Biodiversity IN Development

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Fish and biodiversity

Global fisheries are commercially extremely important for developing countries, who are the chief global exporters. However, the role of fish in supporting the livelihoods of rural communities is also important. Small-scale exploitation of a wide-range of species provides crucial sources of protein, fats, oils and vitamins, as well as a resource in times of hardship. However, these resources are under threat from a range of pressures, from over-fishing to pollution of waterways.

Richness in the water

Some 75% of the earth is covered with water. Living in this water, there are around 28,000 recorded species of fish, 40% of which are freshwater. Some 25% of all marine fish species are associated with coral reefs: the Indo Malay archipelago for example contains over 2,000 species. Freshwater systems can be equally diverse: the Amazon basin has over 1,300 species, whilst old, deep lakes such as Lake Tanganyika and Lake Baikal each have more than 200. Other ecosystems such as mangroves are important in providing shelter for the young of many species.

Diverse catches in Lake Tanganyika

Lake Tanganyika, in the rift valley of East Africa, is home to 7 million people. The lake has more than 240 fish species, most of them endemic, and supports a fishery which can produce up to 100,000 mt per year. The bulk of this fishery is commercial and is based on only six species, comprising two small sardines which form the bulk of the catch, and their predators, four species of perch. By contrast, the artisanal and subsistence fisheries carried out by communities around the lake have over 100 species in their catches. Artisanal fishing is carried out using a variety of equipment in varied habitats along the rocky and sandy shoreline, where biodiversity in the lake tends to be concentrated.

A resource for people

Species caught are often small, but are an important source of protein, oils, vitamins and minerals in many developing countries. Some 60% of animal protein in Indonesia and 50% in Ghana is reported to come from fish. Over 13 million people on the floodplains of Bangladesh are directly or indirectly involved in fishing at some point in the year, and the vast majority of the population, over 114 million people, will eat fish if they have access to it. In Bangladesh most fish will be consumed, no matter how small; one such fish – the *mola* – has been shown to have very high levels of vitamin A.

Much of the fishing which goes on across all the major river basins in the developing world is largely unrecorded and therefore 'invisible'. This is because the fish do not enter the market place, and the fishing is carried out as a small-scale artisanal activity, often part-time or informal, particularly by women and children. It is frequently important to the poorest sections of communities, including landless people, and often becomes the default liveli-

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It is estimated that inland waters produce at least 10 million mt of fish/year, often by artisanal and small-scale fishers.

hood, with the variety of species used spreading the risk. This food security function of fish biodiversity is an undervalued aspect of natural capital.

A resource for industry

Over the last two decades world fish production for capture fisheries has been relatively stable. It was most recently estimated at 94.6 million tonnes of which 7.8 million are recorded inland catches. At present, some 44% of global marine stocks are fully exploited, 25% are over fished, whilst 31% may allow some further exploitation. Modest increases of 20-25% may be achieved if proper management measures are more widely implemented. Of the global catch 25% is estimated to be taken by artisanal fisheries and 40% of fish are for home consumption.

Commercial maritime fleets tend to be very targeted in their choice of fish. Just six species: anchoveta, Alaska pollock, Chilean jack mackerel, Atlantic herring, chub mackerel, and capelin account for 25% of total capture fish production. Commercial fisheries tend to have a specific effect on certain species, distorting the relative frequency within the ecological community. For instance, the upsurge in trigger fish in the Eastern Atlantic during the 70s and 80s, at the time of massive exploitation of small pelagic species, may have been a dramatic example of nature filling a vacuum left by fishing.

There is also the considerable problem of the discard of non-target species (the by-catch), usually dead, back into the water. This is particularly a problem in shrimp boats which have limited hold capacity and therefore tend to discard most fish species caught. It is suspected that discards might amount to an equivalent of some 25% of world capture fish production and includes a wide range of species.

Aquaculture is one way of augmenting fish production. Global production by aquaculture has been increasing year by year and now stands at 26.4 million tonnes or 26% of total fish production. This is derived, however, from only 55 marine species and 96 freshwater species of fish, with the majority coming from a few carp and tilapia species. Escapes of both exotic species or genetically selected strains are always a potential threat to local biodiversity.

Causes of biodiversity loss

Over-exploitation has a major impact on biodiversity leading to impoverishment of stocks of target species. This can have knock-on effects to other aspects of the marine ecosystem, including its productive capacities. There is a need for conservation regulations and incentives for responsible fishing, to maintain stocks, biodiversity and the environment. However, fisheries are an open access and mobile resource, which makes the definition and enforcement of limits problematic. This is exacerbated by a lack of accurate information on which to base regulation and international fishing agreements which can contribute to over-fishing.

