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Short note

Introductory remarks on threats to commercial fish stocks

Alasdair D. McINTYRE

University of Aberdeen, Scotland , United Kingdom

This introduction paper makes some general points about threats to fish stocks in global terms, aiming to provide a background, and an introduction to the workshop discussion on the Adriatic.

The two most significant threats to fish fauna are first, excessive human exploitation, and second, pollution. In both cases the problems stem from the inability of human beings to manage their affairs properly, and in both cases the solution is largely in sight, if only we had the strength of will to grasp it. It is interesting that these two threats divide the millennium which is just about to finish into two more or less equal parts, at least with respect to the times that we became aware of them and began to take them seriously as problems to be dealt with. The overfishing problem began to become an issue about the year 1900, while marine pollution came into focus in the 1950s.

Key words: Fish threats, overfishing, pollution

OVERFISHING

If we look first at overfishing, it is salutary to remember that we awoke to the possible dangers of this almost exactly a century ago. We did know, of course, much earlier, that Man's harvesting activities could damage marine organisms when focused on species which could be hunted as individuals, such as sea otters, fur seals and whales. The great whales were hunted down and brought close to extinction from the time that the right whale was first targeted by the Basques in the Bay of Biscay early in the 12th Century. The speed with which damage could be done is well illustrated by the story of the Stellers sea cow, the largest herbivorous marine mammal, which was first discovered in the Bering Sea in 1768 and became extinct, after intensive exploitation, only 27 years later (REYNOLDS and ODELL, 1991). But it was a long time after the damage to marine mammals was recognised that we began to realise that fish stocks could also be at risk. This first came home to us at around the beginning of the present century, when we saw that initially flat fish stocks in highly fished areas like the North Sea were declining, then other demersal fisheries were seen to be diminishing, and it was widely accepted that fishing pressure must be to blame.

Since these early days the threats from excessive fishing have intensified, with an increased demand for the product, supplied by the continuous advance of technology. Better ships, better gear, and particularly better means of finding shoals by acoustic equipment, made it difficult for fish to escape capture. Indeed, some of the recent disasters, such as the collapse of the northern cod stocks off Canada, can be partly explained by our failure to appreciate just how efficient fishermen now are. We did not realise, until it was too late, that the continuing high catch per unit of effort by the Canadian fleet did not mean that the stocks were still high, but rather was due to the ability of the fishermen to detect and sweep up every last aggregation of cod, and that this masked the decline of the stock.

The irony about the overfishing threat to fish is that we do now fully recognise it, and know exactly how to deal with it. The solution is simply to kill less fish, but the difficulty is how to introduce and enforce the required measures. We now have enough knowledge of the biology of fish and the dynamics of stocks to produce sophisticated population models, and these, together with the lessons learned about the activities of the fleet, should enable us to provide adequate advice on the biological and perhaps even the economic aspect of fisheries management. Unfortunately, things have gone too far to make the application of remedial measures a straightforward administrative procedure. Most fisheries round the world are over-capitalised, with too many vessels in the industry (MACE, 1996). Further, there is often conflict between the offshore industrialised and the inshore artisanal fleets, and also within these groups, those who use fixed gear such as pots or lines may be at odds with those who tow nets. But even if these matters could be resolved, the basic action required to protect the stocks is still simply to reduce fishing mortality, which means that any adequate management scheme would require fishermen at best to cut their effort and at worst to go out of business. This then becomes a political issue, and politicians are notorious for their unwillingness to upset their voters, so the crucial decisions are usually fudged, fishing is allowed to go on at too high a level, and the stocks continue to decline.

So how does all this relate to the present Workshop? A recent study from the FAO (CADDY *et al,* 1995) suggests that the pelagic productivity in the Adriatic has been among the highest in the Mediterranean, with landings of demersal fish and shellfish not far behind. This is because the Adriatic consists of a very extensive continental shelf, with a trawlable bottom of mud and sand, subject to strong nutrient input from rivers, from agriculture and industry and, in some areas, from dense coastal human populations. In addition, there are periodic nutrient inputs from the Mediterranean proper. These conditions, as long as the nutrient input is not excessive, lead to high productivity of natural resources, including among invertebrates, clams, mussels and Norway lobsters, and such fish species as sardine, anchovy, hake and mullet. In the last few decades landings have fluctuated between 170 and roughly 300 thousand tonnes. There was something of a peak in 1983 but now here, as in most other places, the demersal stocks are fully or over exploited, as shown by the small size of the individuals caught. The future of the small pelagics, which are always variable, is far from certain.

