TECHNICAL PAPERS

7. ROLE OF SCIENTIFIC ADVICE ON OPERATIONALIZATION AND IMPLEMENTATION OF THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES

by John Fitzpatrick, FAO Consultant

Article 7 of the Code of Conduct for Responsible Fisheries sets out the principles of the precautionary approach. These recall Principle I5 of the Rio Declaration': which states: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

The implications of the implementation of the Code in general and the precautionary approach to capture fisheries in particular, are far-reaching. Considering the uncertainties in fisheries systems as well as the need to take action, often with incomplete knowledge, the Code needs, *infer* alia, the following actions and attitudes:

- Consider the needs of future generations. Avoid changes that are not potentially reversible;
- Identify undesirable outcomes in advance. Take measures that will avoid these outcomes or correct them.
- Initiate any necessary corrective measures without delay. They should achieve their purpose promptly, on a time scale not exceeding two or three decades
- Where the likely impact of resource use is uncertain, give priority to conserving the productive capacity of the resource.
- Make sure that harvestable and processing capacity in fisheries is commensurate with estimated sustainable levels of resource. Any increase in capacity should be contained when resource productivity is highly uncertain;
- All fishing activities must have prior management authorization and be subject to periodic reviews:
- An established legal and institutional framework should be created for fishery management. Within this framework, management plans that implement the above points should be instituted for each fishery; and
- Appropriate placement of the burden of proof by adhering to the above requirements

Since the above requirements are an integral part of each section of the Code, it is essential that necessary linkages are forged between fisheries managers, researchers, those responsible for coastal area management, the fish harvesting sector, traders and other users of the seas. Above all, fisheries managers must have in place an intelligence system through which they can be well informed, not only about activities undertaken. but also about trends.

I **UN Conference** *on Environment and Development, June 1992*

Authorization to Fish

A prerequisite for responsible fisheries is allocation of an "authorization to fish," and a vetting system for such authorization, coupled with a record-keeping system for ail authorizations issued. The system should be updated at regular intervals. The record should contain details of the fishing activity authorised, the names and addresses of those authorised and, where appropriate, information related to any fishing vessel involved.

The authorization to fish should be conditional. These conditions should include. and specify *inter-alia.*

- That the recipient will abide by the provisions of the Code of Conduct as and when they relate to fishing operations;
- Area to be fished, species to be fished and or quota for vessel or fisher;
- The type of fishing gear or fishing implements so authorized;
- Time/seasonal limitations;
- The need for certain classes of fishing vessels to be issued with a Certificate of Registry'
- The limitation of navigational warranties; and
- Any special requirements with respect to monitoring, control and surveillance (MCS).

Monitoring, control, surveillance and enforcement

MCS schemes and law enforcement powers should be established that include, inter *alia.*

The granting of powers to the officers appointed to carry out monitoring, control and surveillance activities'

Legal provision for action to be taken that is ofsuffrcient gravity so as to be effective in achieving compliance with conservation and management measures;

Appropriate marking systems to identify vehicles, vessels and aircraft authorized for monitoring, control and surveillance activities; and

- A communication network that would ensure that all those engaged in fishing are aware of regulations in force and the penalties for misconduct.

"No force" strategies should also be employed and these may include, *inter-alia.*

- The use ofobservers(without enforcetnent powers) on board vessels for the purpose ofcotlecting data and reporting on the conduct of the Master and the crew;

] *In most States. the process of allocation of a flag to a fishing vessel and the issue of a certificate of registry is conducted by those responsible far marine matters rather than the competent authority for fisheries management*

} *Some countries find it appropriate to enter into a commercial form of contract for MCS purposes*

- The establishment of sub-regional and regional records of fishing vessels and authorizations to fish;
- Flag State responsibility
- Remote sensing and communication techniques'
- Catch and gear monitoring at the dockside as well as catch processing plant inspections and
- Inspection and reporting by Port States

Management data information requirements

The collection of data must not be seen as an end unto itself. It is in fact essential for informed decision-making. Furthermore, data should be collected and analysed in a timely manner and disseminated to where it can best be used, whether at the national level or to regional or sub- regional bodies as may be required by treaty or convention. **To** the extent possible, data should also be made available in an appropriate format for more general dissemination to the fishing industry and the general public.

Scientific data and information must be provided to fisheries managers at three distinct levels:

- Policy formulation
- Formulation of management plans, and
- The determination of management actions to implement policy and plans

Although data requirements differ for each of the three levels mentioned, the quantity and quality of the data collected will have **a** direct bearing on the quality of management at each level. Further, verification or validation of the data collected is essential to the decision- making process. Some examples of methods to validata data include:

- Checking log books against landing data (e.g sales notes)
- Sampling catches for species monitoring
- Comparing landing statistics with certificates of origin, trade and commodity production statistics (value-added processes) etc.
- Inspecting data collection methods by statistical staff
- Interviews with fishers
- Observer schemes
- Reporting of catches on entering and leaving the fishing zone;

---

4 With regard to remote sensing andsatellite communication systems. States should agree on technical specifications andperformance standards that wouldprovide the basis for agreement on the admission in court of evidence so generated at the time of the alleged contravention. For example, identification of the position of a vessel and date and time, as well as the operation mode. There shouldalso be an agreement on how catch data may be communicated over satellite data communication networks.

- Developing and implementing the use of vessel monitoring systems such as satellite communication systems and on board sensing to track the position of a vessel and to obtain information on catch and fishing operations;
- Surveillance by ship, particularly boarding of fishing vessels and by airborne observation

Standardization of Data Collection

The task ofmanagement in general would be made much easier if standard procedures were adapted. In this respect, the "Agreement for the Implementation o the Provision of the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish stocks and Highly Migratory Fish Stocks" set out reporting requirements for people fishing such stocks on the high seas. In addition, the Agreement requires the coastal States concerned to co-operate on the question of scientific reporting of stocks that occur within their EEZs.

The "Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas" also sets out data reporting requirements to be met by parties to the Agreement. It also allocates responsibility to the FAO to maintain records and to disseminate information in a timely manner.

Confidentiality of Data

A key factor in obtaining and verifying catch data is the level of confidentiality. Those responsible for data collection, analysis and dissemination of information are required by convention to co-operate with other States, regional bodies and international organizations through the exchange of aggregate data. There should, therefore, be a clear understanding between scientists, fisheries managers and fishers that the data supplied by them about individual fishing activities would not be:

- Used against them
- Held in a manner that imperils confidentiality; and
- Transmitted in a manner that would give other fishers a competitive edge.

Social and Economic Information

Fishers and their families constitute the human element and are an integral part of fisheries systems. Such systems cannot be fully understood unless the social and cultural features as well as the economic characteristics of the people and their communities within the system are fully understood. Collection and analysis of data on relevant social, economic and institutional factors is therefore essential for responsible fisheries management and for the application of the precautionary approach. The decision makers should have information on

- the interested groups, their features and their interests in the fishery;
- the economic factors related to the fishery, particularly the economic and social dependence of the different interest groups on the fishery;
- the role of the fishery in providing employment and income for the different interest groups or communities:

- the current status of access to the resource or ownership of the resource;
- the institutions currently involved in decision-making with the fishery; and.
- an outline of the history of the fishery and the historical roles of the different interest groups within that fishery.

Technology

Fisheries managers and scientists have at their disposal a further aid to enable States to meet their obligations with regard to UNCLOS 1982, as well as better management through the adoption of elements of satellite technology (always given that they have an integrated management plan in place and the capability and capacity to process data in good time) on the basis of:

- improved research/monitoring of stocks
- remote sensing of fishing operations
- a vessel position monitoring scheme, and
- the reporting and processing of catch data

The fishing industry already makes use of the same technology to increase efficiency and reduce the element of risk associated with "hunting".

As regards fisheries research, Coastal Zone Colour Scanner (CZCS) data provides ocean colour information enabling phytoplankton pigment concentration estimates from space. The relationship between CZCS measures and phytoplankton distibution has been widely applied to physical and biological studies in many parts of the world since the early 1980s. Further, the ability to remotely sense phytoplankton pigment over large areas has provided biological information at spatial and temporal scales unavailable from shipboard measures alone.

When used in conjunction with shipboard sampling, satellite data may enhance the analysis process related to fisheries research and commercial operations. Most researchers also incorporate data derived from the Advanced Very High Resolution Radiometer (AVHRR) that provides sea surface temperatures unavailable from CZCS.

Technological aspects should also be considered with respect to appropriate fishing gear, fishing practices and operational methods. In this regard, standards should be set for research on fishing gear selectivity and fishing gear behaviour.

Scientists should also ensure through prior assessment that the introduction of new fishing practices or fishing gear would not result in significant waste of target species or non-target species. Likewise, they should ensure that no new fishing practices or fishing gear should be introduced by the industry on a commercial basis if it is detrimental to artisanal or small- scale fisherfolk and their communities. There should be a prior assessment to make sure that such detriment does not occur.

Partnership and Co-operation

Co-operation and partnership go beyond the immediate and necessary links between fisheries managers (including researchers) and resource users. This is very much the case with coastal zone management

on environmental issues and with the implementation of the many international conventions that have a direct or indirect effect on fisheries.

Management measures in general depend to a large extent on the support given by the interested parties. In applying the provisions of the Code of Conduct, full support is essential. If a partnership arrangement is in place, compliance is more likely.

Partnership arrangements could also go a long way towards recognition of the responsibilities of the partners and the level and nature of their accountability. This is particularly important at higher levels of government where there must be a political will (on the basis of thrust and respect) to act responsibly on the basis of the best scientific advice available.

8. OVERVIEW OF FISHERIES MANAGEMENT IN INDONESIA: PAST, PRESENT AND FUTURE

by Sukotjo Adisukresno

Director. Fishery Resources Management, Directorate General of Fisheries
Department of Agriculture, Republic of Indonesia

Introduction

Indonesia is an archipelago of 17,000 islands. It has a long coastline of 8 1,000 km.70 per cent of Indonesia's territory consists of the sea, 30% of land. The annual potential yield of Indonesia's fishing zone, including the EEZ of Indonesia, has been estimated at 6.7 million tons. This figure includes 0.5 million tons ofshellfish and seaweed. The fishery resource constitutes the basic potential for fisheries development. Utilization of this potential is discussed in Indonesia's Sixth Five- Year Development Plan, which aims to:

- Improve human resources quality and the earnings of fishermen and fish farmers through sustainable fisheries resources utilization:
- Increase production and distribution of fisheries commodities in order to improve the quality of nutrition among the population;
- Expand employment opportunities;
- Boost development of domestic industry by providing raw materials and increasing foreign exchange earnings;

The plan is being implemented with due regard to fisheries resources management measures. Their aims:

- Sustainable resources development, so that utilization does not exceed its carrying capacity
- Harmony between large-scale and small-scale fisheries

Problems encountered while implementing these measures:

- Rapid development of fisheries
- Scientific data is very limited, especially for capture fisheries
- Increasing violations of fisheries regulations;
- Need to comply with international laws and agreements, such as UNCLOS, Code of Conduct for Responsible Fisheries, etc.

In order to overcome these problems, several measures need to be taken

Il Present Status of Fisheries

I. *Potential Yield and Environment*

Indonesia's fishing zones comprise a total ofapproximately 5.8 million sq.km. This includes 3. I million sq.km of Nusantara and territorial zone, and 2.7 million sq.km of EEZ. The potential marine yield is approximately 4.5 million metric tons and 2. 1million metric tons respectively.

Further, Indonesia as an archipelagic country comprises approximately 17,000 islands and a coastal area of 81,000 km. The potential area for brackishwater pond culture is 840,000 ha, and that for mariculture is 114,325 ha.

2. Production

During the ten-year period 1985 - 1994, total fisheries production increased from about 2.4 million tons in 1985 to 4.0 million tons in 1994 – an annual increase of 5.91%. Marine fish capture increased by 6.02%, fish capture in open waters by 2.53% and fish culture by 7.86%.

Among fish culture activities, brackishwater pond culture and paddy field culture recorded good increases in production. Brackishwater pond production was 156,367 tons in 1985 and 346,2 14 tons in 1994 – an annual increase of 9.42%. Cage culture production increased annually by 70.55%. from 746 tons in 1985 to 33,011 tons in 1994.

During the same period, the number of marine fishing boats increased from 3 16.446 units in 1985 to 396,185 units in 1994 – an average annual rate of increase of 2.56%. The marine fishing boats of 1994 were more developed than those of 1985. The number of non- powered boats increased from 220,823 units in 1985 to 245,486 units in 1994 – an annual increase of 1.22 % per annum. While the number of outboard motor boats increased from 6 1,887 units in 1985 to 87,749 units in 1994 (an annual increase of 4.02%), the number of inboard motor boats rose from 33.756 units in 1985 to 62,950 units in I994 (an annual increase of 7.26%)

Fisheries activities are concentrated in densely populated areas. Western Indonesia is more densely populated than Eastern. This has led to several problems, particularly in Western Indonesia. such as overlap of fishing grounds and degradation of fisheries resources. Several actions have been taken to prevent and solve such problems:

* Minister decree No 60711976 of Fishing Zones regulates fishing activity based on fishing zone and size of fishing vessel
* Waters of Western Indonesia have been allocated for artisanal fisheries
* Industrial fisheries can be developed in this region through the Nucleus Estate Small Holder System (NEES).

3.Export

During the period 1990 – 1994, export of fisheries products increased by 14.85% per annum, from 320,24 ↑ mt in 1990 to 545,37 I mt in 1994. The value of export increased by 13 .O 1 % per annum over the same period. from US$ 1.04 million to US$ 1.679 million. Shrimp and tunas/skipjack were the main contributors to the total export. In 1990, shrimp (unfrozen. frozen and canned) accounted for 29.36% of the total export by volume and 66.39% of total export by value. In 1994. shrimp accounted for 18.25% of total export by volume and 59.80% of total export by value,

Tunas/skipjack -- fresh/chilled, frozen and canned -accounted for 22.72% of the total volume or 12.0% of the total value in 1990; and 14.61% of the total volume or 10.85% of the total value in 1994.

III Fisheries Resources Management

I. *Principles and Implementation of Fisheries Resources Management*

On the basis of Law No 9/1985, fisheries resources management aims principally at community welfare, and pays due heed to sustainability ofresources. The government ought to formulate regulations relating to type, species, size and number of fishing gears operating in a fishing ground. It should specifically) examine the following factors:

- Technical condition of fishing vessel
- Total allowable catch
- Fishing zone and fishing season
- Environmental protection and rehabilitation
- Restocking
- Fish culture and its protection

2. *Basic Considerations in Establishing Fisheries Management Policy*

a. *Archipelagic conception*

Indonesian fisheries resources management policy is principally based on the Archipelagic Conception which says the sea is a single- integrity zone that cannot be divided by administrative boundaries. That is quite different from the principle of provincial land authority. Accordingly, fishermen may operate in all Indonesian waters and fish in accordance with fish migration and season. The management conception is in line with acts issued so far: Law No 4 Prp/1990 on Indonesian waters, Law No 511985 on EEZ of Indonesia and Law No 9/1985 on Fisheries.

b. *Balanced approach to utilization*

Exploitation lacks balance: The utilization of fisheries resources lacks balance. The inshore fishing ground, close to thickly populated fisherfolk settlements, suffers intensive exploitation. But the offshore areas within the EEZ, and the waters of Eastern Indonesia, are under-utilized. Fisheries must be encouraged in these areas.

improving the quality of welfare: Large-scale fisheries should not be allowed to undermine small scale fisheries. Small-scale fisheries should be protected by measures such as

- Fishing zonation based on type and size of fishing gear/vessel
- Priority in Western Indonesian waters to be given to artisanal fisheries;
- In artisanal fisheries, specific species (such as *Napoleon Wrasse)* should be targeted.

c. *Sustainable fisheries development*

The fishery resource is renewable, but the carrying capacity of fisheries is limited. To ensure sustainability, fisheries resources should be exploited optimally. The potential yield should be taken into account during the process of current utilisation. Negative impact on the environment must be avoided.

3. *Implementation of Fisheries Resources Management*

Since Law No 9/1985 in fisheries was passed, fisheries resources management has been covered by it. But in recent years, several other regulations relating to fisheries resources management have been passed:

a. *Fishing zonation regulation*

Ministry of Agriculture decree No 60711976 regulates fishing activities on the basis of size of fishing gear, fishing vessel and fishing zone. The aims are to protect small-scale fisheries and fisheries resources in coastal areas. The decree is implemented in several coastal areas which have a dense population, and where potential exists for conflict of interests between fishermen.

b. *Legislation banning trawls*

Presidential decree No 39/1980 bans the operation of trawls in all of Indonesia's waters. It has several objectives, such as:

- Ensuring sustainability of fisheries resources, mainly demersal and shrimp:
- Encouraging artisanal fisheries
- Preventing social conflicts between small-scale and medium-scale fisheries

c. *Mesh size measurement*

Ministerial decree No 607/l 976 specified a minimum mesh size of I inch for purse seines. The objectives are to prevent catches of small fishes or juveniles and ensure sustainability of fisheries.

Through Law No 511985 on the EEZ, and No 9/l 985 on Fisheries, the government brought into force several regulations concerning fisheries resources management, such as:

- Government regulation No 1511984 on Natural Resources Management in the EEZ of Indonesia;
- Government regulation No 15/1990 on Fisheries Effort:
- Government regulation No. 46/1993, which improves on Government regulation No. 1511990 dealing with Fisheries Effort.

For implementing such regulations, several Ministerial decrees have been issued:

- Minister's decree No.473a/1985 on TAC;
- Minister's decree No.8 15/1990 on Fisheries Licence;
- Minister's decree No. 81611990 on the use of foreign fishing vessels by charter to fish in the EEZ of Indonesia:
- Minister's decree No. 144/1993 on Checkpoint Port.

Formal regulation apart, some traditional laws are also followed. Some local fishermen enjoy exclusive fishing rights on the basis of traditional law, Accordingly, fishing activity in the area is permitted or local conventions prevail. The regulation does not undermine the effectiveness ofresources management measures under formal/national law.

4. General Problems of Fisheries Resources Management

a. *Exploitation of fisheries resources*

Exploitation of fisheries resources over Indonesia's fishing zone is uneven. The inshore fishing grounds. near densely populated fishermen's villages, suffer intensive exploitation. Most of the fishing fleet consists of small boats and vessels. Fisheries activities are encouraged in under-exploited fishing grounds, such as offshore areas. the EEZ of Indonesia and the eastern Indonesian waters.

To encourage the development of artisanal fisheries, the government has applied the Nucleus Estate Small Holder System. This has enabled rapid development of fisheries activities during the last decade, because ofprogress in fishing technology and the size of fishing vessels. They are therefore able to fish far away from their home base.

Fishing is concentrated in certain fishing grounds, according to season. The level of exploitation could exceed carrying capacity. This may undermine the sustainability of fisheries resources. In addition. it could trigger conflicts between migrant and local fishermen. The government is therefore establishing coordination between institutions that have authority for fisheries regulation/licence and other related institutions.

b. *Fishcries violations*

Several fisheries regulations govern the waters of Indonesia and its EEZ. The following activities are considered to be violations:

- Illegal fishing, by either foreign or domestic fishing vessels.
- Zone violations (EEZ to territorial waters or Zone III to Zone I, as spelled out in Ministerial decree 60711976).
- Use of trawls, fishing gear similar to trawls or modified fishing gear similar to trawls;
- Use of blasting or chemical materials for fishing coral reef species.
- Possession of an invalid licence;
- Coral reef exploitation.