Problems are compounded by the commercial success of fisheries, especially in developing countries. For example, the ACP share of the world trade has risen from Euro 309 million in 1986 to Euro 946 million in 1996. 60% of the global catch is taken from waters in the South, and 40% of the catch enters international trade. Distant water fleets of developed countries contribute greatly to catches off LDCs, accounting for example, for 45% of the catches off West Africa. In addition to the impacts on fish stocks and the marine environment, this has often led to conflict with coastal artisanal livelihoods.

For inland fisheries, the main conflicts come from other sectors, such as agriculture, water abstraction and hydro-power. Increased use of water resources is growing; more than 60% of the water flow from the Ganges is used for irrigation and other purposes, whilst over 40% of the floodplain in Bangladesh is empoldered for farming and 85% of the Parana is regulated for hydro-power. Pollution increasingly affects ecosystems and habitats important for fish, and can also directly affect stocks.

Genetic diversity can be at risk in cultured fish partly due to the small gene pool that the parental broodstock represents compared to the wild population. Selective breeding of carp strains has been going on for centuries in China, whilst most recently programmes of breeding and selecting beneficial traits from a number of Nile tilapia strains produced the GIFT (Genetically Improved Farmed Tilapia) which has been widely distributed to small-scale fish farmers in developing countries.

Wider problems can arise if cultured strains escape into the wild, which they inevitably do. For example, monosex hybrid Nile Tilapia escaped into the wild in Israel, where they contaminated the wildstock and diluted the ability to produce the all male hybrids that made them valuable to fish farmers. This trait had to be virtually recreated in the laboratory.

There also emerges the issue of fish as genetically modified organisms (GMOs). It has been proved possible, for example, to insert the DNA for genes, such as that for the growth promoting hormone or cold tolerance, into a fish species to give improved performance. If selective breeding and GM fish are to play a useful role with secure biodiversity, meticulous record keeping and tight protocols are essential.

This is particularly true where the cultured species is an exotic to the region. The intentional introduction of exotic species has been a common practice but with unpredictable results as, for example, the Nile perch in Lake Victoria. There does need to be a precautionary element and follow-up monitoring should be an essential part of the process.

Policy framework

The protection of aquatic biodiversity is subject to overarching agreements on biodiversity, including the 1992 Rio Declaration on Environment and Agenda 21. More specifically, diversity in aquatic systems is the subject of:

- UN Convention of the Law of the Sea, 1982;
- Ramsar Convention, dealing with vulnerable wetlands;
- Jakarta Mandate on Marine and Coastal Biological Diversity of 1995, which is a global concensus on the importance of marine and coastal diversity.

Biodiversity is incidentally the target of measures to conserve fish stocks through fisheries regulations and conventions, most prominently in:

- Convention on the Conservation and Management of Straddling Fish Stocks and

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In developing countries, biodiversity is a grass-roots issue, and people must, therefore, be involved in management measures and biodiversity must be an element in the development of community and co-management approaches, with national or regional institutions.

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Highly Migratory Fish Stocks;
- FAO Code of Conduct for Responsible Fishing, formulated in 1995. The Code of Practice is the most all-embracing attempt to codify how fisheries can become sustainable. It provides protocols for open water capture fisheries, aquaculture, post harvest activities, trade, zonal management and research. It is a voluntary code; nevertheless most countries, including the EU, have agreed to observe it.

Conflicts are arising within the WTO agreements, although the WTO has yet to turn its attention to fishing as such.

Conclusions

The importance of artisanal fisheries in food security needs to be given higher priority in development policy. This means addressing the causes of its loss (i.e. examining the policies of other sectors for impacts on fish-based livelihoods) and introducing conservation and sustainable use measures in habitats important for fisheries. Management of a fishery or maintenance of biodiversity can often only be considered in more holistic terms, through coastal zone or basin management or with reference to the ecosystem as a whole.

Natural ways of increasing stock can be encouraged through habitat improvement or restoration in such a way as to encourage spawning or development of the young. This can also include protected areas to protect spawning and enhance recruitment. There is recent evidence of the importance of the role of marine protected areas, in allowing fish stocks to regenerate or maintain viable and productive populations. The questions governing the role of genetic diversity in aquaculture through in-breeding, selective breeding and GM fish need to be resolved so that they will not be an impediment to the use of these techniques in the development process or as an environmental hazard. Protocols on the introduction of exotic species should be observed.

The management of biodiversity and of fisheries themselves relies upon possession of accurate information, and developing countries need access to the best available at all institutional levels: community, national and regional. This is where the capacity-building of informational, education and research capacities of developing countries is of particular importance.

In protecting fisheries and for the pursuance of aquaculture, the FAO Code of Conduct should be adhered to and fishing nations should play a more dynamic role in the assessment of the stocks they have access to and should help enhance the capacity of developing countries to implement the code.

Further information

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- reference to other Biodiversity Briefs is denoted as (see BB#).

Website

All Biodiversity Development Project (BDP) documents can be found on the website: http://europa.eu.int/comm/development/sector/environment