Until recently although there have been many biological investigations in the Mediterranean, little research was done there specifically to support the management of fish populations. However, the General Fisheries Council for the Mediterranean does cover the whole region, and as it progressively begins to grapple with management, helped by the establishment of sub-regional Expert Consultations on stock assessment, the groundwork for control is being laid, although the reaching of agreement is not made easier by the need to interact with other bodies, such as the EU which has an involvement in the Adriatic through Italy. A major problem is that of obtaining adequate statistics, and that is made worse because of the large number of small fishing vessels operating, for which it is notoriously difficult to secure accurate figures. And even when statistics are available for individual species, it is now widely recognised that adequate stock management is difficult on a single species basis. A healthy fishery depends on a balanced ecosystem, and this takes us on to the second aspect of fish protection – pollution.

POLLUTION

At the beginning I suggested that pollution issues became apparent only in the latter half of the 20th century. Of course, long before that, pollution had been a serious issue in terrestrial and freshwater habitats, but just as in the fisheries context the sea had for a time been seen as inviolable in the context of human activities, so, when the input of human wastes was considered, the same thought process came into play,

and perhaps even more strongly. It was held that the dilution and dispersion offered by the oceans would take care of anything we could discharge, and we could never alter the chemical composition of the sea.

But events in the middle of the present century showed just how wrong we were (GESAMP, 1990). In the 1950s the fallout from nuclear weapon-testing in the atmosphere contaminated the surface waters of the world's oceans with artificial radionuclides, and the effluent from a factory in the Japanese town of Minamata killed more than forty people from mercury poisoning. Although the Minamata incident was on a local scale compared with the radioactive fallout, it did highlight the global problem of metal contamination of seafood. At about the same time, synthetic organic compounds, including pesticides and industrial chemicals, were detected in all the marine environmental compartments, water, sediments and marine organisms, confirming that the sea could be altered by human activities. Then, in the 1960s came the introduction of the supertanker , and after the wreck of the *TORREY CANYON* in 1967, concern for oil pollution in the oceans, which up to that time had been focused on operational discharges of oily water from ships, was transferred to spills from accidents. If this was not enough, the increasing use of synthetic materials resulted in significant deterioration of marine areas from the accumulation of plastic waste.

The outcome of all this was that from the 1950's onwards, there was great public awareness of the potential damage to marine ecosystems from a wide range of pollutants. However, when we come to fish, the impacts have to be evaluated carefully. In general the effects on fish as individuals, are very much less than might have been expected. Fish can detect and swim away from oil spills, they are able to cope with quite high concentrations of metals, the present levels of radionuclides do not seem to damage them, and synthetic organics, although probably of concern for marine mammals, are not usually high enough to impact fish. It is the indirect effects of human activities that are likely to be more dangerous, and in particular, the alteration or destruction of habitats, which increasingly occurs in coastal areas where nursery grounds are located. In addition, there is the more subtle and long-term effect of pollutants through the food chain, when the overall ecology of an area is altered, producing changes which can ultimately impact on the top predators. Finally, there is the effect on fisheries, as distinct from fish themselves through sub-lethal contamination. Accumulation of contaminants in the edible tissues of fish can make them unsuitable for the market, either because the flesh is toxic to the human consumer, or because the flavour is affected. To that extent, fisheries can be much more vulnerable than fish.

Having looked at pollution and fish generally, we may now turn to the Adriatic. Most of the polluting inputs are from the land, and it is the coastal zones which are mainly at risk. In particular, those which are bordered by highly populated areas with industrial or agricultural activities, and which are not regularly flushed with open ocean water, are likely to be subject to increased levels of nutrients, which in extreme cases can cause deoxygenation of the water, fish kills and the production of phytoplankton sludge which clogs nets and accumulates on beaches. GESAMP (1990), in its second report on the State of the Marine Environment, pointed out that it should be possible to recognise such areas and forecast the problems, by simply looking at maps and charts, and it had no difficulty in naming the Adriatic as being particularly vulnerable. This unfortunately is all too true. The Adriatic, particularly the inner part, is now a much quoted case history of the adverse effects of eutrophication, with damage to fisheries and tourism, and of course also the ecology in general.

The Adriatic faces all the well-known problems of overfishing and pollution, but this is not new. We know what the causes are and we know the technical solutions. The traditional reply is to call for further research. Of course additional research will produce a better understanding of the natural environment, and contin-

uous monitoring is essential if we are to keep aware of the changes in nature and of what needs to be done. But the real difficulty is to persuade human beings to work together to take the required action. That is the challenge, and once recognised, it should be possible to address it.

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Alasdair D. McINTYRE

Sveučilište u Aberdeenu, Škotska, Ujedinjeno kraljevstvo

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