Such violations occur because surveillance is weak. At present, marine surveillance is coordinated by Bakorkamla, headed by the Defence Minister/Panglima ABRI. Members of the body are the Minister for Transportation, the Finance Minister, the Minister for Justice, the Attorney General, the Navy Headquarters, the Policy Headquarters and the Minister for Agriculture (DGF).

Thus, surveillance is not the responsibility of the Directorate General of Fisheries alone. The poor coordination between the institutions concerned leads to ineffective implementation, and an increasing number of violations from year to year.

c. *Limitations in data*

Data available at present is limited -especially data concerning potential yield and catches. Insufficient data may lead to errors in estimates of the level of esploitation and lead to unsustainable development. At present, the level of exploitation is lower than the potential yield, and scope for development still

exists. But some areas have been fully exploited. a few others remain under-exploited, so the exploitation is uneven. To tap development opportunities, one needs supporting data on potential yield, and specifics about catches of important economic species, stock density etc. Biological data is also needed on size of fish, migration patterns, fishing season, spawning season, maturity size etc. Non-biological or socio-economic data are also needed. Current data being very limited, perceptions of the level ofexploitation vary.

d. *Fish Aggregating Devices (FADs)*

FADs have a positive impact on increasing fishing gear productivity, but a negative impact on sustainability ofresources and on social conflicts among fishermen. To overcome such negative impact, government has issued regulations concerning FADs.

e. *Delimit&ion of EEZ*

Since Indonesia's EEZ border with other countries has not been clearly delineated, Indonesian fishermen sometimes enter the fishing zones of neighbouring countries. Likewise, fishermen from neighbouring countries enter Indonesia's EEZ waters.

Fishermen who cross the border are apprehended by the surveillance fleet of neighbouring countries. This is a sensitive situation, with potential for conflict. It highlights the fact that marine delimitation of border areas is still unclear, and overlaps occur in certain areas.

f. *Exploitation of fisheries in EEZ waters*

On the basis of UNCLOS 1982, coastal states should give foreign fishing vessels the opportunity to operate in the EEZ of Indonesia, if the coastal states have a surplus allowable catch. Accordingly, Indonesia has taken some measures, such as Ministerial decree No. 473 a/1985, No. 81511990, No. 81611990 and No. 144/1993. On the basis of Ministerial decree No. 473 a/1985, the TAC of the Indonesian EEZ has been determined to be 1.86 tons annually or 80.2 % of the potential yield.

In 1995, the EEZ production in Indonesia was about 565,864 tons (30 % of the TAC). It was produced by 2,2 17 Indonesian fishing vessels and 945 foreign fishing vessels. The number of Indonesian fishing vessels is expected to increase gradually, in order to utilize the surplus allowable catch.

Fisheries Resources Management in the Future

I. *Institution Enhancement*

A coordination forum is needed among the institutions concerned to overcome the problems of fisheries resources management. The DGF has therefore established a Coordination Forum for Fishing Management. The Provincial Fisheries Service is a member of the forum. The forum has several objectives:

* Synchronise the perceptions on resource management measures among members and other institutions
* Seek harmonious implementation and optimal utilization ofresource management measures and thereby ensure sustainability of fisheries resources.

Based on fish migration and fishing patterns, Indonesia's fishing zone is divided into eight fisheries management regions:

* Malacca Strait
* South China Sea and Natuna Sea
* Java Sea, Sunda Strait and Kalimantan Strait
* Flores Sea and Makassar Strait
* Maluku Sea, Tomini Sea, Halmahera Sea and Seram Sea
* Indian Ocean
* Sulawesi Sea and Pacific Ocean.

One of the management actions was a meeting, attended by institutions such as the DGF, the Marine Fisheries Research Centre, the Navy, the Police, the Fishing Port, the Fishing Enterprises Association and the Fishermen's Association. The aim of the meeting was to obtain a consensus on problem-solving approaches to fisheries resources management, such as:

* Formulating effort allocations for each province;
* Regulations for migrant fishermen;
* FAD regulations;
* Fishing logbook applications for improving the quality of catch data and the level of exploitation;
* Strengthening coordination for surveillance to ensure both punitive action through the BAKORKAMLA (Badar Koordenasi Keananan Linkungan Awan), an agency for coordinating civil security, and preventive action in fishing ports.

However, the Forum is still in an embryonic stage. It is yet to run effectively. Some measures are still needed:

* Legality of the Forum to be established through a Minister's decree to widen acceptance
* Legality of the surveillance/inspector officer to be established
* Training to improve the quantity and calibre of surveillance and monitoring effort.

2. *International Issues*

UNCLOS 1982 became effective in November 1994. The Government of Indonesia therefore has international obligations concerning fisheries resources management.

Exploitation of marine fisheries resources should be governed by the FAO Code of Conduct for Responsible Fishing and by environmental concepts. This means the resources should be exploited optimally, with due attention to resource sustainability, and the habitat should not be degraded. The Code is accepted in principle. But developing countries such as Indonesia are at a disadvantage on certain international issues – such as gill net and purse seine curbs, and species protection concerning southern bluefin tuna and shark. Research is therefore needed to back Indonesia's argument in international

fora. Shared stocks and highly migratory species also need attention when we discuss international fisheries resources management. Research is needed to identify and inventorize species that can be defined as shared stocks, to support management measures concerning the stocks.

Marine delimitation of the borders between Indonesia and neighbouring countries is urgent. The DGF and other institutions have the following tasks on hand:

* Formulating Indonesia's position for discussion with neighbour ng countries.

* Frequent discussion on marine delimitation with neighbouring countries.

In terms of exploitation of the EEZ at the end of the Sixth Five-Year Development Plan (1988), the Domestic Harvesting Capacity (DHC) is projected at 770,000 tons or 40 % of the TAC. So, a surplus allowable catch of about 1 .09 million tons (60 %), should be allocated for Foreign Harvesting Capacity (FHC). The ratio of DHC and FHC is therefore 40:60, and the DHC contribution will gradually increase. It is expected that at the end of the second Long-Term Development Plan, Indonesia's fishing fleet will fully exploit all of the TAC on its own. Vessels, human resources and capital investment should be made available.

V. Conclusion

The objectives of fisheries resource management are to ensure optimal utilization and sustainability of resources. This is line with the principles ofresponsible fishing. But the rapid development offisheries during the past decade has led to certain resource management problems such as limitations in data, increasing fisheries violations, conflicts among fishermen, etc. Besides, international issues such as UNCLOS 1982, the Code of conduct for Responsible Fishing, use of Turtle-Excluder Devices or TED, protection/conservation of certain species, and marine delimitation of EEZ borders, have come to the fore.

Expertise on fishery resources management must be strengthened, also coordination between institutions concerned with such management. Legal issues and international issues must be addressed and resolved.

9. GOVERNMENT DECISION - MAKING UNDER UNCERTAINTY: A CASE FOR FISHERIES MANAGEMENT

Fuad Cholik
Central Research Institute for Fisheries

Johanes Widodo
Research Ins titute for Marine Fisheries
Agency for Agriculture Research and Development, Jakarta, Indonesia

Abstract

To achieve the objectives of fisheries management, essentially to attain a sustainable yield from fish stocks, the government must evolve and enforce a set of curbs on fishing activity. Fisheries management entails choices and uncertainty. Any choice must take into account the condition of the fish stocks along with their dynamics over time. The available data cannot usually provide reliable estimates of the best management policy. The uncertainties are not just a matter of annoying imprecision in fish population estimates; in general they reflect a fundamental lack of experience about how fish stocks behave in response to different policy options.

In the face of uncertainties, fisheries management is necessarily an adaptive process; decisions and policies are developed over time. The most important step in any fisheries policy design is to list alternative hypothesis on one side, and alternative management plans on another, then examine the effects of different hypotheses on different plans.

Introduction

The physical yield from fish stocks cannot be increased beyond a certain level by adding more vessels and fishermen: nor can it be enhanced beyond a point through technological innovation. Fishing pressure must therefore be adjusted according to the limited potential yield of the resources. The purpose of adjustments is first, to enhance the efficiency of exploitation, and second, to conserve the resources. The two objectives are compatible and inter-related; exploitation is not efficient when stocks are over-harvested. On the contrary, over-capacity makes conservation impossible. Consequently, the solution to overfishing lies in a steady reduction of over-capacity. i.e. the effective regulation of access.

Under conditions ofuncontrolled and open access, too many boats and people tend to enter the fisheries and generate a fishing pressure that is greater than what is optimal on a sustainable basis. Result: An equal or smaller yield of smaller fish harvested annually at steadily growing cost. The solution to the problem producing at a low cost a high yield that the fish stock can sustain year after year - requires the design, adoption and implementation of institutions that will enable the harvesting sector to function efficiently from the economic perpective.

A number of measures might be implemented to correct the imbalance between fishing pressure and potential yield. First, the catch level might be controlled, by allocating individual catch quotas for example. Second, a restrictive licensing system could be implemented only the licensed vessels may participate legally in the fishery. Third, fishing rights would have to be paid for a system of fees or fishing right auctions could be introduced.

To determine the most appropriate management system for a given fishery, the likely impact of alternative regulatory measures must be assessed. For that purpose, it is useful to construct a mathematical model of the fishery in question, combining both its biological and socio-economic aspects. i.e.. a bioeconomic model. Such a model can be used to simulate the likely consequences ofdifferent kinds of regulations. Clearly, such a model is only as reliable as the data that is used to set it up. But a second merit of the model is that it can identify the processes most directly relevant in fisheries management, the control variables through which the management authority can effectively regulate the amount of fishing. and. therefore, the major data gaps and priorities of research topics.

Fisheries management measures in the tropical waters ofmultispecies stocks face a number of constraints. One constraint is that available mathematical models of the dynamics of the fish population are not immediately applicable to tropical situations. Basic data that can be applied to any model are sparse, there are few scientists to perform the necessary studies, and often the administrative structure to implement and enforce the detailed restrictive measures does not exist.

Fisheries management requires information on resources, e.g., on the delimitation of stocks that can be better managed separately; on the size of fish that need to be protected for maximizing stock productivity: and the relationship between stocks and fishing yield. The work of stock assessment biologists will play an important role in providing such information for fisheries management. Information on the amount of fishing, along with information on the costs of fishing and the value of the harvest, are important to determine desirable objectives of exploitation and the intensity of exploitation. They constitute the basic information needed for management planning.

The concept of a precautionary approach to fisheries management requires that fisheries should and must be managed even in the absence of documented evidence of overfishing.

Unctrtainity in Fisheries

Uncertainty often dogs fisheries analysis. This factor must be taken into account, directly and explicitly. in deciding on fisheries management measures to avert any disaster. The ability and willingness of fisheries management agencies, e.g., government. to deal with uncertainty, play a significant role in promoting more efficient and effective fisheries management.

“Conventional constraints”(Marr, 1982) account for some ofthc uncertainties in fisheries management. These include lack of theories applicable to the multispecies stocks of tropical fisheries resources, lack of data, lack of well-trained personnel, lack of institutional infrastructure, and gear conflicts.

“Lack oftheories” relates to the fact that modern theories of fish population dynamics are largely based on single-species fisheries of high latitude in which the species usually live long, whereas the fisheries in tropical waters are generally multispecies fisheries based on a large number of short-living species. Catch, effort and age/size data are often sparse for tropical species. Result: there is no theory against which one could check available data; there is no data on the basis of which one could develop a valid theory; and data is insufficient for a bio-economic approach to fisheries management.

The dearth ofwell-trained personnel provokes frequent comment. The fact is that there are a number of trained fishery scientists, but poor pay scales keep them off government jobs. Such individuals may either quit the government fishery service or remain nominally active with it while devoting most of their time to more profitable activities.

Often, the institutional infrastructure necessary to supply the essential scientific information. identify the broad problems of fishery management in an appropriate context. take the necessary policy decisions and put management plans effectively in place are simply not present. However, with increased interest in fisheries, increased awareness of resource limitations and the virtually universal establishment of 2OO-mile EEZs, there is some optimism in this regard.

The establishment of EEZs makes fisheries management feasible by establishing national resource ownership, thus making it possible to deal with the problem of unlimited access. But it has at the same time created enforcement problems of unanticipated magnitude. Countries worldwide simply do not have the physical infrastructure to effectively enforce management regimes.

Gear conflicts are a protean component of fisheries, that seem to appear in various forms. Usually, but not always, they involve two or more different kinds of gear taking not only the same species but also the same species at essentially the same life-history stage. In these conflicts, the "inshore" artisanal fishermen using traditional gears are pitted against the "offshore" commercial fishermen using modern fishing gears. The conflict is major, because artisanal fisheries involves so many people. Some measures require modem gears to stay and operate beyond a specified distance from the shore.

The effectiveness of this measure in the context of the resource is questionable, since the species caught commonly occurs on the "inshore" grounds as juveniles and on the "offshore" grounds as adults. 1 Incertainty in fisheries management is also brought about by "unconventional constraints'*-geographic, demographic, institutional, international and cultural (Marr 1982).

Geographic/demographic constraints are especially important in archipelagic states like Indonesia and Philippines. Exceptionally long coastlines, with a very large number of artisanal fishermen distributed along the coastlines, pose management problems of overwhelming magnitude.

Among institutional constraints, tuo in particular should be noted. First, the responsibility for various components of management may be spread so widely throughout government, that it may be difficult or impossible to put management plans into effect. Second, fisheries departments at best fail to communicate very well with other departments; at worst, they may actually be in conflict.

As some migratory species will occur in the EEZs of two or more countries, and as some fishermen do not respect EEZ boundaries, competition for these resources is an important international constraint.

Finally, cultural constraints to fishery management may take the form of avoiding participation in an international management body. The country concerned thereby spares itself the public admission that it hasn't collected the requisite management data.

Constraints such as these permeate fisheries analysis, creating uncertainties in fisheries management. Major uncertainties can be grouped into two types: those that the manager need not learn about to manage a stock well; and those that define untested opportunities to improve yields and economic performance. An obvious example of uncertainty of the first type is how recruitment will behave at very low stock sizes for a stock that has already suffered some degree ofrecruitment overfishing; it might bc scientifically interesting to see what would happen if the stock were depressed still further, but the manager should avoid this circumstance if he knows that recruitment overfishing has already occurred (he should be moving the stock in the opposite direction).

Uncertainty of the second type relates to how management must respond when the optimum policy is uncertain; the optimum can be found only by testing alternative opportunities through management experience. Someone cannot predict how a stock will respond to exploitation. The best hope lies in either spatial replication or quantitative experience with similar stocks elsewhere or the same stock in the past. You cannot predict MSY without exceeding it.

Decision-Making in Fisheries Management

Fundamentally, the purpose of fisheries management is to ensure sustainable yield from fish stocks over time to promote the economic and social welfare of fishermen and their families. To achieve this purpose, government must design and enforce a set of regulations on fishing pressure and fishing patterns, These decisions should take into account the biological knowlegde of the stocks, the condition of the fish stocks, and the dynamics of the stocks in response to the actions being intended (Gulland 1982, 1983).

Fisheries management is a matter of making choices and comparing options, and not just calculating any single quantity, be it MSY, fishing effort to masimise yield-per-recruit or whatever. Therefore. managers must make very difficult and quantitative choices about how much development of fishing to encourage or permit, what specific limit to place on catches (time of fishing, size of fish, total landings. location of fishing), how much money to spend on enforcement of regulation versus enhancement of production, e.g., investment in a government-owned fleet of new vessels, encouragement of private investment, e.g., by the provision of low-interest loans, technical assistance and advice on the use of more effective gears, to the provision of shore facilities, or improved communication between landing places and the main markets.

Fisheries management in developing countries, particularly in South and Southeast Asia. is concerned not only with resource problems but also with people problems. Consequently, it cannot be successful unless viewed in the context of integrated coastal area development and getting support and commitment from fishing communities and other stakeholders.

Much of the failure to implement management measures is due to lack of communication between administrators. fishermen and scientists of which the absence of an assessment is one aspect.

The roles of stock assessment and biological advice in arriving at management decisions and in increasing the need for precision in forecasting the wider effects of management measures are strategic.

To realize that the available data and information usually cannot provide reliable guidance about the best management policy does not take much practical experience with stock assessment methods and models. Assessment calculations based upon historical data often reveal gross uncertainties about sustainable yield, optimum effort levels, etc. In general these uncertainties are not just a matter of annoying imprecision in estimates of a few parameters such as natural mortality rates, but they reflect fundamental tack of experience about how the stock behaves under alternative policy options.

In the face of large uncertainties, fisheries management is necessarily an adaptive process. The decisions and policies developed over time may have a profound influence on how rapidly the uncertainties arc resolved.

Hilborn and Walters (1992) said that there are three basic strategies for dealing with uncertainty in the management of dynamic systems over time. These strategies differ in how models based on historical data are used to guide policy choices. First, one can use the available data at each point at the time to

construct a single "best guess' or "best possible model" based on the data, and then act as though this model were true (or hedge against uncertainty by being more conservative than this model predicts) while counting on any weaknesses or errors, to reveal themselves in future assessment. This is called passive adaptive strategy.

Passive adaptive policies can in fact be optimum when uncertainties are small and/or when the passive decision choice is as well-informed as any other choice would be. However, passive policies may cause the system to be locked into a narrow range of behavior (e.g., stock size and harvest held near the presumed optimum) without any data ever being gathered to help decide whether the optimum is in fact within this range.

Second, one may simply try a variety of alternative policies, more or less at random, in the hope of accumulating experience about which one is best. This is called an evolutionary adaptive or trial-end-error adaptive policy. It has the advantage of not requiring the decision-maker to make any judgement about which model best fits the data available to him at any point in time. If the manager has considerable flexibility to try a wide range of choices, then the evolutionary adaptive approach may lead him to eventually stumble across some very good choices that would never have been identified or noticed through rigorous but narrow analysis of historical data. However, like natural evolution, a trial-and-error strategy is likely to be very wasteful.

Third, one may deliberately try to construct a range ofalternative models that are consistent with historical experience and use these to identify a policy that offers some balance between probing for information (directed experimentation) and caution about losses in short- term yield and long-term overfishing. This is known as actively adaptive strategy. It involves a great deal more effort in stock assessment and modelling than is required for passive policy design. It may involve testing a much narrower range of best bet policy than would be tried in an evolutionary strategy, but possibly a wider range than would be tried in a passive strategy. Thus it is in a sense a compromise between those extremes.

Of course fisheries managers need not go so far as to apply sophisticated analytical techniques, but it is far more important to explicitly consider uncertainty. The most important step in any fisheries policy design is to list alternative hypotheses on one side of the table, alternative management plans on another side and examine the consequences of the different plans under the different hypotheses. This should be done in every policy evaluation.

If we accept that policy design should explicitly consider uncertainty, we still have a long way to go before knowing what methods work best. The concept of adaptive management was first proposed by Walters and Hilborn (1976), and, even though the basic principles have been widely accepted in many fisheries agencies, there are few examples of practical application of these methods.

The biggest constraint on effective fisheries management is the inability to change fishing mortality. Most fisheries disasters are brought about by not being able to reduce fishing pressure once the biological and economic need is obvious. We should therefore devote research and management resources to understanding fishermen and their gears.

Always present managers with decision tables showing biological and management alternatives. The output of a stock assessment exercise should not be recommended quotas or fishing effort. It should be biological consequences ofdifferent actions. Stock-assessment biologists are not likely to be the right people to weigh the risks of alternative management actions.

The most serious obstacle to effective management stems from the lack of communication among scientists, administrators, decision-makers, and fishermen. It is necessary, therefore, that dialogues be held to promote better understanding among them. There must develop a clear consensus about how important it is to manage the fishery for sustainable long-term yields.

