

Lack of information on inshore fisheries

Most Pacific countries have some estimate of commercial fisheries production but there is usually very little information collected on subsistence fisheries production. The development of the commercial fishing industry, and the collection of information to support commercial fisheries management, has been the main priority of both national governments and outside funding agencies.

In the early stages of the development of a fishery, whether it be subsistence, artisanal or commercial, each increase in the amount of fishing effort produces a corresponding increase in the annual catch or yield. At this stage catch rates (catch per unit of fishing effort, or CPUE) will be high, encouraging more people to enter the fishery. As the amount of fishing effort grows the resulting increase in yield will not be as great and mean catch rates will decrease. If fishing effort continues to increase then the adult stock may be reduced to the extent that insufficient young fish are produced to maintain the fish stock. Continued excessive fishing will cause fish yields to decrease, on the average, year after year.

Reductions in fish stocks are therefore indicated by lower catches per unit of effort. Catch and effort information are the basic data requirements for monitoring the "health" of a fishery. Other indications of over-fishing can include changes in the size structure of catches, changes in the catch composition and a shift of fishing effort to more distant grounds.

In most temperate-zone, developed-country fisheries, mathematical models are used by a centralised administrative authority to make

decisions about management strategies and the regulation of fishing pressure. The collection and use of this type of information can be extremely difficult and costly for Pacific Island countries and territories with limited budgets and fisheries staff. This is compounded by the difficulty in dealing with a fishery that can involve a wide range of fish stocks and species, a variety of different harvest methods, many fishers per unit of catch and a large number of distribution channels.

If government fisheries agencies recognise that the key to the successful management of inshore marine resources lies in the hands of the fishing communities who harvest those resources, they can take the first step of encouraging and motivating those communities. A side benefit of fisheries staff working closely with village fishing communities is that the collection of scientific data on subsistence fisheries is greatly facilitated by community involvement. Fishing communities can also provide much local or indigenous knowledge to supplement scientific information.

A trial run in Samoa involved village high-school students keeping a "weekly fishing log" of all fishing activities (fishing methods, effort and catches) in their own household or extended family. A surprising amount of information, and even estimates of sustainable yield by area, may be gained from such extensive surveys on subsistence fisheries. Where data are collected from different areas with similar ecological characteristics it may be possible to apply a surplus yield model (over area rather than time) not only to provide an approximate estimate of the average sustainable catch, but also to indicate villages where resources are presently under pressure (King, 1995).

Declining fish catches

Despite a lack of hard data in most Pacific Island countries, it is agreed that the coastal inshore and reef areas are heavily exploited and, in many cases, overexploited. This is especially the case in or near the main urban communities. Surveys from some Pacific countries and territories indicate a reduction in landings of inshore species (Horsman & Mulipola, 1995; Saucerman & Kinsolving, 1995; Dalzell et al., 1996).

Reductions in total inshore fish landings in a country may be caused by less people going fishing, or by there being less fish to catch. Lifestyle changes may mean that in some areas less people are going fishing, due to loss of traditional culture, increased involvement in the formal employment sector and the availability of cheap, convenient sources of protein such as tinned fish and mutton flaps. However, most fisheries agencies and fishing communities acknowledge that catch rates of fish and shellfish from the lagoons and inshore reefs of many areas have been declining for a number of years.

Reasons for the decline in fish stocks can include overexploitation, the use of destructive fishing methods and environmental disturbances. Overexploitation has resulted from a combination of factors including increasing population sizes, and the use of overly efficient, and sometimes destructive, fishing methods. The use of modern materials such as chicken wire for fence traps and monofilament nylon for gill nets, for example, has made fishing effort more effective. In some cases, modest developments such as the availability of underwater torches, which allow the spearing of fish resting under corals at night, have resulted in a dramatic increase in fishing efficiency.

Some fishing methods are considered to be destructive because they damage the environment or are non-selective in what they kill. Damaging the environment in which a fish or animal lives reduces the quality of the marine environment and makes it unavailable for further life, or reproduction, for a long time. Destructive fishing methods also tend to kill everything, including coral polyps, very small fish and shellfish, as well as the food of the target species.

Destructive fishing methods include the use of explosives and chemicals such as bleaching agents, as well as traditional plant and animal poisons. Fish drives and some collecting activities may involve damage to corals, either directly as a result of breaking or overturning coral to catch sheltering fish, or indirectly through the impact of many people moving over the reef. Some traditional destructive fishing practices have only become problematical as a result of increasing population sizes; in the past the marine environment was able to sustain occasional, localised damage because the frequency of the activity was low and fewer people were involved.

In some countries, the use of explosives and poisons to disable and capture fish represents a serious threat to marine ecosystems and the long-term viability of fisheries. These destructive fishing methods include the use of toxic plants, commercially available poisons such as bleaches (Sodium hypochlorite), insecticides, and explosives. Poisonous plant material may be derived from the roots of the climbing vine, *Derris elliptica*, and the nut of the coastal tree, *Barringtonia asiatica*, which are ground into a paste and wrapped in small parcels made of leaves; fishers drive fish into the shelter of a pre-selected coral head where two or three parcels of poisonous material are placed. More seriously, commercial poisons, including bleaches,

are poured into pools isolated at low tide to capture small coral fish. Explosives are either thrown from a canoe into a school of fish such as mullet, or set on coral where fish have been encouraged to gather by setting bait. Explosives and severe poisons are many times more damaging to small animals, such as fish larvae and coral polyps, than they are to large fish. Destroyed coral reefs result in low fish production, and may not recover for over 20 years.

Environmental disturbances have resulted from not only natural events such as cyclones and storms but also from human activities. These activities include the destruction of nursery areas (including mangrove areas) by road construction and land reclamation. Corals are collected for sale as souvenirs and coral blocks are used for building. Harbour dredging and coastal building projects often release silt into the water, and this blocks off sunlight or smothers coral. Poor land management practices have resulted in erosion and the siltation of lagoons. Environmental disturbances and habitat destruction have been linked to an increased incidence of ciguatera, a form of poisoning caused by eating affected fish, and an increase in outbreaks of the crown-of-thorns starfish.

Lack of government support

In many countries subsistence and artisanal fisheries have been seen as steps on the way to the development of a commercial fisheries sector rather than important contributors to the economy and the well being of the community in themselves. There has been a lack of government support for small-scale fishing communities and the problems they face.

Government responses to falling subsistence catches usually involve setting up public awareness programmes and enacting national laws to

protect fish stocks. For a number of reasons these actions are rarely successful. National regulations rely on government enforcement and if that enforcement is poorly funded or stopped, then compliance with the regulation also stops. Enforcement from the national government level is also very difficult in communities that operate under their own traditional governing structure. A lack of community "ownership" is another reason government-imposed actions often fail – the community is given no ownership of either the resource or the problem and therefore feels no responsibility or accountability.

Government fisheries agencies have traditionally assumed responsibility for directing community actions and they may be reluctant to encourage village communities to take over that responsibility. However, experience suggests that a government agency promoting community management gains both public support and respect (see Chapter 6).