resource managers and fisheries economists. But until 1976 most world fish stocks were open to all-comers, making conservation almost impossible. Then, an international agreement

extended some aspects of jurisdiction from 12 to 200 nautical miles offshore, to create areas now known as "exclusive economic zones".

Because most commercially attractive fish live near the shore, the 1976 agreement brought many fisheries under the control of the nearest country. Marine biologists were then able to set quotas based on the maximum catch that would leave enough fish to spawn next year; and managers could try to limit fishing by licensing boats, restricting fishing times and regulating fishing gear--such as the size of boats and of nets' mesh.

And yet, even so, after 18 years of management, overfishing in developed-country waters is worse than ever. Too often, politicians have been reluctant to conserve stocks, for fear of reducing fishermen's income; and managers have been unwilling to follow scientists' advice. When countries have banned unregulated foreign fleets from their exclusive zones, domestic fleets have expanded to take their place.

The catch in developed countries has fallen back to the levels of the early 1970s. Catches of Atlantic cod off the north-west American coast at 800,000 tonnes in 1968 and collapsed in the 1970s. In 1992 managers recommended a catch of less than 50,000 tonnes; Canada closed the fishery altogether. In the North Sea, the spawning cod stock fell to 66,000 tonnes in 1990, barely a third of the FAO's safe minimum.

In some waters, management has merely brought the foolishness of overfishing into the open. In 1975 the Alaskan fleet enjoyed a season for Pacific halibut lasting 120 days. The fleet can now take the year's entire catch in one or two 24-hour "derbys". If fishing went on longer, there would be too few halibut to spawn future catches. (The Alaskan herring-roe fishery is open for a mere 40 minutes a year.) Boats queue to sell their catch to processors who gut and freeze the year's supply as quickly as they can.

Having failed in Europe and America, fisheries management threatens to fail in developing countries too. A few, such as Namibia, are introducing sensible management early on, even before the fleet is overcapitalised. More, however, are repeating the mistakes made in the rich countries by building up fleets without regard to the size of their fishing stocks, sometimes with subsidies from development agencies.

Fishermen are not happy with overfishing, but see no alternative. Few have any faith in the government managers who have curbed their independence but have not delivered the plenty that was promised. They (correctly) see that fisheries science is inexact, but (wrongly) deduce that the scientists' estimates of a safe catch are always too low. Even if they trusted the fisheries managers, many fishermen would worry more about paying the mortgages on their boats.

So conservation usually seems to happen only when it is too late--when there is no doubt that stocks have collapsed. To assume that stocks can always recover would be a mistake: it is quite possible that the near-elimination of a species can change the ecology of a fishing ground permanently. And yet, so far, most stocks have shown a remarkable recovery when the fishing stops. During the 1970s, for example, the stock of North Sea herring collapsed from several million tonnes to 52,000 tonnes in 1977. Fishing was banned temporarily, allowing stock to rise back to 1.3m tonnes and the catch to 646,000 tonnes.

THE HUNTER'S LOGIC

Managing fisheries has proved hard not because fishermen are foolish, but because many boats are kept in business by subsidies, and each boat has a powerful motive to overfish. Like hunters, fishermen will try and take what they can when they can, before anyone else catches it. A fisherman who tries to conserve the stock by leaving fish in the sea has no reason for thinking that he will gain by his investment: the fish he has spared, or their offspring, will probably be caught by someone else. On the contrary, if he catches more fish now he will be the richer for it. Although there will be fewer fish next year, the cost will not be borne by him alone, but spread over the entire fleet. Without regulation, in other words, fishermen have an incentive to overfish.

With regulation, though, they have an incentive to twist the rules or to cheat. Fisheries scientists, looking at the Stocks, the species and weather, can predict the number of fish that can be caught safely that year, but this is no good if their advice is ignored. Enforcement is expensive and it is hard to stop landing of so-called "black" fish.

Although nobody can be sure of the size of the illegal catch, some estimates suggest it is 30-50% of the reported catch (a figure which helps explain why much of the world fleet continues operating, officially, at a loss).

The unintended effects of regulation can be severe. A boat licensed to catch only a limited amount of a particular species has an incentive to throw back any fish that it does not find valuable--even fish that might have some value to other fishermen. Poor specimens of the target species are thrown back, because the fishermen want to fill their quotas with the highest-quality fish they can find. The by-catch of non-target species is enormous. Gill-nets in the north Pacific catch 200 unintended species--40% of the total catch weight. One study estimates the annual by-catch of finfish in the world's shrimp trawls at 8.2m-16m tonnes.