Directions for Future Research

Function of Stock Assessment

The function of stock assessment in the broad sense is to carry out and provide management advice. It seeks to identify the stock present, to estimate potential yields, and to recommend strategies for approaching these yields. As such, it has both short- and long-term goals, i.e., providing immediate information about whether a stock is close to full exploitation, and proposing strategies for manipulating the fishery to achieve the desired catch characteristics. Accurate stock assessment requires available data concerning the stock, but depends upon current understanding of nature and the functioning of biological communities on the one hand and the yield responses of fisheries on the other.

Data Needs and Requirements

Among the data needs and requirements are the following:

(1) Reliable catch data by species and associated fishing effort data

(2) Length composition by species or by groups of species of the catch.

(3) Indices of abundance (catch per unit effort, CPUE), expressed in terms of catch per unit of standardized fishing effort.

(4) Age composition of selected species as a basis for using standard techniques of assessment and for calibrating length-structured models.

(5) Related to these data requirements is the problem ofobtaining satisfactory species identification.

(6) Information on costs of fishing and the value of harvest.

Research Priorities

In the short term, high priority should be given to development of stock assessment methodology through length-structured models. Research priorities should focus on several objectives as follows:

(1) Length-structured models along with a special program of age determination to compare results obtained from the length- and age-structured approaches as a means of validating the length-structured models.

(2) Relationship between yield, effort and species composition (dealing with multispecics stocks).

(3) Stock identification.

(4) Selectivity and catchability of gears.

(5) Adaptive (experimental) management.

Conclusions

Uncertainty permeates fisheries analysis, this factor should be taken into account in deciding fisheries management measures. In general, the occurrence offisheries disasters is strongly related to the ability and willingness of managers to deal with uncertainty.

Since the available data and information cannot provide reliable guidance about the best management policy, managers have to make very difficult and quantitative choices to set up management measures that can be actually applied.

In dealing with uncertainty in the management of dynamic systems, an adaptive policy as proposed by Walters and Hilborn (1976), seems to be more appropriate than conventional policies that are based on single quantity of MSY, effort which maximises yield- per-recruit, etc. In addition, by minimizing conventional constraints as well as unconventional ones. the effects on fisheries brought about by management measures may be forecast more precisely.

Literature Cited

Gulland, J.A. 1982. The management of tropical multispecies fisheries, p. 287-298. In D. Pauly and G.I. Murphy (eds.) Theory and management of tropical fisheries, ***ICLARM Conference Proceedings. 9. 360*** p.

Gulland, J.A. 1983. Fish stock assessment. A manual of basic methods. ***John Wiley &*** Sons. New York.

Hilborn, R., and C.J. Walters. 1992. Quantitative fishery stock assessment: choice, dynamics, and uncertainty. ***Chapman & Hall, Inc. New York. 570 p.***

Larkin, P.A. 1982. Direction for future research in tropical multispecies fisheries, p. 309-328. In D. Pauly and G.I. Murphy (eds.) Theory and management of tropical fisheries, ***ICLARAM*** *Conference* ***Proceedings. 9. 360*** p.

Marr, J.C. 1982. The realities of fishery management in the Southeast Asia Region, p. 299-307. In D. Pauly and G I. Murphy (eds.) Theory and management of tropical fisheries, ***ICLARAM Conference Proceedings. 9. 360*** p.

Walters, C.J., and R. Hilborn. 1976. Adaptive control of fishing systems. J. ***Fish. Res. Bd. Can. 33: 145-159.***

10.. AN OVERVIEW OF FISHERIES MANAGEMENT IN ASIA PAST, PRESENT AND FUTURE

by Nik Mustapha R Abdullah & K Kuperan
Department of Natural Resource Economics, University Pertanian Malaysia, Serdang, Selangor, Malaysia

Abstract

Asia accounts for more than 40 per cent of the world's total fishing fleet. The increase in the capacity of this fleet highlights the overcapitalization of this fishery. A collapse of fisheries in Asia could be disastrous for the fishing industry as well as for related industries. The rising conflicts among resource users provides an impetus for several fisheries management strategies. The way forward is to avoid falling deeper into the capital trap, work towards lowering enforcement costs, and improve the institutional design for securing legitimacy for fisheries management institutions.

Top fish producers are from Asia

The importance of the fisheries sector to the Asian economy is widely acknowledged. Its significance lies in three main areas:

(1) as a source of animal protein

(2) as a source of employment, and

(3) as an earner of foreign exchange.

Some 150 million people in Asia are economically dependent on fishing and its related activities, although marine fishing accounts for only about one per cent of the worldwide economy. Table 1 shows the distribution of world marine catch by principal producers in 1993. Ten of the 20 top world fish producers are from Asia, with China contributing about 10 million tonnes of fish or 11.9% of the total world catch. These 10 countries together account for almost 43% of the world's fish catch. Southeast Asian countries such as Thailand, Indonesia, Philippines and Vietnam, account for another 10 per cent.

Fishing Fleet

In 1992, Asia accounted for almost 43% of the world's total fishing fleet, way ahead of its more advanced counterpart from the former USSR, Europe and North America. Table 2 shows the distribution by continent of the world's nominal catch and total fishing fleet, In terms of productivity of the fishing fleet, the index for Asian fisheries is quite low at 4.39 mt/GRT compared to the fisheries of South America, Africa and Oceania. With a rapidly growing population, and an increasing demand for fish among Asians, it is expected that the dwindling fish stocks in the region will face even greater pressure.

The facts of the fishing crisis have been well documented. Yet there is little sign that the fishing industry and those who control it are interested in anything other than short-term gain. The general response to declining fish stocks around the world has been to keep using bigger boats and more sophisticated methods so that catches go on increasing. As seen from Table 3 Asia accounts for some 85 per cent of

the number of decked vessels in operation and about 62 percent of undecked vessels in 1992. In terms of capacity, this represents **a** 129 per cent increase in the GRT of docked vessels in Asia, compared to a 91 per cent increase in capacity of decked vessels for the world as whole between 1970 and 1992. It appears that Asia is set for the same mistake that Europe, USSR and North America have made with regard to overcapitalization in fisheries. Unless the commercial fishing industry and governments that regulate fishing capacity are prepared to reduce capacity and develop a system of sustainable management for fish stocks, we are heading for an even greater disaster in Asia.

Table 1: World Marine Catch by Principal Producers 1993

Country/Region	*Marine Catch ('000 tonnes)*	*% of Total (World Catch)*
China*	10,066	11.9
Peru	8,410	9.9
Japan*	8,273	9.8
Chile	6,020	7.1
USA	5,595	6.6
Russian Federation	4,154	4.9
Thailand*	3,065	3.6
Indonesia*	2,731	3.2
Korea Rep*	2,619	3.1
Norway	2,562	3.0
India*	2,473	2.9
Iceland	1,718	2.0
Philippines*	1,688	2.0
Korea DPR*	1,640	1.9
Denmark	1,499	1.8
Spain	1,300	1.5
Taiwan*	1,144	1.4
Canada	1,135	1.3
Mexico	1,036	1.2
Vietnam*	810	0.9
World Total Marine Catch	84,262	

*Asian countries

Source: FAO (1995). The State of World Fisheries and Aquaculture, Rome

Marine fishing accounts for only about one per cent of the worldwide economy, but for many Asian countries the effect of a fishing collapse could be disastrous, as some 150 million people are economically dependent on fishing and its related industries. In Southeast Asia, five million full-time fishers contribute US$6.6 million to the total annual earnings of the region (Martin, 1966).

Table 2:Distribution by Continent of the World's Nominal Catch, and Total Fishing Fleet, 1992

Continent	*Nominal Catch*	*%*	*('000 GRT)*	*s;,*	*Catch/GRT (M)*
Asia	48,427	49.1	11,013	42.37	4.39
Africa	5,203	5.3	699	2.69	7.44
Europe	12,679	12.9	3,018	II.61	4.20
South America	15,913	16.1	817	3.14	19.48
North America	8,652	8.8	2,560	9.85	3.37
Ocean ia	890	0.9	122	0.47	7.29
Former USSR	6,876	6.9	7,776	29.87	0.88
World Total	98,640	100	25,944	100	

Source: FAO (I 995) : The State of World Fisheries and Aquaculture, Rome

Characteristics of well-managed coastal fisheries

Although Asian fisheries contribute substantially to the world's fish catch, one of its unique characteristics is that its fisheries tend to be dominated by small-scale coastal fisheries. The challenge for fisheries administrators in Asian countries is therefore clear: better management of coastal small-scale fisheries. But what are the characteristics of a well-managed coastal fisheries? Some universally accepted properties of well-managed coastal fisheries are described by Miller (1990). These properties can be classified into fwo sets of characteristics:

Resource characteristics

(1) The quality and quantity of resource habitat are maintained.

(2) Catch is stable and changes by only a moderate amount, e.g a factor of less than 1 .3 in successive years.

(3) Market demand. processing capacity, resource yield, and fishing capacity are well-matched.

(4) Annual yield predictions are avoided, but if required they are based on recruit year-class strength and yield per recruit rather than on an assumed stock -- recruitment relationship.

(5) Resource waste is low: discards and by-catch are less than 30% as large as yield to the fishery, and the yield per recruit is at least two-thirds maximum.

Management characteristics

(1) Fishermen or fishermen's organizations take part in framing and implementing regulations.

(2) Regulations in place are enforceable and enforced.

(3) Reasons for regulations are understood by the fishing industry, enforcement personnel, resource managers and scientists.

(4) The resource managers and fisheries scientists are visible and can be personally identified by fishermen or fishermen's organizations.

Understanding these characteristics is critical for the design and adoption of fisheries management tools in many countries. However, what has happened thus far in many countries is that fisheries management policies tend to be ad hoc in nature. To a large extent, it is a political exercise. Most fisheries management policies were implemented as a response to certain tragedies or events that disrupted the harmony that existed within the fisheries sector. As such, the fisheries management regimes in many Asian countries revolved around the nature of fisheries exploitation itself. The institution of certain fisheries management regimes is therefore seen as a temporary solution to a particular problem in the fisheries. The next section traces the evolution of fisheries management in Asia, discusses changes over the years, and possible future directions.

Fisheries Management in Asia

For many years, the management of fisheries resources has been paid little systematic attention by the countries of Asia. Efforts at fisheries management have largely been exercises in political management, with little basis in the application of the biological, economic or social consequences of management approaches. Limited social science research and very little biological research has been specifically directed at management issues. In the 1990s however, there has been a small but notable change, and fisheries scientists are increasingly directing attention to management issues. The social scientists are now at a point where they can begin to address important issues of fisheries management policy.

The '80s and the early '90s were decades of ambitious industrialization programmes in many of the developing countries of Asia. The approach adopted for industry was also applied to fisheries. Many of the programmes for developing the fisheries failed, and donors "discovered" small-scale fishing as the mainstay of most fisheries resource exploitation in developing countries. Funding for the fisheries subsector, both inland and marine, by bilateral and multilateral donors -particularly development banks -was substantial, with a major emphasis in fishery development/investment in catching and processing capacity (Insu!! and Orzeszko, 1991).

The emphasis ofnational fisheries policy in al! the countries of Asia has been to increase fish production for domestic consumption and export. This has been sought through various devices such as motorization, port development, and introduction of new boats and fishing gear. There have been substantial technological advances resulting from private sector adoption and adaptation of new fishing methods of systems such as trawls. This production development has been supplemented by market development efforts in some countries that have sought to improve the incomes of fishermen and their families. The result has been increased output, to be sure, but the corollary has been major increases in investment in fishing effort.

Another factor that has contributed to the growth in effort has been the role of fishing as an employment of last resort. The fisheries sector has played an important role in absorbing surplus labour. People who cannot find any job either in cities-where both population and employment are high – and in villages, have sought opportunities in fishing. This almost limitless supply of labour has kept incomes generally low and supported labour- intensive but very effective fishing technologies. Only in the late '80s and

the early '90s has the rapid industrial development of some of the Southeast Asian countries (Malaysia, Thailand. Indonesia and Vietnam) possibly reduced employment pressure on fisheries. But the pressure on fisheries resources has remained high because of more advanced capture technologies.

Many of the nearshore and coastal resources in Asian countries are overfished. Fishermen's incomes have been sustained by price increases, not by increases in productivity. Increases in total landings have often given a misleading picture of the possibilities for further expansion. The force of market pressure continues to attract investment into artisanal fisheries and those who compete with it. Growing fishing pressure has generated growing conflict.

The rising conflicts among resource users provided the impetus for the establishment of several fisheries management strategies in many Asian countries. However, these regimes underwent a series of changes over the years in response to the changing nature of the fisheries in the region. Fisheries management in Asia can roughly be divided into three phases: (I) Pre-1980s (2) During the 1980s and (3) the 1990s and beyond. But most fisheries management policies focused mainly on fishing effort reduction.

Pre-1980s

In the early 20th century, most Asian fisheries were coastal and small-scale in nature. Fixed fishing gears were the gears most commonly used by fishermen. Catches were low, and meant only for local consumption. But in the 1930s, many parts of Asia showed a preference for more mobile fishing gears that allowed fishermen to actively pursue the fish. This was followed by the introduction of purse seines and motorized boats in the 1940s and 1950s. They generally fished in shallow territorial waters within 12 miles from the coastline, mainly catching pelagic species. Fisheries management policies then were confined to limited licensing programs.

In the early 1960s, trawlers were first introduced by the Germans in Asia. The introduction of these mechanized fishing techniques has changed the fishing industry in this region. What was once a coastal, small-scale and self-sufficient fishery, became commercial and export-oriented. During this period, fish catch – including increased landings of small juveniles and by-catches – increased at a record rate. Trawlers caused a tot of damage to fishing and nursery grounds. At the same time, their intrusion to nearshore areas, meant exclusively for small-scale fishermen, created serious conflicts among fishers. Several countries amended their fisheries regulations to reduce the damage created by trawlers and to create orderly fishing activities in their coastal areas. Mesh-size restrictions were introduced. For example, Malaysia's I963 Fisheries Act says that the minimum mesh size for any trawl net shall not be less than 1" internal measure at cod end (Saharuddin. 1995). At the same time, many Asian countries imposed operational zones for trawlers to prevent depletion of their fisheries stocks.

Although fisheries regulations were established, the lack of enforcement and surveillance capabilities of many governments was a handicap. The effort to reduce fishing effort proved ineffective. More trawlers were introduced during this period, driven purely by the short-term motive of profit. Many countries reported cases of overfishing and serious conflict among fishers in the 1970s. The clashes among resource users sometimes took a toll of human life. Result: some existing laws were amended. There was an absolute ban on trawlers in Indonesia in I980 (Susitowati, 1991). At the same time, new regulations were introduced to further tighten the disastrous effects oftrawls. As the experiences of the 1960s and 1970s had shown. individual fisheries management regimes were less effective in controlling overfishing. The era of the 1980s saw a different philosophy for fisheries management in Asia. A combination of various tools was introduced to prevent further depletion of fish stocks in the region.

During the 1980s

The valuable lessons learnt by fisheries administration during the 1960s and the 1970s had led to new insights concerning fisheries management. In the 1960s and 1970s, fish catch increased rapidly through overcapitalization of fishing fleets. Many inshore areas of Asian countries were overfished. In the 1980s, the problems faced by fisheries planners sprang basically from activities ofearlicr decades. Many fisheries administrators were saddled with the problems of resource rehabilitation and resource conservation for sustainable uses. To meet those new demands, a host of integrated fisheries management regimes were instituted to further reduce fishing effort. Major policies aimed mainly at effort reduction. Measures included limited licensing programs, gear restrictions, area closures and further restraints on mesh sizes. One of the most effective tools used during this period was the zoning regulation, which not only specified fishing areas but also clamped down on the type of gears used in certain zones. The net results were improved catch, less poaching, less gear damage and fewer reported conflicts. Examples of zoning regulations in selected Asian countries are listed in Tables 4a, b and c.

Restrictions to fishing zones were also introduced in other countries like Thailand and Myanmar. In Thailand, for example, the 12- mile territorial waters remained closed to trawlers. In Myanmar, under the Marine Fisheries Law, all artisanal fishermen are given priority to fish in all fishing zones (FAO, 1996). To some extent, these zoning regulations were successful in reviving and conserving fish stocks in this region for future uses. However, further refinements were needed to establish a healthy and economically viable Asian fishery. These goals became new challenges to fisheries managers in the 1990s.

The 1990s and Beyond

Prior to 1990, many fisheries management regimes were concerned with intra-generational equity issues (Garcia 1994). In many Asian countries, fisheries policies and regulations were based on a top-down approach and most of these regulation were by-products of colonial legacies. Their legitimacy was always questioned by stakeholders in fisheries. It was for this reason that in many cases, fisheries management failed to achieve its desired objectives. The failures of conventional methods of managing fisheries in many parts of the world are well-documented and publicised.

Table 4a: Zoning Regulations in Malaysia

Zone *Description*	*Distance From Coastline*
A Within 5 miles from shoreline	Reserved solely for artisanal, owner-operated vessels
B 5-12 miles	Reserved for owner-operated trawlers and purse-seiners of less than 40 GRT
C 12-30 miles	Reserved for trawlers and purse seiners greater than 40 GRT, wholly-owned and operated by Malaysian fishermen.
D Beyond 30 miles	Reserved for deep sea fishing vessels of 70 GRT and above. Foreign fishing through joint ventures or charter are restricted in this zone.

Table 4b: Zoning Regulations in the Philippines

Zone	*Distance from Shoreline*	*Description*
1(municipal waters)	Up to 3 nautical miles from the shoreline of municipality	Only for municipal fishing vessels (3 GT or less with or without power or fishing without boat)
2 (national waters)	> 3 nautical miles	For commercial vessels (‘3 GRT)

The unwillingness on the part oflisheries administrators to include fishermen’s interests while formulating fisheries regulations and policies partly explains why fisheries management failed badly in many areas. Realizing these past mistakes was actually the best thing that has happened to many fisheries administrators in Asia.

The traditional approach towards fisheries management requires a serious second look. The interests of stakeholders in fisheries cannot be taken for granted. A shift will have to take place in the management paradigms of policymakers. The new fisheries management objectives must focus on more pressing inter-generational equity issues, and its implementation has to be more participatory, taking into consideration the standpoints of the government as well as of fishermen.

Using these two guiding principles of the new order of fisheries management, many scientists and economists today have advocated **community-based management, precautionary fisheries management** and **Marine Stewardship Councils** (MSCs) as new fisheries management approaches, over and above the conventional techniques in place. Although these approaches have been mooted for quite some time now, it is too early to evaluate their effectiveness, as they have not been fully implemented at the ground level, for a sufficient length of time.

The way forward

The way forward in fisheries management is to

1) avoid falling deeper into the capital trap (i.e. the tendency to over-invest in the capacity to capture fish)

2) to lower enforcement costs arising from attempts on the part of some to create property rights to designated fisheries resources and

3) to improve legitimacy for institutions engaged in managing fisheries resources.

The three approaches mentioned above Marine Stewardship Councils (MSCs), community-based management and precautionary fisheries management are seen as possible approaches that can lead fisheries in Asia forward. They will check investment in fish capture capacity, lower enforcement costs and increase the legitimacy of fisheries management institutions.

Prospects for the future

The prospects for the approaches mentioned above may not be the same in all Asian countries. The concept of Marine Stewardship Councils (MSCs) is still very new in all of Asia. Rut it probably has

greater chances of success in the more developed Asian countries such as Japan, Korea and Taiwan and less bright prospects in poorer countries such as India, China, Indonesia and Philippines. Community-based management, on the other hand, appears to have better prospects in less developed countries such as the Philippines, Indonesia, India. There are also issues with regard to the costs of alternative management approaches. It is often argued that the transaction costs of alternative approaches differ. Which approach is better is ultimately an empirical issue (Nik Mustapha, K. Kuperan and R. Pomeroy, *1996).*

The precautionary approach instills the need to consider the fishery ecology and socio-economic relationship as fragile. Policies should therefore be implemented with caution. This could help improve the way politicians think about or approach fisheries management.

References:

Food and Agriculture Organization, FAO 1995. The State of the World Fisheries and Aquaculture, Rome.

Anon. (I996) Myanmar Fishery Industry Profile. Infofish International, No 4/96: 16-20

Garcia, S.M. (1994). The Precautionary Principle: Its Implications in Capture Fisheries Management. *Ocean & Coastal Management,* Vol. 22(2) ; 99-125

Insull. D. & **J Orzesko,** 1991. A Survey of External Assistance to the Fisheries Sector in Developing Countries, Rome, *FAO Fish. Circ. 755* (Rev.3) 74p.

Martin C, 1996. Fishing Our Way to Disaster. Development Reports. Development *and Cooperation No 6.* Nov/Dec I996 p 27-28.

Miller R J. (1990) Properties of Well- Managed Near-Shore Fishery. *Fisheries* Vol. 1 S(5): 7- I5

Nik Mustapha R Abdullah, K Kuperan and R S Pomeroy (1996). Transactions Costs and Fisheries Co-Management, Asian Fisheries Social Science Research Network Monograph, ICLARM. *Manila 18* p.

Saharuddin, A Hamid (1995). Development and Management of Malaysian Marine fisheries. Marine Policy. Vol. 19(2): 115-126.

Susilowati, Indah (1991). Welfare Impact on Improved Boat Modernization in Pemalang Regency. Central Java, Indonesia. Master Thesis, *University Pertanian* Malaysia, Serdang.

11. U S EXPERIENCE IN IMPLEMENTING THE PRECAUTIONARY APPROACH TO FISHERIES MANAGEMENT

by Stanley Wang and Andrew Rosenberg

Introduction

Renewable fishery resources, if properly managed, can produce long-term sustainable yields and thus support continuous economic activities and employment. The U.S. caught 5.9 million metric tons of fish in 1994, accounting for 6.3 per cent of the world catch, making it the fifth-ranking nation in fish harvests worldwide. (U.S. Department of Commerce, July 1996). However, the long-term potential yield from U.S. fisheries is estimated to be approximately SO per cent higher than the recent average yield (Sissenwine and Rosenberg 1993). This indicates that large increases in the harvest are possible through improved management that will help recover depleted stocks and diversify utilization of under-harvested stocks. The potential maximum net economic value of the nation's finfish and shellfish resources is, at a minimum, $I .8 billion a year or $60 billion in net present value. (NMFs, Silver Spring, MD, May 9,1991).

The U.S Government has managed the fisheries resources within the country's Exclusive Economic Zone (EEZ) since 1976. The Fishery Conservation and Management Act of 1976 (Magnuson-Stevens act) was passed and implemented in 1977'. By 1995, 36 fishery management plans resulting from the Magnuson Act were implemented. In 1995, NMFS issued 623 notices through the Federal Register to implement FMP fishery management actions and rules for domestic fishing (U.S. Department of Commerce, July 1996).

After two decades of fisheries management under the Magnuson-Stevens Act, the U.S. has a high percentage of stocks at low abundance and over-utilized (NMFS 1996). Forty five per cent of the 182 stock groups whose resource status is known (83 out of 182) have an abundance level lower than what is required for producing the U.S. long- term potential yield (LTPY). Of I91 stock groups with known utilization status, 33% (63 out of I91 stock groups) are currently over-harvested. Many of these over-harvested stocks occur in the Northeast demersal species complex (I 8 stocks) or in the Gulf of Mexico reef fish group (10 stocks).

The high percentage of the overutilized stock groups is indicative of the need for continual improvement and for precautionary approaches to fishery management. It is only in recent years that the U.S. has begun to take a precautionary or risk- averse approach to fishery management. This means that in the face of uncertainties about the stock status, the efficacy of management controls or the prognosis for the managed resource, management actions should err on the side of conservation if the resource is to be maintained.

In this paper, we will describe federal fisheries management under the Magnuson-Stevens Act with special references to precautionary approaches in Section II. Then we will present the U.S. strategies

---

The Fishery Conservation and Management Act later renamed as the Magunson- Stevens Fishery and Conservation Act (Magunson-Steven Act)

for resource protection and stock rebuilding as a precautionary approach to fisheries management in Section III, and conclude this paper with a summary in Section IV.

II. FAO Guidelines and U.S. Federal Fishery Management

2. I *FA 0 Guidelines*

The FAO published a set ofguidelines on the precautionary approach to capture fisheries in **June 1995.** (FAO 1995) The guidelines were developed by an international group of 34 fishery management experts'. The guidelines have the following specifications for a precautionary approach to fishery management:

1. "Management according to the precautionary approach exercises prudent foresight to avoid unacceptable or undesirable situations ..."
2. "An important element of the precautionary approach is to establish legal or social management frameworks for all fisheries At a minimum, such frameworks should establish rules controlling access to fisheries (e.g. all boats must be licensed), data reporting requirements, and processes for planning and implementing more comprehensive fishery management."
3. "The precautionary approach accords due concern to long-term effects in specifying management objectives and in developing management frameworks, procedures, and measures. **Thus a** precautionary approach links fishery management intimately with general environmental management."
4. "Precautionary management involves explicit consideration of undesirable and unacceptable outcomes and provides contingency plans to avoid or mitigate such outcomes."
5. The operational interpretation of precautionary management will depend on the scale of the fishing operations and the state of the exploited system.
6. The precautionary method is included in all stages of the management process-management planning; implementation, monitoring, and enforcement; and re- evaluation of the management system.

2.2. *U.S. Legal and Institutional Framework for Fishery Management*

U.S. federal fisheries management is mandated by the Magnuson-Stevens Act of 1996, With jurisdiction over living marine resources extending to 200 nautical miles from the coasts. The National Marine Fisheries Service (NMFS) of the U.S. Department of commerce has the responsibility, to implement the Magnuson-Stevens Act with the assistance of eight Regional Fishery Management Councils created by the Act. Councils are charged with preparing and proposing fisheries management plans (FMP) within the respective regions, and NMFS is responsible for review, approval and implementation of such FMPs.

An FMP must meet 10 national standards specified in the Magnuson- Stevens Act and also be consistent with other applicable laws so that the FMP would constitute an integrated conservation management plan. First, the national standards require the Council FMPs to:

---

[2] The international group participated in the Technical Consultation on Precautionary Approach to Capture Fisheries organized by the Government of Sweden in co_operation with FAO. Sweden 6-13 June 1995

(1) prevent overfishing,

(2) be based on the best scientific information

(3) manage an individual stock or stock complex as a unit throughout its range

(4) be non-discriminatory against residents by states

(5) consider efficiency of resources utilization

(6) be flexible, relative to different fisheries

(7) minimize cost and avoid unnecessary duplication

(8) take into account the importance of fishery resources for fishing communities

(9) minimize by-catch and by- catch mortality, and

(10) promote the safety of human life at sea.

Secondly, the other applicable laws with which FMPs should be consistent, are generally concerned with the condition of marine resources, its impact on the marine fish habitat, and its effects on coastal environment and communities. These laws include the National Environmental Policy Act, the Coastal Zone Management Act, the Marine Mammal Protection Act, the Endangered Species Act, the Paper Reduction Act. and the Regulatory Flexibility Act.

Further, the Magnuson-Stevens Act and its related guidelines have specified procedures f'or both the Councils and NMFS for implementation of the Act. Some examples are: Council organization structure (e.g., membership composition and Council committee organization), FMP development and review procedures (e.g.. procedures for meetings and constituent input). FMP contents (e.g., management objectives and alternative options and environmental impact statement), and procedures for stock rebuilding. (SEC.(302)-(304), Magnuson- Stevens Act, 1996)

Thus, the U.S. federal fisheries management program is based on a wel l-established legal and institutional framework with prudent foresight to prevent undesirable outcomes (e.g. overfishing) and to take an ecological approach to fishery management (e.g., integration of marine-related issues in the fishery management framework). This constitutes one of the basic components of a precautionary approach to fisheries management put forth in the FAO guidelines for the precautionary approach.

2.3 Fishery Management *Plan (FMP) Development*

A Council is responsible for preparing FMPs with proper expertise and technical assistance from NMFS, state fishery agencies, academia and fishery interest groups. The expertise and assistance are recruited to the FMP process through various means:

(1) Appointment of council members with necessary knowledge and expertise to Council committees designated to develop the FMPs

(2) assignment of federal, state and university employees with proper expertise to a plan development team (PDT) working under the Committee

(3) recruitment ofknowledgeable industry members to form industry advisory panels to advise and assist both the committee and the PDT for the FMP development, and

(4) use of a Council scientific and statistical committee to advise on scientific and statistical matters. This ensures that FMP is based on the best information available and also involves the constituents for better communication, acceptance and compliance.

The FMP development process includes five general tasks discussed below:

(I) Identify management problems, specify management objectives, propose feasible alternative management options including management measures.

Management objectives are expressed in quantitative or qualitative terms. In practice. most objectives are qualitative in nature, indicating a direction of improvement toward a desired condition e.g., prevention of overfishing and improvement of efficiency. Options must be considered to attain the management objectives and include a "no action" option. A full suite of management measures is widely available to the council. The following measures are typically considered: Minimum fish size, fishing area closure, fishing season closure, fishing gear restriction, fishing permit requirement, eligibility for limited access to fisheries, effort quota, catch quota, individual vessel effort allocation, and individual vessel catch quota.

It should be noted, however, that the tide has turned in favor of access control, individual harvest rights and mandatory data reporting as regulatory measures for U.S fisheries (Sissenwine and Rosenberg 1993). More FMPs under development have considered and included mandatory reporting, access control, individual rights and transferability. Nevertheless, with uncertainty about the social and economic impact of individual quota systems, the 1996 amendment to the Magnuson-Stevens Act mandates that no new individual quota systems shall be put in place until October I, 2000. (SEC. 303. (d)(I), Magnuson Act 1996) This is considered as a cooling off period for further assessment.

(2) Analyze the management problems, objectives and options

Sources of data for analyses are many. A few examples are vessel perinit data, vessel fishing logbooks, dealer purchase reports, observer sea sampling data and resource survey data. In case of a lack of data. special data can be collected through experimental fishing authorized with special fishing permits and as appropriate, anecdotal information and expert opinion.

Analytical findings are delivered, discussed and debated in the Committee. PDT and/or Advisory Panel meetings. This mobilizes a decision- making process that is an important element in the precautionary approach. Meetings are held and allow comments from the public, implying effective communication to the constituents of the uncertainty and risk associated with fishery management programs. The effective communication could seemingly reinforce trust between the regulators and those regulated, and thus improve the enforceability and compliance that are needed to achieve the management objective, another feature in the precautionary approach.

(3) *Propose the preferred opt ion for adoption by the Council.*

On the basis of the above analysis and with inputs from the public, the Council Committee selects a preferred option for developing an implementation system consistent with MP objectives. The development of the implementation system and strategy is presented in Task (4).

(4) *Propose a set of regulations and a monitoring and re-evaluation system for the proposed option.*

Regulations are proposed in view of the intent of the policy, taking into account fishery behavior and the predicted change of behaviour. The proposed regulations are formulated by the Committee with inputs from constituents and the legal and enforcement staffs of NMFs and the U.S. Coast Guard.

The proposed monitoring and evaluation systems for FMP are established with proper responsibilities assigned. Two examples are cited below: Under the Northeast Multispecies (Groundfish) FMP Amendment 7. a Multispecies Monitoring Committee consisting of industry advisors and federal/state scientists has been instituted to monitor groundfish stocks, target TAC and recommend necessary adjustments to management measures. Similarly, parts of the Scallop FMP require a plan development team (PDT) to conduct a third-year review of its vessel days-at-sea (DAS) reduction program to evaluate a reduction of effective fishing effort for further consideration of management policy.

Data needed for monitoring and evaluation are specified in the FMP data reporting requirements. The data, in most cases. are parts of the existing data collection system. In some situations, data collection requires a separate data system design. For example, the real-time catch quota monitoring system for summer flounder was designed on the basis of add-ons to the existing dealer reporting system.

(5) Involve the constituents and other interested parties in Tasks (1)-(4) during the FMP development process.

The Magnuson-Stevens Act requires the involvement ofconstituents and interested parties. Any meeting convened by the Council, the Committee, the PDT and the Industry Advisory Panel are required to be publicized and kept open to the public for input and comment. Public hearings are held along the coast in fishing communities for important issues and decisions – e.g., a draft FMP proposed by the Committee and the adopted FMP by the Council before its submission to NMFS for review. A scoping document which initiates an FMP process for a fishery required in Task (1) also requires public hearings. {SEC.(302)(1), Magnuson-Stevens Act 1996))

Important components of the public review include

(1) the purpose and need for the proposed action

(2) the management objective and management approach,

(3) a summary of the proposed action and its alternatives, including every measure and its justification,

(4) a description of the resources and fisheries,

(5) a discussion of the proposed action relative to the national standards and overfishing,

(6) the relationship between the proposed action and the other applicable laws and

(7) an environmental impact statement.

One of the most important elements in an FMP is the specification of the overfishing definition. This specification defines a threshold criterion for triggering Council/NMFS actions to prevent any fishery from overfishing or rebuild overfished resources. It is an underpinning of a risk-averse precautionary approach for conservation that promotes sustainable yields from fisheries. The required actions are also specified in the Magnuson-Stevens Act and the overfishing 602 guidelines. Recent changes in the Magnuson-Stevens Act require an FMP to be developed to end overfishing on any stock currently over-harvested, and rebuild the resource with a planning horizon that does not exceed 10 years. {SEC.304(e)4 A(ii), Magnuson-Stevens Act 1996,) More detail will be available in Section III.

2.4. *National Marine Fisheries Service (NMFS) FAP Review and Implementation*

NMFS is the agency charged with the responsibility to review the FMP prepared and submitted by the Council. This review determines if the Council's proposed plan is consistent with the Magnuson-Stevens Act and other applicable laws both in content and substance. Are all components of an FMP presented'? Do the components meet national standards including the prevention of overfishing, and are they consistent with other applicable laws?

The review also assesses whether the proposed program can achieve management objectives while preventing overfishing. All aspects of the program (including biological, economic and social impacts; the program's enforceability; industry acceptance; and cost/benefit ratios) are evaluated in terms of management objectives.

In order to ensure timely management action, the NMFS review schedule is regulated by the Act and its guidelines. On or within five days of the Council's transmission of the proposed FMP, the NMFS should issue a notice inviting comments from the public about a Plan or plan amendment proposed by the Council, and allow a 60-day comment period. Within 30 days of the end of the 60-day comment period, the NMFS has to notify the Council of its disapproval and partial approval. Otherwise. the proposed plan or plan amendment would be considered approved. (SEC.304.(a)(I)-(5), **Magnuson** Act 1996). This will ensure timely action as recommended in the FAO guidelines for precautionary approaches.

Upon NMFS approval of a Council FMP, the NMFS also implements the FMP. The implementation consists of three major components: Regulation enforcement, FMP monitoring and evaluation. The enforcement is carried out by MMFS and the U.S. Coast Guard. and in some cases, in co-operation with states. NMFS monitoring systems and evaluation programs are based on the FMP's specification, and considering other NMFS requirements.

III Federal Fishery Management and Overfishing: Robustness of the Precautionary Approach

An FMP prepared and implemented under the Magnuson-Stevens Act shall prevent overfishing as stated in the national standard I of the Act. "Fishery, conservation and management measures shall prevent overfishing while achieving, on a continuous basis. optimal yield from each fishery for the U.S. fishing industry". (SEC.301(a)(I), Magnuson-Stevens Act 1996)

Implementation of the 1976 Magnuson-Stevens Act began and continued without a clear definition of overfishing and specific procedures to prevent overfishing. The related guidelines were also ambiguous on these issues. As a result, overfishing definitions in the early FMPs under the Magnuson- Stevens Act. if included at all, were based on various biological concepts and criteria. The ability, of the definitions to prevent overfishing was hard to assess and evaluate. Consequently, the issue ofoverfishing got escalated as time went on. It become obvious by the 1980s that an overfishing definition with a proper biological reference point was needed to improve the FMP. along with a set of clear guidelines for preventing overfishing. A reauthorization of the Magnuson-Stevens Act and the revised CFR part of602 Guidelines for an overfishing definition provided a comprehensive framework for the prevention of overfishing and for rebuilding overfished stocks.

With this reauthorization and the revised 602 overfishing guidelines, the Councils arc required to specify a quantitative overfishing definition for each stock in each FMP, regardless of the status of the stock

condition. The overfishing definition must be approved by NMFS and accepted as a threshold level by which a Council and NMFS determine whether and when to trigger necessary management actions to prevent overfishing and rebuild overfished stocks. With the overfishing definition, the Council and NMFS monitor and assess resource conditions for the species within their jurisdiction.

If a stock or stock complex is determined as one that is likely to approach the overfishing threshold level in two years or has already reached that level, the Council within one year of the such determination must prepare an FMP with management measures and regulations to prevent overfishing and to rebuild stocks for NMFS approval and implementation. If the Council does not submit NMFS a fisher) management plan, plan amendment, or proposed regulation to end overfishing and to rebuild the overfished stocks, NMFS must prepared a fishery management plan or plan amendmont and any accompanying regulations to stop overfishing and rebuild the stocks within nine months. The rebuilding plan must be monitored and re-evaluated routinely at least every two years and revised as necessary. (SEC.304(e)(1)-(5), Magnuson Act 1996).

3.1 U.S. 602 Overfishing Guidelines'

Overfishing defined without a standardized method often leads to a professional debate over the appropriateness of a particular overfishing definition. Historically, the task of evaluating whether an FMP is in compliance with national standard ! (to prevent overfishing) becomes a difficult task. often weakening under political pressure and subject to professional judgement. In order to evaluate an FMP effectively, relative to the national standard. NMFS sought to revise the 602 overfishing guidelines during the 1980s.

In 1986. a NOAA Fishery Management Study), recommended that NOAA set up a conservative standard for the fishery and take responsibility for determining a harvest level in each fishery to safeguard against recruitment overfishing. This ensures that the stocks would not be driven down or would be maintained at the threshold ofoverfishing, and it also establishes a maximum biological acceptable catch (ABC), However, Councils and NMFS regions indicated that it was not feasible to derive a single. generic definition of overfishing. Later, guidelines were developed, allowing the Council discretion to define overfishing in each FMP with a specified time frame and specific criteria to approve a definition of overfishing. In spring 1988, a series of Council/NMFS regional workshops was held to discuss the conservation standard and its implementation. A proposed rule was published and finalized as a final rule on July 4, 1989; it revised the 602 overfishing guidelines.

The current 602 guidelines require a definition of overfishing as a level or rate of fishing mortality that jeopardizes the long-term capacity of a stock complex to produce the MSY on a continuing basis. An objective and a measurable definition of overfishing must if possible be specified. Overfishing may be expressed in terms of a minimum level of spawning biomass, a maximum rate of fishing mortality, a formula, a model or other measurable standard that is designed to ensure the maintenance of the stock's long-term capacity. Moreover, the overfishing definition must be capable of monitoring and evaluation by NMFS and be based on the best scientific data. Councils are further required to take risk factors into

---

[3] The material in this section is drawn from osenberg et al(1994)

account in defining overfishing and focus on identifying and gathering the data needed for the overfishing definition if scientific data are severely limited.