If regulation is to work, it must be supported by effective surveillance and heavy penalties, says John Beddington of Imperial College, London, who runs the Fisheries Management Research Programme for Britain's Overseas Development Administration. Governments that have both those weapons can pay for administration by charging large licence fees to reflect the difference between the value of fishing inside and outside the licensed area.

Mr Beddington's group helps to run the fisheries around the Chagos archipelago in the Indian Ocean when an unlicensed fishing boat was fined £1.5m (\$2.25m) recently, revenue from licence fees promptly shot up. It has also helped the government of the Falklands to install a licensing regime. After howls of protest from countries that had been fishing the waters cheaply for years, fisheries now provide 50-70% of the islands' total revenue.

Such policies are much easier to introduce if the fishing industry is foreign. Countries with powerful and overcapitalised domestic fishing industries need a different approach. New Zealand has tried to encourage its fishing industry to take a long-term view, by sharing out quotas in the catch and then encouraging fishing companies to trade their quotas with each other. If a fisherman regards a certain stock of fish as his property, the theory runs, he will want to protect and conserve it, just as a farmer would try to improve the productivity of his land. The quotas can be bought and sold, so fishermen leaving fishing will have something to show for it. This is one way to help reduce today's massive overcapacity.

New Zealand's scheme, introduced in 1982 and expanded in 1986, has not been without its problems. There were long arguments over the size of each fisherman's quota. Then, quotas set in terms of an absolute tonnage of fish proved too high to be sustainable. The overestimate was most serious in the case of the orange roughy, a fish discovered only in the 1970s. Once it had been established that this oddity took 20-30 years to reach maturity and lived for up to 150 years, it was clear that its quota had been set too high. Rather than buy out the fishermen, the government changed the rules and set quotas as a proportion of future catches.

These unforeseen changes made fishermen slow to trust the scheme. According to Philip Major, of New Zealand's Ministry of Agriculture, it was six years from the expansion of the scheme in 1986 to the point at which behaviour started to change. Now, Mr Major can point to several small signs that fishermen are starting to act like owners and not hunters. They are voluntarily helping to finance the policing of valuable inshore shell fisheries, for example. Trawlers are paying more attention to the quality of their fish, ensuring that those at the bottom of the nets are not accidentally pulped and so squeezing more revenue from each catch. In 1993 fishermen were offered the chance to catch an extra 50,000 tonnes of hoki. But the market is glutted. So the industry refused, hoping to catch more hoki in future years. "It's the first group of fishermen I've ever encountered who turned down the chance to take more fish," says Mr Major.

The most elaborate scheme to regulate fisheries was unveiled in January by the Australian state of New South Wales. The state proposed to give fishermen shares (which would be registered, like land titles) in each fishery, distributed as a proportion of their past catch. Each year, owners would hand back 2.5% of their shares to the government, which would sell them and keep the proceeds, to reinforce the concept that the fisheries remained a communal resource even though the right to fish was owned by the individual fishermen.

Under the Australian scheme, fishermen should be able to sell all or part of a year's fishing rights easily and cheaply. That way, they could buy quota from other boats to cover fish in their catch of the wrong quality or species, not just throw the fish away.

One of the terms of the shares would be the acceptance of restrictions, set for ten years, on fishing inputs, such as the

One of the terms of the shares would be the accepting of restrictions, set for ten years, on fishing inputs, such as the kinds of nets and boats fishermen could use. Penalties for cheating would be steep. If the rules were changed early, fishermen could fish under the old rules up to the end of the ten-year period already under way, or accept the new rules for a new ten-year share. The aim is to ensure that the scheme can evolve in tandem with scientific understanding of different fisheries; but also to make changes in the rules gradual and predictable, so that they do not undermine faith in the system.

The fisheries of New Zealand and New South Wales are tiny, compared with those of the north Atlantic or north-west Pacific. That makes experiments easier to design and police. But elective regulation will always be difficult, expensive, and resisted more often than not by fishermen themselves. Schemes to trade quotas will spread only slowly even to fisheries that are already over-exploited, and will work only when they command the confidence of the fishermen. In the developing world, it is hard to imagine that investment in fisheries management will match that in fleet capacity.

If the FAO is right, fish will become scarcer and dearer over the coming years. High prices will curb consumption and stimulate fish farming, but not enough to deter overfishing so long as subsidies remain in place. Until now, only the dramatic collapse of local stocks has persuaded individual groups of fishermen and individual governments of the need for radical, tough regulation. That harsh lesson has had to be learned afresh, time and time again. While some fishermen realise that the age of the unbounded ocean is already over, and that fisheries must be managed, the question is how to persuade all fishermen, and all governments, of the urgency of that need.

* Global Marine Biological Diversity", edited by Elliott Norse, Island Press, 1993.

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