The NMFS applied several criteria to evaluate the Council's definition of overfishing: scientific merit, the likelihood of effective Council action to prevent overfishing, a basis for measuring stock status against the definition, and operational feasibility.

Finally, while an FMP must contain the management measures necessary to prevent overfishing, the key to preventing it is the definition of overfishing, because it sets the threshold level to trigger management action to protect resources. Without a proper threshold, necessary action might not be taken or could bc delayed, even under the newer and more stringent guidelines. NMFS has taken its position on the matter of overfishing definition both in practice and in theory very seriously.

3.2. Status of the U.S. Overfishing Definition

In 1993, NOAA initiated a panel consisting of I5 scientists to review overfishing definitions in U.S. fishery management plans". {Rosenberg et al (1994) and Rosenberg and Restrepo (I995)) The panel reviewed approximately 30 theoretical and empirical studies done worldwide and arrived at the following conclusions regarding the overfishing definition as related to precautionary management reference points and strategies.

(1) Precautionary management reference points are those initiated to prevent recruitment overfishing. In order to be precautionary, it is more appropriate to assume that the spawning biomass or egg production is linearly related to recruit than to assume average constant recruitment at all stock sizes. Limit reference points for biological conservation should set the constraints within which a management strategy must operate and be case specific.

(2) It is useful to define control laws combining several thresholds, instead of a single threshold, to provide protection of resources. A combination of a maximum fishing mortality rate (that is a precautionary biomass level to which the maximum allowable fishing mortality rate is reduced) and an absolute minimum biomass limit may provide good protection for the resource.

(3) Nevertheless, a precautionary management strategy should contain. in addition to limit reference points, a priori decision rules on the acceptable probability (risk) that recruitment overfishing will take place, given the target harvest and the estimated stock status.

With the basic conclusions above, the panel proceeded to evaluate the overfishing definitions existing in the U.S. fishery management plans. The panel first selected evaluation criteria and specified an ideal definition of overfishing. The ideal definition should be a threshold rather than a target level, at least neutrally conservative in protecting against recruitment overfishing, measurable, linked to management actions, unambiguous operationally, and biologically suitable with no obvious need for improvement.

The panel considered and evaluated 117 overfishing definitions for stocks around the nation. Of the 11 7 definitions, 44 for the primary stocks were chosen for detailed analysis. The remaining 73 overfishing

---

[4] The material presented in this section is drawn from Rosenberg et al(1994) and Rosenberg and Restrepo(1995)

definitions that were designated as the secondary stocks, were analyzed in less detail. Presented below are the findings of the panel:

Four of the primary stocks (9%) met the criteria for the ideal overfishing definition and many of them (39%) met the criteria with minor improvements e.g., removal of ambiguity or linking to management actions. Seventy per cents of the definitions for the primary stocks were biologically sensible and 64%were at least neutrally conservative. Almost all of the primary definitions (96%) were measurable while 43% had some ambiguity. Only 45% used thresholds separate from management targets in the FMPs. The findings for the secondary stocks are similar.

Based on the evaluation, a sizable fraction of the definitions were considered risky for protecting the resource: 20% of the primary stocks and 9% of the secondary stocks. About a half of these definitions required modifications for a more conservative harvest rate. The other halfcould be improved by relating them more directly to stock productivity.

It was alarmingto have found that less than halfofall the definitions were explicitly linked to management actions. The overfishing definition is intended to set a management threshold for triggering more stringent management actions to protect the resource. Lack of the linkage might delay management actions and thus fail to protect resources.

The panel finally concluded that all of the definitions identified as risky, not measurable, ambiguous or not biologically sensible, should be reconsidered as soon a possible. Overall, the panel recommended that 77% of the definitions for the primary stocks and 88% of those for the secondary stocks be improved in further FMP amendments.

This review revealed that more was required to improve the U.S overfishing definitions to protect and rebuild the U.S. fishery resources under the Magnuson-Stevens Act.

3.3. New England Groundfish Example: Rebuilding Strategy

The New England Groundfish fisheries case study is selected because the fishery resources have been severely overfished and some important new management actions have been taken recently. In this example, the role of the overfishing definition and the 602 overfishing guidelines has been significant for the management of New England groundfish fisheries to date.

The US New England groundfish fishery exploits demersal marine groundfish species off the U.S. east coast from Maine to Virginia. This fishery has been an important source of jobs and incomes for the coastal communities in the Northeast region, New England in particular. However, the fishery resource base has declined to an all-time low in the last three decades. NMFS research trawl vessel surveys have documented a declining trend in the abundance of this groundfish resource from 1963 to the present. (U.S. Department of Commerce, January 1995)

The potential benefit of successful management is great as indicated by Anthony (I 993) and Edwards and Murawski (1993): “Overall groundfish landings were one-third the maximum sustainable yield (MSY). Landings for haddock and yellowtail flounders were one-tenth the MSY. If the abundance of groundfish were rebuilt to provide MSY, the catch could increase by two to three times with one- half of the present effort.” (Anthony 1993) The potential gains in resource rents and consumer benefits from efficient exploitation of the New England groundfish resources by the commercial fishing industries

was estimated to be roughly $130 million and $20 million a year respectively. (Edwards and Murawski, 1993).

3.3.1. *Management System'*

The First Groundfish FMP (1977-1982): Under the Magnuson-Stevens Act, in March 1977, NMFS adopted and implemented the Council's first groundfish fishery management plan (FMP) which included species catch quotas for cod, haddock and yellowtail flounder along with other measures e.g., minimum fish sizes, minimum mesh sizes and spawning area seasonal closures. Under this FMP, the number of U.S. vessels increased dramatically as the Magnuson-Stevens Act eliminated foreign fishing. The increasing number of U.S. vessels caught the quotas rapidly and forced the fisheries to close frequently and for long periods of time.

To prevent long closures and allow small boats to catch their historical share, a system of individual vessel trip limits was added to the catch quotas. Trip limits were eventually abandoned because of wholesale violations and inadequate enforcement resources. The industry called for less restrictive regulations devoid of quotas and closures. The Council responded with a new plan, commonly referred to as the interim groundfish plan.

Interim Groundfish Management Plan (1982-1986): The Council, in order to mitigate management problems, began to prepare an interim groundfish FMP in 1980 that was adopted in 1982 for a limited 3-year span. The interim FMP replaced the catch quotas with minimum fish size and net mesh size regulations for Georges Bank and the Gulf of Maine. Also included was a controlled framework to allow small mesh fisheries e.g., whiting and shrimp fisheries, to continue in the Gulf of Maine. With the implementation of this interim FMP, fishing exploitation rose, landings increased and resource abundance indices declined.

A Comprehensive Groundfish Fishery Management Plan (1986): To follow on the interim plan, a comprehensive groundfish FMP was implemented in 1986. This groundfish FMP set biological targets in terms of maximum spawning potential (MSP), based on spawning biomass per recruit analysis, and was also expanded to include more species in the management unit: cod, haddock, pollock, white hake, redfish, winter flounder, American plaice, witch flounder, and windowpane flounder. Ilowever, this FMP continued a management system and measures which were similar to those adopted in the Interim FMP. The important measures were fish size, mesh size and spawning area regulations as well as a framework for regulating small mesh fisheries. Direct controls on catch or fishing effort Ivere not included. Although this FMP was amended several times, the amendments generally fine-tuned the existing system and added more groundfish species into the management unit. The fishery remained open to access with a ominal requirement for vessel permits.

At the beginning of this FMP in 1986, a Groundfish Technical Monitoring Group consisting of NMFS and state biologists was instituted to monitor the performance of the FMP. In 1988, this Monitoring Group issued a report indicating that the FMP failed to protect major groundfish resources (i.e. cod, haddok and yellowtail flounders) from overfishing.

---

[5] The material in this section is primarily drawn from Wang (1993)

In July 1989, the NMFS reissued the 602 guidelines requiring(l) an overfishing definition to he specified for every fish stock in FMPs and (2) Councils to design and propose a stock rebuilding program for any stock that is overfished by the definition. In Amendment 4 to the groundfish FMP adopted in 199 1. the Council included the overfishing definition for most of the regulated groundfish species, and by those definitions, all stocks of cod, haddock, and yellowtail flounder were overfished. Nevertheless, the Council did not include a stock rebuilding program for the overfished stocks.

It should be noted, however, that the precautionary approach to the prevention of overfishing under the Mngnuson-Stevens Act and the 602 overfishing guidelines sometimes can be frustrated. The Council, on one hand, has the responsibility to protect the resources based on National Standard 1 and on the other hand, must be sensitive to the policy impact on fishing industries based on the National Standard 8. The impact on the industries particularly in view of the short-term need of the industries can be overwhelming and thus bias the Council decision. resulting in downplaying scientific input. It should he noted, also, that the concerns over the short-term impact are expressed through public comments in a transparent decision-making process, a feature of the precautionary approach.

Consent Decree: Following the NMFS approval of Amendment 4 in 1991. NMFS was sued by the Conservation Law Foundation (CLF) for implementing Amendment 4 that did not prevent overfishing of cod, haddock and yellowtail flounder stocks as required in the guidelines. A Consent Decree was reached between NMFS and CLF to reduce the groundfish fishing mortality by 50% in a S-year rebuilding schedule. In response to the Consent Decree, the Council prepared and submitted Amendment 5.

Amendment 5 to the Groundfish ***FMP*** 1994-1 995): The two main purposes of Amendment 5 were (1) to eliminate the overfished condition of the principal groundfish stocks (cod, haddock. and yellowtail flounder) by reducing the fishing mortality by 50% over the next 5-7 years, and (2) to reduce the by-catch of harbor porpoise in the sink gillnet fishery. (NEFMC September 30, 1993).

In pursuing its objectives, the Council amendment expanded the management unit to include all stocks of cod, haddock, pollock, yellowtail flounder, winter flounder (blackback), witch flounder (grey sole), windowpane flounder, American plaice (dabs). redfish. white hake, red hake, silver hake (whiting), and ocean pout. Further, the amendment included the following components as the core management system for the resource (NEFMC September 30, 1993).

(1) A moratorium on the issuance of additional vessel permits during the rebuilding period of 5-7 years with exceptions for smaller and lower power vessels.

(2) An effort control system allocating and limiting individual vessel days-at-sea (DAS)

(3) An effort reduction program to reduce the initial vessel DAS allocation by 10% each year and down to 50% of the initial allocation in 5 years.

(4) A continued mesh size regulation scheme for vessels retaining more than the groundfish "possession limit" that was currently set at 500 pounds.

(5) An interim sink gillnet regulation to reduce harbor porpoise bycatch using four-da), blocks of time during which all gear must be out of the water.

(6) The mandatory reporting of landings and fishing data by groundfish dealers and vessels respectively.

Amendment 7 to the *Groundfish FMP* (1996-): While Amendment 5 above was under development, the stocks of cod, haddock and yellowtail flounder continued to decline in abundance. In mid- 1994 as Amendment 5 was being implemented, haddock stocks were at record low levels, two yellowtail flounder stocks (Southern New England and Georgcs Bank Stocks) had collapsed and the collapse of Georges Bank stock was imminent, according to assessment scientists in the region. In August 1994, based on the SARC/SAW reports[6]. the Northeast Fisheries Science Center issued a Special Advisory Report (I) to state that the fishing mortality for the final-year of the S-year rebuilding schedule under Amendment 5 would not prevent the stocks from further decline and (2) to advise that fishing mortality rates should be reduced to as low a level as possible, approaching zero, to avert a collapse of cod and improve the prospects of rebuilding the yellowtail flounder stocks. Further, the status of the other groundfish stocks were also considered depressed with many of the stocks being overexploited. (NEFMC Amendment 7. *1996)*.

As a result, the Council initiated Amendment 7 with an objective "to reduce fishing mortality on Georges Bank cod, haddock and yellowtail flounder and southern New England yellowtail flounder to as close to zero as practicable, and also to reduce fishing mortality for Gulf of Maine cod to rebuild the spawning stock biomass of the identified stocks." (NEFMC Amendment 7, February 7, 1996) The biological reference point was F_{01} as the objective for Georges Bank stocks of cod, haddock, and yellowtail flounder and the Southern New England yellowtail flounder stock.

Amendment 7 was approved and implemented in May 1996. The Amendment extended the existing measures of Amendment 5. The limited access permit was expanded to cover small groundfish otter trawl and gillnet vessels between 30 and 45 feet which had an open access permit under Amendment 5. The DAS reduction schedule was accelerated with the new schedule for the 50% DAS reduction shortened by 2 years from a S-year schedule under Amendment 5 to a 3-year schedule under Amendment 7.

Some new measures were added to the above fine-tuned measures to enhance the precautionary approach in New England groundfish management.

(1) Target total allowable catch levels (TAC): Total allowable catch targets for the commercial sector were set for specific cod, haddock, and yellowtail flounder stocks (5 stocks in total) and an aggregate TAC for the combined stocks of the other regulated species (7 other groundfish species). Ifan individual stock or aggregate TAC is reached in any period (e.g. year), the Council must take actions to restrict catches in the next period.

(2) A Multispecies Monitoring Committee (i.e., a groundfish monitoring committee) consisting of industry representatives and assessment scientists from NMFS, states and the Council has been instituted and is charged to track DAS and TAC utilization, assess the groundfish stocks and make proposals on necessary adjustments to the management measures relative to the FMP objectives.

(3) A Certification of the Bycatch Fisheries Program: This program has been put in place to minimize bycatch and the mortality of the bycatch of the regulated groundtish. Vessels with no groundfish DAS quotas are not allowed to fish in Northeast groundtish fishing areas unless the Regional

---

[6] The SARC/SAW reports are biological asessment reports and advices for fishery managers and based on the stock assessment studies conducted by a team of biologists from NMFS and states

Administrator certifies that the vessels involved can achieve a groundfish bycatch less than 5% of the trip catch.

3.3.2 Economic Assistance Programs

The U.S. Department of Commerce, the supervisory agency of NMFS/NOAA, initiated two economic assistance programs parallel to but independent of Amendments 5 and 7. In 1994, the first program was initiated tomitigate the impact of Amendment 5 on the fishing industries and communities. This economic assistance program consisting of a $30 million grant was designed to assist the fishing industries and communities by including grants for developing alternative fisheries (i.e., underutilized species and aquaculture), improving fishery infrastructure, training fishermen for alternative jobs, and promoting community development.

The second program under implementation is a voluntary vessel buyback program for reducing the fishing capacity of the groundfish fleet. The buyback program with a budget of $25 million has two parts, a pilot project of $2 million and a follow-up project of $23 million. The pilot project, which has been completed, was to establish program procedures and identify evaluation criteria. Detailed procedures are now available and used in the second project. The procedures include the owner's proposal for selling his groundfish vessel to the U.S. federal government with a proposed vessel price. One criterion to establish the vessel purchase priority is the ranking of the vessels by the ratio of the vessel's groundfish revenue to the proposed vessel price: The higher the ratio, the higher the priority for the vessel to be bought by the federal government. The pilot project with a $2 million budget bought and retired I I groundfish vessels with a total of 9 11 GRT, 4355 horsepower and 2 106 vessel days at sea (DAS). With a linear extrapolation, the $25 million budget is estimated to retire 1 1,388 GRT, 54,438 horsepower and 26,325 DAS. The estimated days at sea quota to be retired is approximately 20% of total DAS quota under Amendment 5[7].

IV Summary

The U.S. Federal Government has managed the fisheries resources within the U.S. EEZ under the Magnuson-Stevens Act since 1977. By 1995, there were 36 fishery management plans (FMPs) in place and in 1995 alone, National Marine Fisheries Services (NMFS) issued 623 notices through the Federal Register to implement FMP management actions and rules for domestic fishing. An examination of the U.S fishery management experience indicates a need for continual improvement and the adoption of more precautionary principles in management systems and strategies.

Even though the U.S fishery management program may not be perfect, it should have enough components to be considered precautionary based on FAO precautionary principles and guidelines issued in 1995. The U.S. legal and institutional framework has been well established and mandated by the Magnuson-Stevens Act and other applicable laws. The fishery management program is not only prudent to avoid unacceptable situations (e.g., to prevent overfishing) but also has a long-term objective (i.e. to achieve an optimal yield. on a continuous basis for each fishery),

---

[7] The estimated 26,325 DAS quota to be retired under the $ 25 million vassel buyback program accounts for about 30% of the DAS quota of the active ground fish vessels which used a DAS phone in system in 1995.

The guidelines for the process of the FMP development. review. and implementation are well specified for all FMPs around the nation. Each step of the process is concerned with the achievement of management objectives, national standards and other applicable laws and gives detailed consideration to a variety of issues: Resource conservation and protection. prevention of overfishing, stock rebuilding. use of the best information. uncertainty associated uith a complex environmental system and management outcomes. transparent decision processes. public input and comments, the FMP impact on the industry. industry compliance, enforceability of rules and regulations, and responsiveness and effectiveness of an FMP in dealing with changing conditions. The U.S. FMP process has resulted in different management systems including limited access programs, harvest rights and the transferability of the rights.

An important feature of the U.S. fishery management program is its overfishing definition and its related guidetincs for resource protection. The Magnuson-Stevens Act and 620 overfishing guidelines require the following: (I) Each FMP must define an overfishing definition for each of the species covered in the FMP and the overfishing definition should be specified as a threshold level of biological reference points. (2) Each FMP should establish a management program with a time schedule for preventing overfishing of a stock if the stock is approaching the overfishing, threshold level or for rebuilding a stock if the stock is below the overfishingthreshold level. The implementation of the overfishing definition has made a serious impact on the FMP process and on the status of the fisheries. NMFS has taken action to review U.S. overfishing definitions and implement the overfishing guidelines to protect U.S. fishery resources.

Management of groundfish stocks in New England can be considered an example of the U.S. fishery) management program that has dealt with overutilized groundfish resources since the hlngnuson- Stevens Act with limited success. The Act and the 602 overfishing guidelines along with the involvement of the public (i.e., the Conservation Law Foundation) have altered the strategy for managing the New England groundfish fisheries. The new fishery management program is different from the traditional program in that it includes an overfishing definition for each groundtish stock, a stock rebuilding time schedule with an overfishing threshold level, a limited access program, a vessel days-at-sea (DAS) quota system with a DAS reduction schedule, and necessary enforcement, monitoring and evaluation systems. Also included in the strategy are twoeconomic assistance programs to mitigate the impact of the management program on the industries and to reduce the fishery harvesting capacity of the fisheries. These include a $30-million grant to mitigate the economic impact and a $25-million vessel buyback project to reduce the harvesting capacity.

V. References

[1] **Anthony, V.** C., March 1993 “The State of Groundfish Resources off the Northeastern United States”, *Fisheries,* Vol. 18, No. 3.

[2] **Edwards S.F.and S A Murawski.** 1993. “Potential Economic Benefits from Efficient Harvest of New England Groundfish”. *North Amer J Fish Management 13:437-449.*

[3] **Food and Agriculture Organization of the United Nations** (FAO). 1995. Precautionary, approach to fisheries. Part I : Guidelines on the precautionary approach to capture fisheries and species introductions. *FAO Fisheries Technical paper 350/ I*

[4] **Food and Agriculture Organization of the United Nations** (FAO). 1995. Precautionary approach to fisheries. Part 2. Scientific papers. *FAO Fisheries Technical Paper 350/2.*

[5] **National Marine Fisheries Service** (NMFS), July 1989 Guidelines for Fishery Management Plans, 50 CFR Part 602.

[6] **National Marine Fisheries Service, Silver Spring,** MD, May) 9, 1991. Potential economic benefit from improved management and utilization of U.S. marine fishery resources: summary) analysis.

[7] **National Marine Fisheries Service** (NMFS), 1996. Our Living Oceans. Report on the Status of U.S living marine resources, *1995 U.S Deparment of Commerce, NOAA Techn. Memo* NMFS-F/SPO- 19, 160p.

[8] **New England Fishery Management Council** (NEFMC), September 30, 1993. Amendment #5 *to the northeast multi-species fishery management plan incorporating the supplemental environment impact statement* Vol. 1, 11, IV.

[9] **New England Fishery Management Council** (NEFMC), *Amendment #7 to the northeast multi-species fishery management plan incorporating the supplemental environment impact statement* Vol, I, II, IV.

[10] **Rosenberg A** et al 1994. Scientific Review of Definition of Overfishing in US Fishery Management Plans, *NOAA Technical Memorandum* NMFS-F/SPO- 17.

[11] **Rosenberg A A and V R Restrepo** 1995. "Precautionary Management Reference Points and Management Strategies", Precautionary approach to fisheries: Part 2: Scientific papers. FAO *Fisheries Technical Paper 350/2* (pp. 129- 140).

[12] **Sissenwine, MP and A A Rosenberg,** 1993. Marine Fisheries at a Critical Juncture" *Fisheries* Vol 18, No 10.

[13] **U S Department of Commerce** January 1995, Status of Fishery Resources off the Northeastern United States for 1994, *NOAA Technical Memorandum* NMFS-NE-108 January 1995.

[14] **U S Department of Commerce,** NOAA, NMFS July 1996, Fisheries of the United States 1995, July 1996. *Current Fishery Statistics No 9500*

[15] **U S Department of Commerce, NOAA,** NMFS 1996. *Magnuson-Stevens Fishery Conservation and Management Act:* As Amended Through October 11, 1996.

[16] **Wang, S.D.H** December 1993, the U S Northeast Groundfish Fishery: Resource Base, Fishing **Industry** and Management system. *National Marine Fisheries Service,* Gloucester, MA 0 1930.

12. OVERVIEW AND PRACTICAL IMPLICATIONS OF THE PRECAUTIONARY APPROACII TO FISHERIES MANAGEMENT

G.L. Preston
Preston and Associates
Noumea, New CaledoniaGillett,

Introduction

The precautionary approach to fisheries management (PA2FM) is a concept which has been under development for some time and has aroused considerable debate at the theoretical or academic levels. The purpose of this paper is to present some ideas on possible practical implications of the PA2FM. both for fisheries managers and for the fishing industry, and to promote discussion of these topics.

For the purpose of this paper "practical implications" are taken to mean :

- considerations which may facilitate or prevent the widespread adoption of the PA2FM;
- operational systems that will have to be put in place to allow practical implementation of the PA2FM.

A number of relevant ideas are discussed on the basis of general observations and literature. A case study illustrates some of these issues.

Because there has been little practical application of the concept so far, much of what follows is based on the author's personal observations or opinions (encountered mainly in the South Pacific and Australasia). They should be viewed as discussion points rather than as concrete facts or assertions.

Management versus development

Many people in the fishing industry, as well as working, fisheries officers and managers, see a clear distinction between fisheries development and fisheries management.

Development is frequently perceived in relation to fishery growth – more fishing units, shore bases and processing factories, increased production and greater exports. Development may be driven entirely, by the private sector, or may involve Government providing financial assistance or investment incentives to the fisheries sector in order to allow fishery exqploitation to begin or to grow. In some countries, Government may get directly involved in commercial fishing ventures, in order to compensate for shortage of venture capital, raise Government revenue generate foreign exchange, or for other reasons. Development tends to dominate the thinking of fisheries administrators and public officials in developing countries.

Management, on the other hand, is often perceived as a response to development, especially if this has been excessive or over-rapid, and frequently takes the form of reaction to a crisis. Fisheries officers may view management in purely pragmatic terms, such as the control of fishery input (e.g. fishing effort, in the form of limits on numbers of fishing units, gears types, closed arcas and seasons) or outputs (e.g. production limits, expressed as quotas, size regulations and species restrictions) to solve an immediate problem. Fishermen or members of industry may see management as a form ofbureaucratic interference with their livelihood, and the placing of obstacles in their way.

The precautionary approach is generally seen as an 'extreme' form of management. under which these perceived burdens and obstacles will he even more extensive. This view is reflected, for instance, by the NGO declaration from the FAO World Food Summit held in Kyoto, Japan in November 1995. The declaration recognised that improved management of the world's fisheries was a basic requirement to enhancing the contribution of fisheries to food security. At the same time. however, it expressed concern that the precautionary approach to fisheries management might be implemented in such a way as to impose esccssive burdens or constraints on industry.

This divergence seems to characterise feelings about fisheries management in general and the PA2FM in particular, and stems from broader attitudes towards natural resource use and the environment. In many developed countries, active and vocal conservation groups have succeeded in raising widespread awareness of environmental management issues, to the point where one might reasonably imagine that the precautionary approach should be more easily embraced by these societies. For example in Australia the population is increasingly environmentally-minded and all commercial fisheries are managed through sometimes complex arrangements involving Government. industry, and local communities. Even there. however. the precautionary approach is perceived by industry and by many officers of the Australian Fisheries Management Authority as being potentially too restrictive on commercial activity. These reservations may stem from lack of a clear indication of what the PA2FM means in practical terms. Nevertheless it is not surprising that in many developing nations, where the focus is still on increasing the economic returns from fisheries, the precautionary. approach may be viewed with suspicion or lack of enthusiasm.

Perhaps the most immediate practical implication of the PA2FM, therefore, is one of perception. At present, the precautionary approach is widely regarded with doubt and lack ofconviction even by, those who acknowledge that there is a serious problem with present systems offishery management. It may be viewed with outright hostility by those who do not share this perception. Before the precautionary approach can be widely embraced, a shift in thinking is required on the part of both the fishing industry and fishery administrators, so that management ceases to be viewed as being different from, or opposed to, development.

For industry and the public at large achievement of such a change in attitudes may be a long-term process that will probably arise only as a result of broad public education programmes. In developed countries, growing environmental concerns have arisen mainly as a result of resource misuse. Developing countries may have to undergo similar negative experiences before concern over environmental issues such as fisheries management takes root in the minds of the public at large.

In the case of fishery administrators, where acceptance of the PAIFM really needs to be instilled over a shorter time-frame, a change may be needed in the way training in fisheries management is delivered, so that the perception of management as a reaction or response to development is de-emphasised in favour of more holistic approaches which view development and management as components of the same process. The first responsibility of many fisheries officers and administrators is to promote fisheries development. If PA2FM is to be taken up, management concepts need to be better integrated into development thinking.

Indeed such changes appear to be taking place already in some parts of the BOBP region. For instance, the introductory notes to a training course to be run in Sri Lanka in 1996 defined management as "the process of having a fishery perform in accordance with established objectives"'. This contrasts sharply

with the often-seen more 'traditional' definition of management as "the exercise of controls in order to limit or reduce fishing effort or output". It underlines the fact that management and development should be integrated, inseparable activities, rather than action-and-reaction.

How the PA2FM differs from present fishery management systems

Whereas 'traditional' definitions- or at least implementation of fisheries management are characterised by reaction to and solution ofproblems, the precautionary approach attempts to ensure that problems do not occur in the first place. The PA2FM proposes that development should not proceed blindly, and that restraint be exercised where there is a lack of certainty about the ability of the resource to withstand increased exploitation. The precautionary approach thus puts the emphasis strongly on prevention rather than cure.

The PA2FM also proposes that the burden of proving whether a resource can withstand increased exploitation be shifted from fishery administrators to the developers themselves, thus shifting some of the responsibility for resource assessment and environmental audit on to those who will benefit most directly from its exploitation.

Traditional forms of fishery management rely on concepts such as Maximum Sustainable Yield (MSY) or Optimum Economic Yield (OEY) to provide management targets. However, as our knowledge of aquatic ecosystems gradually improves, and we begin to understand more about their complexity, it is becoming increasingly clear that such concepts may over-simplify the dynamic nature of fisheries. MSY, for instance, is probably not static for rnost resources : it may vary over time as a function of natural fluctuations in the target fish stock and in response to changes in the ecosystem of which the stock forms a part. Sometimes these changes may be human-induced – for instance the establishment or closure of another fishery for predator or prey species of the exploited stock. A simplistic MSY-based production target which is held constant for long periods may therefore lead to "under-exploitation" in some years but, depending on the reproductive characteristics of the resources, could cause serious depletion in others. Over the long term, MSY estimates may go out of date because of other changes not directly related to the fishery, such as the impacts of coastal degradation or global climate change.

In addition, natural systems contain a great deal of variability, and the data that we collect on those systems is subject to sometimes extensive statistical uncertainty. Many fishery scientists now doubt the ability of standard modeling techniques to predict MSY for even intensively-studied stocks with any confidence. Carl Walters, a well-known fishery scientist, told a meeting of Australian fishery scientists in 1996 that he was not aware of any fishery in the world where a sustainable quota could be truthfully said to be assessable within an accuracy of 40% (Walters. 1996)'. This is in stark contrast to, for instance, Indonesia's fisheries development plans which use MSY estimates rnade 21 years ago as a production

[1] Anon. (1996) Introduction to the objectives and strategies of management, Lecture material, Marine
[2] Fisheries Management Project (SRL/91/022). Colombo Sri Lanka.
[3] Walters, C.(1996) Sharing The High Cost Of Effective Fisheries Management, Fisheries Management Paper No. 88. Proceedings of the Third Australasian Managers Conference, Fisheries Department of Western Australia,

target, and which measure the "remaining potential" (the difference between current production and MSY) to one-tenth of one per cent of these targets (Gillett, 1996)[3].

In the late 1980s, Walters and another well-known fishery scientist, Ray Hilborn, argued that a fishery system can best be understood by perturbing it – for instance, by exploiting it and then measuring its responses to these perturbations. If we are faced with a system that we have not perturbed such as a virgin fishery -we have no way to know what its characteristics are or to estimate what its productive potential might be, because we have no data on the response of the stock to exploitation. In practical terms, therefore, where there is no exploitation, we cannot realistically determine our management targets, whether this be MSY or some other appropriate management goal, as long as these targets are expressed in terms of production.

To counter the shortcomings of management based on static and probably inaccurate MSY estimates, Walters and Hilborn suggested the use of 'adaptive' or 'experimental' management as a means of better tailoring the exploitation of a resource to its productive potential. Under the adaptive approach, increasing levels of exploitation are allowed to take place but are carefully monitored, and their impact on the resource is measured. Management steps are taken in response to perceived changes in the resource by frequently adjusting effort or other parameters in the fishery. In this way the MSY or some other management target is approached in an empirical f&ion, sometimes from the 'other side' after having been exceeded. The adaptive approach permits increased exploitation in times of stock abundance and decreased exploitation when resources are diminished, and thus gets away from the idea of a permanently fixed, unchanging MSY-based production target.

Unfortunately one of the problems with adaptive management is that it assumes that effort can be easily controlled and can be reduced when required. Sadly, experience shows that this is often not the case. When effort reaches levels that are too high for the fishery, it can be extremely difficult or impossible to pull back. Fishermen and businesses may have invested heavily and the enforcement ofregulations that will reduce their incomes or force them out of the fishery may be socially or economically unacceptable. It may prove politically easier to provide susbsides which allow the fishery to keep operating at higher-than-ideal levels ofexploitation. Once it reaches or exceeds production targets, therefore, the management of the fishery ceases to be simply a question of fish biology or population dynamics, and takes on political and socio-economic dimensions which may present problems that cannot be solved in a manner consistent with resource conservation.

The PA2FM recognises this difficulty, and advocates the converse of adaptive management. Instead of using fishing effort as a means of gathering data, the PA2FM attempts to constrain exploitation in the face of inadequate data. Because of this approach, the PA2FM may be better viewed as a form of risk management than production management. Garcia (1995)[4] suggests that instead of setting management goals in terms of a fishery's productive potential, it may be more appropriate to set the risk ofeconomic

---

[3] Gillett, R.D. (1996), Marine Fishery Resources and Management in Indonesia with emphasis on the Extended Economic Zone, Workshop on Strengthening Marine Fisheries Development in Indonesia. Directorate General of Fisheries /FAO

[4] Garcia, S.M. (1995). The Precautionary Approach to Fisheries with reference to Starddling Fish Stocks and Highly Migratory Fish Stocks, FAO Fisheries Circular No.871

or biological collapse at what we consider to be an acceptable level. FAO (1995)[5] develops this idea further by advocating the use of 'minimax' and 'maximin' approaches which use probabilities tables depicting the relative risks of different management strategies in order to select the most acceptable management option.

Precautionary fisheries planning and monitoring

The PA2FM requires that, instead of proceeding blindly, fisheries development should be constrained so that exploitation does not exceed predetermined limits. These limits may be applied to a number of different factors in the fishery-total production, mortality rates, inputs, rate of fishery growth, probability of stock collapse, etc. The basic requirement, however, is that even for new or obviously underexploited resources, fisheries development should be planned rather than haphazard. As mentioned earlier. this requires that the processes ofdevelopment and management, often seen in the past as being independent or counter-acting, should be integrated under the PA2FM, so that management becomes a component of development which itself proceeds according to predetermined methods and goals.

In practical terms, this means that if the precautionary approach is to be followed, formal fishery plans must be put in place, even for unexploited or under-exploited resources. Development targets and limits must be set and mechanisms established that will put a brake on the growth of the fishery when they start to be approached. Similar steps must be taken for those fisheries which are already being exploited. and must be accompanied by additional and possibly difficult measures to reduce exploitation levels if these are thought to be too high.

Fishery development and management plans should not regarded as static and unchanging. They should specify overall management objectives and specific goals for the fishery but these should be subject to revision and modification as information accumulates and the fishery becomes better understood. The plan should include management measures to be applied in response to specific events in the fishery. These measures should be pre-determined, and non-discretionary, although this in itselfmay be difficult to reconcile with the idea of adaptability and flexibility. There is always the danger that provision for revising and updating management plans might be used as an excuse for avoiding politically difficult management actions when they are needed.

A fundamental requirement for any kind of fishery planning is basic data on harvesting practices and catch levels. Probably the most important practical requirement of the PA2FM, therefore, is the implementation of adequate fishery monitoring systems. In the case of fisheries'involving the licensing of larger commercial and industrial vessels, the principal means of doing this should be through the imposition of compulsory logsheets for fishing vessels under which fishing skippers or owners are required to submit appropriate catch and effort data both regularly and promptly. Non-compliance with this requirement can be used as grounds for non-renewal offishing licences and is a particularly powerfull tool in regard to foreign vessels.

[5] FAO (1995). Precautionary Approach to Fisheries. Part 1: Guidelines on the Precautionary Approach to Capture Fisheries and Species Introductions. FAO Fish Tech Paper 350/1.

Depending on the nature of the fishery, it may also be desirable to supplement logsheet data collection systems with the use of on-board observers, port samplers. or other independent means of gathering data on fishing operations. This not only allows checking on the compliance of fishing vessels with data reporting requirements (for instance, logsheet data can be checked against unloading data at canneries or processing plants to ensure that no false repot-ting has taken place) but also permits gathering of supplementary information on such factors as size composition, reproductive condition and by-catch and discard practices.

Other research activities may also need to be instituted in line with the requirements of PA2FM. This is especially so in regard to smaller-scale or artisanal fisheries where logsheet-based data gathering systems would be impractical or unacceptable and where for whatever reason, licensing is not an appropriate management tool. Depending on the situation, the focus may need to be on biological or socio-economic information-gathering. The cost ofgathering this data may be substantial and may represent an additional burden for fisheries administration and / or the fishing industry.

Irrespective of how it is carried out and financed. the purpose of data gathering should be to allow development and retinement of fishery management plans, monitoring of the status of the fishery. evaluating the impact on the fishery of the management measures taken, and further refinement of the fishery management plan in response to this knowledge.

The PA2FM and overfishing

Although MSY or OEY are frequently cited as fishery management targets, there is a wide range of production levels at which a fishery can be sustained. If effort is maintained at low levels, catch per unit effort (CPUE) will be high, even though total yield may be low. At higher levels of effort total yields will increase as CPUE decreases, until the MSY is reached. Once this point is surpassed. total fields will start to fall again as CPUE continues to decline. and the fishery experiences growth overfishing. With still higher effort the fishery may suffer recruitment overfishing which can lead to stock collapse.

Of these four scenarios, the first three can exist as stable states producing sustainable levels of production. The third condition is sometimes referred to as “sustainable overfishing” and is a state in which both total yield and CPUE are lower than they could be, but in which participation in the fishery and the distribution of benefits from it are maximised.

Overfishing is rarely stated or even considered as a management objective, but in fact sustainable over-fishing is not an illogical management target if the economic goal is to distribute income as widely as possible. Furthermore, subsidising a fishery in order to place it in a state of sustainable overfishing may in some circumstances be a valid and efficient economic strategy (and in fact is a de facto result of the subsidies that are currently causing overfishing of many of the world fisheries). Unfortunately, fisheries in this state, especially open-access fisheries, can and usually. do progress to the next phase, which is unsustainable overfishing and stock collapse. Because of this risk, the concept ofsustainable overfishing is incompatible with the precautionary approach to fisheries management.

A characteristic of the precautionary approach when applied to fisheries that are currently being over-fished is that. even though it may reduce total landings. it should lead to improved economic performance of fishing units by improving per-vessel catches. This comes about because the PA2FM attempts to ensure that fisheries are not exploited above their MSY due to the unacceptably high levels of risk this

entails. The net result of applying the PA2FM to a heavily fished stock, therefore, is that CPUE will increase (although normally this would be at the expense of some vessels having to leave the fishery).

Whether this characteristic would be perceived positively or negatively depends on circumstances of the fishery in question, and Government's broader social and economicgoals. Ifwide income distribution is a stated economic target, as it is in many poor or developing countries, then reducing the numbers of people who benefit directly from the fishery may be an undesirable outcome.

Resistance to the precautionary approach

As noted earlier, major parts of the fishing industry and even many fisheries managers are apprehensive that the PA2FM will unreasonably constrain fishing activity, cause unnecessary economic loss or hardship, or burden the industry with extra costs and administrative obstacles.

A major concern is the 'burden of proof' aspect of the PA2FM, under which the onus is shifted to developers to demonstrate the capacity of the resource to withstand any increased exploitation they may intend. It is not yet entirely clear how this provision will be implemented by countries who formally adopt the precautionary approach. However, similar requirements have been imposed on other industries. For instance, most major construction or infrastructure development projects are now required to carry out environmental impact assessments and adjust their projects to minimise or compensate for these impacts. The 'burden of proof requirement of the PA2FM may be comparable to such requirements. Fishing industry managers are concerned that this will impose major cost burdens on them.

Many fisheries managers, for their part, doubt that the fishing industry can be trusted to carry out resource or environmental impact assessments thoroughly and honestly when these may produce results which are counter to the industry's own best interests. Mechanisms whereby such assessments could be carried out and then reviewed by the appropriate fishery management authority are still to be developed in most countries. If assessments were to be carried out directly by industry, there would be a need either for pre-determined standard methodology to be developed, or for a qualified, disinterested body to review the assessments and determine whether they had been conducted diligently and objectively. Arbitration procedures would probably need to be set up to deal with disputes over the veracity or reliabi t ity of impact assessments.

An alternative to industry carrying out resource or impact assessments directly would be to have these tasks carried out by fisheries management authorities or joint Government/industry bodies, and charge the cost back to industry, or otherwise build them into the overall costs of fishery management. There is a growing trend in some countries to transfer the cost of managing fishery resources onto the resource users and principal beneficiaries, and away from the general public. This is typically done through levies on fishermen, for instance through a tax on catches or quota allocations, Such a system removes many of the objections to the concept of industry carrying out its own analyses, but creates a new set of problems in that it requires fishery management agencies to have access to practical skills, facilities and resources that they may currently not possess.

Irrespective of the means through which the 'burden of proof' provisions of the PA2FM are put into practice, there is a danger that they could add significantly to the total cost of fisheries management and that at least some of this cost could be transferred to industry. This factor is unlikely to encourage industry support and may be used to provoke anti-fisheries management opinion on the grounds that

Depending on the nature of the fishery, it may also be desirable to supplement logsheet data collection systems with the use of on-board observers, port samplers. or other independent means of gathering data on fishing operations. This not only allows checking on the compliance offishing vessels with data reporting requirements (for instance, logsheet data can be checked against unloading data at canneries or processing plants to ensure that no false reporting has taken place) but also permits gathering of supplementary information on such factors as size composition, reproductive condition and by-catch and discard practices.

Other research activities may also need to be instituted in line with the requirements of PA2FM. This is especially so in regard to smaller-scale or artisanal fisheries where logsheet-based data gatherings\ stems would be impractical or unacceptable and where for whatever reason, licensing is not an appropriate management tool. Depending on the situation, the focus may need to be on biological or socio-economic information-gathering. The cost ofgathering this data may be substantial and may represent an additional burden for fisheries administration and / or the fishing industry.

Irrespective of how it is carried out and financed, the purpose of data gathering should be to allow. development and refinement of fishery management plans, monitoring of the status of the fishery, evaluating the impact on the fishery of the management measures taken, and further refinement of the fishery management plan in response to this knowledge.

The PA2FM and overfishing

Although MSY or OEY are frequently cited as fishery management targets, there is a wide range of production levels at which a fishery can be sustained. If effort is maintained at low levels, catch per unit effort (CPUE) will be high. even though total yield may be low. At higher levels of effort total yields will increase as CPUE decreases, until the MSY is reached. Once this point is surpassed, total yields will start to fall again as CPUE continues to decline, and the fishery experiences growth overfishing. With still higher effort the fishery may suffer recruitment overfishing which can lead to stock collapse.

Of these four scenarios, the first three can exist as stable states producing sustainable levels ofproduction. The third condition is sometimes referred to as “sustainable overfishing” and is a state in which both total yield and CPUE are lower than they could be, but in which participation in the fishery and the distribution of benefits from it are maximised.

Overfishing is rarely stated or even considered as a management objective, but in fact sustainable over-fishing is not an illogical management target if the economic goal is to distribute income as widely as possible. Furthermore. subsidising a fishery in order to place it in a state of sustainable overfishing may in some circumstances be a valid and efficient economic strategy (and in fact is a de facto result of the subsidies that are currently causing overfishing of many ofthc world fisheries). Unfortunately, fisheries in this state, especially open-access fisheries, can and usually do progress to the nest phase, which is unsustainable overfishing and stock collapse. Because of this risk, the concept ofsustainable overfishing is incompatible with the precautionary approach to fisheries management.

A characteristic of the precautionary approach when applied to fisheries that are currently being over-fished is that, even though it may reduce total landings, it should lead to improved economic performance of fishing units by improving per-vessel catches. This comes about because the PA2FM attempts to ensure that fisheries are not exploited above their MSY due to the unacceptably high levels of risk this

economic development is being sacrificed or subject to unreasonable bureaucratic requirements. Under such circumstances the PA2FM may continue to be widely perceived in a negative way and resisted.

Another area of concern over the PA2FM is the way in which it would apply to multi-species fisheries. Many fisheries, especially those in the tropics, take more than one species, either as targets or as by-catch. These different components of the catch have different population dynamics and productive potentials and are harvested at different rates. In many multi-species fisheries one or more target species may be over-exploited while others may still be able to withstand increased exploitation, but the fishing gear is unable to selectively target these latter. An example is the international tuna fishery of the Western-Central Pacific Ocean, where bigeye and albacore (1995 harvest : about 300,000 tonnes) are thought capable of yielding higher catches. In such cases there is concern within the fishing industry that the PA2FM will result in the placing of limits on under-exploited resources in order to conserve over-exploited resources. The first landed value of this fishery was estimated at around US$ 1.7 billion in 1995, so the potential losses to industry are high if the PA2FM were indeed to have the effect of capping or reducing production.

A case study

Small-scale longlining for tuna is developing as a domestic industry throughout the Pacific Islands region. Many of the region's 22 countries and territories aspire to have locally-based fleets fishing within their national waters and exporting the catch by air to Japan to supply the high-price sashimi market. At least ten countries of the region now hnvc such locally-based fishing fleets, all of which have developed in the last five years.

The tuna resource in the Western Central Pacific Ocean is a shared one. For those Pacific Island countries with large EEZs (and some are very large) a part of the tuna stock may be considered resident, and may be manageable at a national level. For many countries. however, tuna resource management needs to be carried out on an international basis if sustainable use is to be achieved. Tuna resources in some countries, especially those with smaller EEZs, may be impacted very significantly by fishery developments in "upstream" or neighbouring countries.

In 1992, the Government of one country of the region undertook a review of its efforts to develop a local tuna longline fishery (in fact the study was supported by FAO). The review recommended changes to national licensing policy with the aim of putting in place a cap on the number of vessels operating in the fishery. At the time about 55 boats were operating, most of which were locally owned, with a few on charter or under foreign licence arrangements. After considerable internal debate, and the views of industry and other Government Departments were canvassed, the Fisheries Department set the cap at 50 licences, even though the FAO review had suggested a maximum number of 80 vessels. Preference was to be given in the licence allocation process to locally-owned vessels.

The cap was not determined on the basis of resource considerations. Tuna resources in the country's national waters were not felt to be threatened by this number ofvessels, and in any case such an attempt to manage the resource would probably have been futile in the absence of parallel management efforts by neighbouring countries. In fact a more cynical approach might have been for the country to over-develop its local tuna fleet in the hope that this would be supported by in-migration of fish from neighbouring countries.

Rather. the 50-vessel limit was a conscious and deliberate attempt by the Fisheries Department to prevent over cnpitalisation of the fishery and to establish a situation in which a smaller number of vessels would operate more profitably, instead of having a larger nurnber of vessels with marginal operating economics. It was hoped that this approach would allow the fishery to be sustainable even in the face of falling catch rates, and avoid the problems of vessels going out of business and the possible failure of onshore processing and export activities. The Department judged that the cost of the fishery failing or undergoing economic decline would be greater than the revenues that would be foregone by limiting total catch through a cap on vessel numbers. The industry supported the Department's approach, since it meant no new entrants to the fishery to compete with the existing vessels.

Unfortunately not everybody supported the precautionary approach that the Fisheries Department was attempting to apply. The National Investment Bureau formally complained to the Ministry of Trade and Industry that the Fisheries Department was impeding economic development in the country and that much . needed foreign investment was being blocked. The Fisheries Department's own data. which suggested that the resource was capable ofwithstanding higher levels ofexploitation, was used against the Department as an argument to raise the cap. Several local businessmen who had been planning to buy longliners used their political influence to seek additional licences. Letters were written to newspapers. and the issue became a matter of national debate which was taken up in the Cabinet.

To his credit, the then Minister for Fisheries resisted considerable political pressure and supported the Department in maintaining the cap, despite the fact that he had ministerial authority to change it at any time. Two years later, however, he was replaced by another Minister who quickly succumbed to the continuing pressure by issuing licences to an additional 30 fishing vessels. Indications arc that further licences will be approved in the near future.

These latest decisions were made quite recently, and it is too early to judge what their impact will bc on the resource or on the economics of individual fishing vessels (although one can say with reasonable confidence that both will be negative). However this story, while inconclusive, illustrates several of the general points previously made regarding the practical application of the PA2FM

First, total production was deliberately not being maximised because other management goals. specifically higher per-vessel catch rates and profits, were considered more important. However as in many developing nations, the widespread perception in this country is that natural resource production **should** be maximised, not optimised. Maximising production is a stated goal of the national development **plan** and the Fisheries Department found itself under attack from other branches of Government for its attitude. Self-defence was made all the more difficult because the Department acknowledged that the resource **could be** exploited more heavily than it was permitting.

Secondly, in this case industry was supportive of the precautionary cap on the number of fishing licences. However this was only so because the fishery was not greatly over-subscribed and no major reduction in vessel numbers was planned. Ifthe cap had involved a major reduction in vessel numbers, a situation of confrontation with the industry would probably have arisen and it is unlikely that the cap could have been imposed. This illustrates what is probably the PA2FM's most important feature from the viewpoint of practical implementation, which is the need to put in place a management plan before the fishery starts to be over-exploited or over-capitalised.

Third is the difficulty ofevaluatingthe usefulness of the PA2FM and proving this **usefulness** to detractors. The precautionary approach was applied in this fishery for only two years, but **even** if it had been applied indefinitely it would have been very difficult to assess whether the approach was having a

positive impact or not. If the fishery had continued to operate without economic or resource-related problems, as it may have, then critics of the approach would almost certainly have argued for an increase in the number of vessel licenses, which would have made the approach less precautionary. This gradual process of attrition would probably have continued over time to the point where management of the fishery could no longer have been precautionary.

Fourthly, although the Fisheries Department tried to follow a precautionary approach, this was done in a non-precautionary environment. The country has no formal system in place to support or reinforce precautionary measures -in fact, quite the opposite. Decisions in regard to vessel licensing, and indeed all other fishery management measures, are at the discretion of the Minister, who in this case eventually applied his judgement in favour of a less precautionary approach. The lesson here is that the PA2FM will rely on rigid, non-discretionary decision-making systems if it is to be successful in the long-term.

Although the PA2FM was applied in this case, it is no longer in place, and the chances of reinstating it are poor. There are now at least 80 vessels in the fishery and there may soon be 100, which may represent excess capacity. However reversing the growth of the fishery and reinstating the 50-vessel cap would be politically difficult or impossible. The alternative is to do what happens in many other fisheries : allow some or all of the vessels to go broke, causing economic hardship and loss of jobs (perhaps including those of some politicians); or look at artificial ways to bolster the economics of fishing through direct financial assistance or via tax reliefand other forms of indirect subsidy, thus maintaining pressure on the resource through the operation of an economically unviable fishery.

All this is not to say that the precautionary approach was the wrong one to follow in this case : it almost certainly was the right one, and if maintained may have led to the creation of a model fishery. Unfortunately, the systems are not in place in the country in question to support the PA2FM at the present time. This is probably also true of many other countries, whether developed or developing,

Conclusions

The above discussion does not pretend to be exhaustive or, for that matter, based on a great deal of practical information. The precautionary approach to fisheries management is largely conceptual at the moment and there is not a lot of practical experience on which to draw. Rather, the paper attempts to bring together ideas and comments from a variety of sources to illustrate what some of the practical considerations relating to the PA2FM may be. In some cases these are real, while in other they may be the product of differing perspectives.

In general there appears to be widespread uncertainty about the ways in which the PA2FM could be implemented, and the impact it may have on the fishing industry. Fishermen are often conservative by nature and may be reluctant to accept innovation until it has been demonstrated to be beneficial to them. This is particularly so with a proposed management regime which threatens to reduce total landings, increase management costs and place extra financial and administrative burdens on developers.

Doubt about the PA2FM is not confined to the fishing industry, however. Many fisheries managers are also concerned that the precautionary approach may place unrealistic burdens on industry, These views exist even in countries where the need for fisheries management is accepted. and where management of most fisheries is in place (even if the systems are recognised to be imperfect). One might imagine that in countries which have yet to prioritise fisheries management, the PA2FM might be regarded with even more reserve.

If the PA2FM is to gain widespread acceptance, therefore, there will be a need for broader publicity and understanding of its aims. As regards the general public, this will be a long-term process linked with general environmental awareness. In the case of fishery managers, there may be a need to examine delivery offisheries management training to cmphasise precautionary considerations as well as the role of management in the fisheries development process.

As regards practical implementation of the PA2FM, much hinges on improving the fisheries development process so that it takes place on a planned basis. Linked to this is a need to establish or improve data collection and research programmes which can feed back into the management plan, allowing management decisions to be taken according to predetermined criteria, as well as permitting periodic revision of the plan based on accumulating knowledge.

The PA2FM may be inconsistent with economic development policies in some countries, although in many cases this might be due to economic aims which do not realistically account for the finite limits to living marine resource utilisation. Whichever is the case, however, there may be a need in some cases for the PA2FM and national economic development goals to be reconciled.

13. OPERATIONALISING AND IMPLEMENTING THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES

by John Kurien

The Code of Conduct for Responsible Fisheries is indeed one of the most important international instruments devised for wholesale management of the living aquatic resources of our planet.

The Code arises out of the Declaration of Cancun made at the Conference on Responsible Fishing sponsored by the Government of Mexico in 1992. The Code has been formulated to be consistent with the 1982 UN Convention on the Law of the Sea, the UN Treaty for the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, the strategy endorsed by the 1984 FAO World Conference on Fisheries Management and Development, the I992 Rio Declaration and Agenda 2 I of UNCED (U.N. Conference on Environment and Development).

What does the code contain?

The Code sets out voluntary international standards of behaviour for responsible practices in fisheries. based on the general principle that the right to fish carries with it the obligation to do so in a responsible manner. Only this can ensure effective conservation and management of living aquatic resources. with due respect for the ecosystem and for biodiversity. The Code recognises the interests of everyone concerned with fisheries as well as the interests of consumers and other users. It calls on states and all the various interest groups to apply the Code and give effect to it.

The Objectives

The objectives of the Code are to establish principles and criteria to formulate national policies for responsible fishing and fisheries activities. It thus intends to serve as a reference document for the exercise ofresponsible fisheries by providing standards ofconduct for all persons engaged in the fishery sector.

The Structure

The Code has a part that comprises the general principles together with six thematic articles on fisheries management, fishing operations, aquaculture development, integration of fisheries into coastal area management, post-harvest practices and trade, and fisheries research.

General Principles

The statement of general principles asserts that users of aquatic resources should conserve the aquatic ecosystems. It states unequivocally that fisheries management is for present and future generations. It calls on states to protect the right of fish workers to a secure and just livelihood and to involve them in policy formulation. It advocates transparency in decision-making processes.

Thematic Articles

Among the thematic articles the one on fisheries management is one of the first. The precautionary approach is accepted as a guiding principle for fisheries management: the absence of adequate scientific

information should not be used as a reason for postponing or refraining from measures to conserve and manage a fishery. The fishing operations articles are fairly comprehensive covering fishing practices, gear selectivity, energy optimization, marine environment, atmosphere protection and artificial reefs and fish aggregation devices.

The articles on aquaculture urge states to ensure that aquaculture will not impair the livelihood of local communities and their access to fishing grounds. It also suggests that the active participation of fish farmers and their communities be promoted in developing responsible aquaculture practices. The articles on integration of fisheries into coastal area management permit the evolution of holistic ecosystem management.

The articles on post-harvest practices and trade cover questions of responsible fish utilisation and international trade, which give top priority to fairness, equity and environmental concerns. and call for laws and regulations governing the fish trade. The articles on fisheries research stress integrated and multi- disciplinary research and the setting up of appropriate institutional frameworks to promote this. They emphasise that the role **of** traditional knowledge and technologies needs to be investigated and strengthened.

What does adopting the code imply?

When the Member States of the FAO unanimously adopted the Code on 31 October1995, they were also collectively endorsing two things. First, they were tacitly admitting that living aquatic resources could no longer sustain the rapid and uncontrolled exploitation and development they had been undergoing over the past four decades. Secondly, they were enthusiastically endorsing the urgent need for news approaches to management of these resources that would reflect conservational and environmental concerns.

It is this second factor that gives the Code its significance. But unlike other international agreements. the Code has no legal sanctity. Consequently, even states that unanimously endorsed the Code at the 1995 FAO Conference, are not under any compulsion to implement or operationalise the Code. Herein lies both the strength and the weakness of the Code. It can be cast aside as a collection of unnecessarily convoluted norms. Or it can become the centre-piece and the inspirational foundation for states and sub-regional or regional fisheries organizations that wish to formulate sustainable management measures for a new era of responsible fisheries. If this latter course of action is adopted, the Code may well become an instrument to chart the voyage into a new century of sustainable fisheries development and management.

Operationalising the code

Operationalising the Code becomes a task (the burden of all stakeholders in the fisheries) once a commitment is made to accept it as a new frame of reference. Clearly, mere endorsement of the Code by the state will not suffice.

The FAO published the Code early 1996 in all its official languages and made it accessible through Internet on a WWW home page. It has also disseminated the Code through the FAO's marketing services and its associated organisations (GLOBEFISH, INFOFISH, INFOPECHE, INFOPESCA, INFOSAMAK), so that fishery users, processors and traders would be infonned about it. Some 3,800

fisheries organisations have received copies of the Code. It has also been disseminated through well-known fisheries magazines and newspapers. The UN and the FAO are producing a joint publication which will contain the provisions of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, the Code and the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas.

The message of the Code needs to be effectively communicated and also fully imbibed by all the actors in the fish economy – fishworkers, investors, traders, processors, bureaucrats, politicians and others, Educating everybody about the Code is therefore the most primary task for operationalising it. There is no standard practice for this task. For those who drafted the Code, every word in it is important – they are unlikely to easily concede any "dilution". However, though the Code is not a legal document, its involved and cautious phraseology makes its essence elusive. We need many attempts to translate, summarise, simplify, illustrate and visualise the Code.

Implementing the Code

As a first step to promoting implementation of the Code. the FAO sent a circular to Governments and private bodies, entreatingthem to publicise and apply the Code by adopting responsible fishing practices. Suggestions were made about initiatives that could be undertaken for particular countries, regions and circumstances. The appointment of a focal point was suggested, also the setting up of mechanisms to facilitate coordination and monitoring of various initiatives to implement the Code.

Partly due to this initiative, some countries have already started formal programmes to redesign their fisheries policies and management practices in line with the provisions of the Code. The United States, Canada and Morocco are said to be among the first to take these initiatives.

Requests for authorization to translate the Code into other languages also point to the seriousness with which it has been received.

Another task to be undertaken will be to ensure that all states ratify the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, so as to bring it into force as soon as possible. This is being done only gradually, and the pace needs to be speeded up. To date (February 1997) only IO countries have ratified the Agreement. In Asia, Myanmnr is the only country to do so.

To assist developing countries to implement the provisions of the Code, the FAO has elaborated an inter- regional programme for external assistance. A programme containing 10 components was submitted to donors. Norway, Netherlands and the UNDP have to date expressed interest in considering support for some of the components. Project documents are being prepared for these.

The FAO, in collaboration with some member states. is also engaged in preparing a series of "Technical Guidelines for Responsible Fisheries." Canada, New Zealand, Sweden, and Australia have collaborated by hosting Technical Consultations to develop some of the guidelines pertaining to the thematics of the Code, particularly fisheries management and fishing operations.

The need for responsible aquaculture is gaining popular response the world over, particularly in Asia. A number of activities to support of implementation of the Code's article on aquaculture are being undertaken by Asian- based organisations such as SEAFDEC, NACA and ICLARM, and networks like INGA.

Non-Governmental organisations (NGOs) who took part in the formulation of the Code are trying to spread the Code's message in order to create pressure from below to get States to take measures to adopt its provisions.

International organisations working closely with fishworkers have also taken initiatives to publicise relevant aspects of the Code. They include the International Labour Organization (ILO), the International Federation of Free Trade Unions and the International Collective in Support of Fishworkers.

Giving a new meaning to fisheries management and development

An important clarification is in order at this stage. How different is "responsible" fisheries from the approaches wc have all followed thus far? Is "responsible" only an additional new adjective for the old game of fisheries development and management?

The Collins Westminister dictionary defines "responsible" as accountable, trustworthy and rational. The title, "Code of Conduct for Responsible Fisheries" may therefore be expanded to read:

The orderly collection of principles and norms that direct and provide guidance for behaviour to achieve accountable, trustworthy and rational fisheries.

The three words that elaborate the meaning of "responsible" can be further paraphrased thus: *being able to explain one's actions; being reliable and accurate; and being sane, equitable and fair*

An honest introspection will show that on all the above counts, the past behaviour at all levels ofvarious **actors in** world fisheries can hardly be considered responsible!

The challenge for change is a big one. We need to take it, not leave it.

14. IDENTIFICATION OF UNRESOLVED AND NEW ISSUES IN FISHERIES MANAGEMENT

by Kee-Chai Chong & John Kurien

In many developing countries of Asia, fisheries development has been driven and guided by fisheries acts, ordinances and regulations that were either developed by the countries themselves (Thailand) or inherited from colonial rulers (Sri Lanka). These acts were promulgated on the basis of conditions prevailing then, and were development-oriented rather than management-oriented. The acts and ordinances served their purpose at that time very well because fisherfolk were few and the resources abundant. But this situation changed with development and modernization and the growing pressures on fisheries.

In spite of2-3 generations of intervention in fisheries development, and some "management" measures initiated in response to overcrowding, competition and conflicts among fisherfolk user groups, the problems of fisheries communities largely remain unresolved, and new issues are emerging at the same time. Any management measures introduced reflect government responses to conflicts. It is not proactive management per se.

This paper seeks to identify unresolved and new issues in fisheries management in developing countries of Asia.

Development over Management

Developing countries in Asia are still locked into the fisheries "development" mode; they regard "management" as an attempt to place curbs on production. In other words, they perceive only the regulatory dimension of management; those aspects of management that pertain to conservation and active rejuvenation or rehabilitation of the resources and the ecosystem are addressed only peripherally.

In countries where the conservation and rehabilitation aspect of management has been in vogue for nearly two decades, its adoption by the state has been hastened by strong socio-ecological and political pressure from small- scale fishing communities. These communities have demanded the state's unequivocal intervention in the regulation, allocation and conservation of resources because of the ill-effects of state-sponsored development based on inappropriate technology.

Consequently, the list of unresolved issues in fisheries management is likely to be large because it includes issues never even taken up by the state. The new issues therefore read more like an agenda for solving unresolved issues.

So far, efforts to address fisheries issues have depicted problems rather than solutions. Any fisheries discourse pays far greater attention to the problem than the solution. Solutions proposed, ifany, come at the very end, when audience attention has already been lost. Further, many government-sponsored assistance programmes do not remain in force long enough to be "institutionalized". Government institutional commitment and regular follow-up are low.

Moving from the development mode to the management mode does not come naturally, Many interest groups in society would like the development mode to continue.

Often, in Asian countries, plenty of lip-service is paid to management, while actions continue in the development mode. To quote Gen Sardjono, former Director General of Fisheries of Indonesia, after he

announced the 1980 trawl ban, "We need to take two steps back to make a big leap forward". If we examine what was done in the name of developtnent – particularly the heavy investments in inappropriate harvesting technology and infrastructure we would firmly advocate management.

Unresolved Issues

Effective Enforcement of Regulation and Conservation Measures in Coastal Waters

Most countries have enacted legislation for regulating and conserving coastal fishing-- typically through zoning arrangements; entry restrictions; closed seasons and closed areas; mesh regulations and gear restrictions; bans and curbs on certain fishing methods; protection ofcertain species. Inability to enforce such legislation is the rule rather than the exception. What is it that prevents enforcement of well meaning laws? Is it lack of technique or lack of will?

As pointed out earlier, the organizational set-up and institutional structure in many countries is not conducive to fisheries management. The organizational structure is compartmentalized. There is no fisheries management unit; if one exists, it lacks staff, funds and equipment.

Proper Allocation of Resources and Rights of Access in Coastal Waters

The coastal fishery has largely been an open-access fishery. Consequently, no catch limits have been set. We hear only of continuing increases in fish harvests, side by side with an increase in boats, fishing gear, fish-finding devices etc.

Only in a few countries are customary rights acknowledged and recognised by the state. Most often, the major stakeholders who traditionally eke out a livelihood from fishing are treated on par with a small minority of outside investors who regard the fishery as a source of quick and easy profit. The state's inability to prioritise rights of access to coastal waters leads to conflicts in which the majority stakeholders are marginalised. What measures can be undertaken to overcome this peculiar circumstance, where those with short-term interests in the fishery corner most of the benefits? Till date, the question of use and user rights has remained unresolved.

Effective Enforcement of Rights Over Exclusive Economic Zones

Most countries extended their EEZs in the 1970s. However, the inability to prevent encroachment and illegal access, and monitor the access of licensed vessels, has been a major cause for worry, and in some countries a cause for conflict as well. Is the main problem a lack of investment and technology for monitoring compliance? Is it the lack of regional and sub-regional cooperation agreements? Will this change in the context of the UNCLOS agreement on straddling and migratory stocks?

Protection of Critical Habitats

Mangroves, seagrass beds and coral reefs are examples of critical habitats that have been degraded of destroyed, often in the name of "development" of one sort or another, without realizing the crucial role they play in enhancing the biological productivity of the coastal waters. To what extent is ignorance of habitats the cause of such destruction? Are factors outside the fishery primarily responsible for the degradation? That the public regards the sea as a huge and available receptacle for wastes, has not helped in their protection.

New Issues/Initiatives

Sub-Regional and Regional Co- operation for Management

In the light of UNCLOS, the Agreement on Straddling and Highly Migratory Stocks and the Code of Conduct for Responsible Fisheries, such co- operation attains significance. What institutions already exist? What is the scope for new institutions to be formed? Even the future of FAO regional fisheries bodies has to yet be resolved.

Fitting Participatory Management into the Overall Management Picture

The importance of local-level community management is now increasingly recognized. The usefulness of these approaches is beyond question. What needs to be sorted out is the manner in which local, village- level or port- level management institutions can be fitted into a large state-supported management framework. Are there examples in Asia where attempts to achieve this have met with reasonable success?

What are the implications of participatory community-based systems of management? Where the government has sole authority to manage fisheries, is it willing to share this authority with the fisherfolk? Are the fisherfolk themselves willing and ready to take on management responsibility? These are pertinent questions which need to be resolved. Different groups of users and stakeholders have different objectives in managing the fisheries. A consensus has to be worked out about the overall objective of management.

Initiating Aquarian Reforms

The overall regulation of effort may be insufficient in a context where access to the resource is asymmetrical – investment capability varies widely. Priorities must be worked out over the allocation of access rights to the resource. An aquarian reform is needed, where the "rights to boats, fishing and first sale of fish are given only to the persons who actually fish." Such an allocation of rights may have to be seriously contemplated to limit entry into the coastal fishery, particularly in countries that have large numbers of artisanal fish workers. This class of owner-workers then becomes the key participant in local-level co-management. Is this a technically feasible and politically viable solution? What are the preconditions for aquarian reform?

Proactive Measures for Resource Enhancement

Rather than wait for depletion and degradation to initiate conservation, what must be considered is planned and proactive participatory measures for 'resource enhancement which will create new fish habitats. Examples are artificial reefs made from vessels deemed "illegal" following aquarian reforms. redundant boats, mangrove replantation, sea ranching, "no-go" bio-reserves, coral reef and seagrass rehabilitation. Can these be organised through State initiative alone? What is the role and relevance of local level participation in ensuring sustainable success for such initiatives?

In many coastal areas, boats are available for sale. These could be purchased to be used as platforms for sea-farming or mariculture of molluses such as oysters, mussels and scallops. These fishing boat-converted platforms can be towed out to sea and left there and towed back into sheltered waters during bad weather or impending storm outbreaks.

Integrating Fisheries Management into Coastal Zone Management

The coastal waters being the "tail-end" ecosystem, resources management within it must necessarily be linked and integrated into the larger contest of management of both the aquatic and the terrestrial components of the coastal zone. What legislative support is needed for this? Should the initiative for CZM come from the fisheries sector?

Involving Women in Resource Management

It is well known all over the world that women play an important rote in fisheries. The masculinization of fisheries was a result of the development mode-the rote of women was relegated to one of producing fishermen! This emphasis needs to be changed. The potential of women as effective natural resource stewards should be tapped. How this is done will differ from society to society. What are the ways by which this can be achieved?

Considering Coast-Oriented Employment Opportunities

Since most countries in developing Asia are tabour-surplus economies, the option for employment outside fishing is likely to be restricted. Resides, the occupational or marketable skills of fisherfolk are limited. However, reducing the pressure of human numbers on the fishery must be a tong-term strategy for fisheries resources management in developing Asia. Creating employment opportunities in coastal areas which are oriented to fisheries or allied to fisheries, may therefore be the more plausible and appropriate solution for redeployment of educated youth and older men from fishing into other productive and socially useful employment. To what extent does effective redeployment depend on the overall economy? Is such employment creation socially acceptable?

Conclusion

An exhaustive list of all the unresolved and the new issues that confront fisheries managers in Asia would be difficult to make. Suffice to say that the tasks of fisheries management are daunting, and can't be undertaken single-handedty by the managers. Morever, one should note that management decisions are often influenced by "political" considerations. So techniques alone will not suffice for success. Tenacity of purpose and tact in implementation are a prerequisite.

Management decisions do not "hold" amidst conflict. Identifying common interests and building a consensus among different user and stakeholder groups in the fishery, especially on management objectives, and setting up participatory agreements, are part and parcel of the process of moving towards a precautionary and responsible approach to fisheries development and management.

The identification of unresolved and new issues in fisheries management

15. DO FISHERIES STATISTICS GIVE THE FULL PICTURE? INDONESIA'S NON-RECORDED FISH PROBLEMS

by Nick Willoughby, Daniel Monintja & M Badrudin*

Abstract

Fisheries statistics are a calculated guess about how much fish has been landed. This paper describes an attempt to set up an 'expert system' in Indonesia to assess whether there is a serious non- recorded fish problem, and the potential magnitude of this problem; and to determine to what extent a group of senior fisheries scientists and statisticians can help improve fisheries statistical collection.

The statistical system of the Directorate General of Fisheries (DGF) has three types of fisheries catch surveys – for big business enterprises (system I), for medium-sized fisheries (system 2) and for small- scale tisheries (system 3).

Our expert system was asked to consider the possible importance of

- By-catches and discards in the longline and shrimp trawl fisheries (system 1)
- unreported trans-shipment on the high seas (1)
- fish caught in joint ventures which should be landed in Indonesian ports, but is discharged elsewhere (1);
- fish which is sold or traded through non-government markets (1 ,2 & 3)
- non-recorded fish which the fishermen and their families eat (mainly 2 & 3)
- catches by illegal methods (3);
- others such as sport fishing, beach gleaning etc.(1 ,2 & 3)

This paper describes how the Indonesian statistical system tackles possible problems. The estimated size of the non-recorded fish deficit is thought to be more than 1,000,000 tonnes/year - 1 /3 *of* the total recorded catch. The levels at which total allowable catches may be set should take these significant non-recorded parts of the catch into account – a precaution against the unknown!

Introduction

Statistics are viewed with suspicion by many people. Why?

Part of the reason is that some people manipulate statistics for their own purposes. They may end up with correlations which although perhaps excellent in statistical terms have little meaning in the real world. Example: the suggestion that, because at one stage the rising sales of washing machines in the USA coincided with the rising murder rate, washing machine ownership causes murder!Silly relationships like this bring little credit to people who use statistics, and have given rise to Mark Twain's phrase -- 'There are lies, damned lies and statistics'

*Dr Nick Willoughby of the Natural Resources Institute (NRI) k. is team leader of the Marine Resources Evaluation and Planning Project, Indonesia. Dr Daniel R Monintja is from the Institute Pertanian. Bogor, Indonesia. In M Badrudin is from the Central Institute for Fisheries. Jakarta.

However, lies are intended to deceive or confuse. Fisheries statistics are seldom intended to do this - though even with my minimal statistical training, I would hesitate to say 'never'.

Fisheries statistics are, at best, a calculated guess of how much fish has been landed, not how mush has been caught

There are many stories of absurd statistics, which have slipped through the national nets of quality control. Three quick examples will demonstrate this:

1. In the Gambia, West Africa, in the 1980s, the Fisheries Department ran out of money to pay ferry operators. The ferry staff did not allow fisheries staff to cross the main river dividing the country. to collect statistics from the northern side. The data analysts on the southern side of the river merely added up the catch forms they were given . . . and the national fish catches apparently fell suddenly to half their usual levels (R Cordover, pers.comm)

2. In Malawi, Southern Africa, in the early 1970s, we changed the weight recording system from pounds to kilograms, but forgot to issue one set of recorders with a new balance. Was it any wonder that the catches per unit effort from their area seemed to be twice as high as anywhere else? (Willoughby, 1975)

3. Portuguese catches of tuna during one year in the early 1980s suddenly shot up by three orders of magnitude over previous levels. We all know the massive catch variations one can get in shoaling pelagic fisheries.. but the statistician was entering his kilograms of tuna as tonnes by mistake (Willoughby, 1981)

These examples show 'operator error' - not a deliberate intent to deceive

Unfortunately, in some countries there may be significant pressure on fisheries statisticians to demonstrate that fish catches are rising every year. Much of the time this will be true, because more fishermen and more boats mean more catches. This outcome may suit short-term political goals, but what about the long-term effects? Statisticians are seldom expected, or able, to comment on the state of the stocks from year to year. Or the probability of what will happen to the national fishing industry when (not if) stocks eventually crash.

The situation might develop like this:

1. The stock assessment biologist calculates the levels of the 'standing stocks' for the species groups, and suggests sensible levels for the 'total allowable catches' (TACs) which are accepted by Government.

2. The fisheries statisticians monitor landings and calculate the amount of fish landed this will always be less than the fish caught.

3. If the landings are less than the TACs, greater effort and investment in the industry are urged;

4. Ifthe catches are in fact greater than the TACs without the statisticians and fish biologists knowing it, the fisheries are likely to be heading towards economic and biological collapse caused by over-fishing.

This potential disparity between recorded landings and catches can be considered to be an unresolved issue in fisheries management (and part of the reasoning behind FAO's "Precautionary Principle")

This paper describes an attempt to set up an 'expert system' in Indonesia to assess:

* Whether non- reporting or under-reporting of catches is a problem;
* The possible magnitude of the problem, and what can be done about it if it is significant; and
* Through this exercise, to discover whether and how a group of senior fisheries scientists and statisticians can help improve national fisheries statistical collection.

One of the key problems is identifying areas of under-reporting of catches and landings

The National Statistical Collection System

As the largest archipelagic country in the world (80,000 km ofcoastline), Indonesia probably has one of the most difficult of fisheries to assess in statistical terms. The Directorate General of Fisheries (DGF: Direktorat Jendral Perikanan, DJP) has a statistical system which assesses landings by using three types of fish landing surveys:

* One for big business enterprises- including large-scale tuna longlining and shrimp trawlers:
* One for medium-sized fisheries, including most inboard engine boats. This addresses small pelagic fisheries;
* One for small-scale fisheries- including all non-motorized and artisanal activities.

Early frame surveys indicate that an estimated 925,000 full-time fishermen and 925,000 part-time fishermen take part in fisheries. (Table 1)

Table 1: Number of Marine F'ishermcn in Indonesia (DCF, 1994)

Full-time fishermen (fisheries the only source of income)	925,000
Part-time fishermen (fisheries the major source of income)	650,000
Part- time fishermen (fisheries a minor source of income)	275,000
Total	1,850,000

Their recorded marine landings in 1994 were 3,080,000 tonnes, nearly 90% of which was fish (Table 2)

Table 2: Marine Landings Recorded in Indoesia (DGF, 1993)

	Weight (mt)	% of total
Fish	2,675,000	87
Crustaceans(mainly shrimp)	295,000	6
Molluscs	93,000	3
Other animals	7,000	
Seaweeds	110,000	4
Total	3,080,000	100

Our expert system was asked to consider the possible importance of under-recorded elements in:

* By-catches and discards in the longline and shrimp trawl fisheries (system 1);
* Unreported trans-shipments on the high seas (1);
* Fish caught in joint ventures or on charter vessels which should be landed in Indonesian ports. but is in fact discharged elsewhere (1)
* Fish which is sold or traded through non-government markets (2,3)
* Non-recorded fish which fishermen and their families eat (mainly 3)
* Catches by illegal methods (3)
* Others?? Sport fishing, illegal imports, beach gleaning etc. (1,2,3)

Survey Method 1: Big Fishing Business

It is probably easiest to examine first the problems of fisheries statistics collection from big businesses. These include the large-scale shrimp trawlers operating in the Arafura Sea, tuna longliners, joint venture and contract operators, and some of the larger pole and line fisheries. These firms fill out their own catch return forms, which are apparently accepted by the DGF's Statistics Unit with the single proviso that the declared catches will be converted to live weight equivalents.

These larger mechanised fisheries are particularly prone to four types of"problem catches" which will be under- recognised in national statistics.

· By-catches – defined as all non-target species, such as shark from a tuna longline fishery (by-catch may in many instances be retained rather than discarded)

· discards – fish thrown away at sea. such as undersized fish from a shrimp trawl

· trans-shipments at sea

· trans-national landings e.g. fish caught in Indonesian waters and landed as 'high seas' fish in other countries.

1. By-catches. Many commercial companies deny that there are significant by-catches from their operations. In tuna long line fisheries, by-catch declarations usually consist of 'other tuna-like species and marlins' most of which are kept as non-discarded by-catch. However, the by-catch declarations very seldom include sharks, which must therefore become discards.

   Longliners frequently allocate the shark portion of their catches to the crew as bonuses. The shark fins are cut offand the carcasses thrown overboard-sometimes in very significant quantities. Our experts suggested that sharks and tuna be caught in approximately equal proportions by longliners fishing in Indonesian waters. Tuna catches (mainly of yellowfin and southern bluefin) in 1994 amounted to 90,000t. If we assume that the bulk of these tuna were longline fish, we should also assume that 90,000t of shark were killed but not recorded.

2. Discards. The fish from the targeted shrimp trawl industry in the Arafura Sea are also collected and 'may be eaten by the crew or frozen for sale later'. Independent observers suggest that a lot of'trash fish' in fact becomes unrecorded discard. If half the total shrimp landings come from the trawl industry, this would be 100,000t of shrimp, and the 1:9 shrimp-fish catch ratio suggests

that perhaps 900,000t of fish arc caught as well. Even if the shrimp trawlers land (or their staff consume) half of this fish – which must be viewed as unlikely – we arc still left with perhaps 400,000t of mixed trawled fish as discards. Not only would this fish have been part of the total stocks calculated as being 'available', but the trawling procedure also damages further quantities of un-caught fish, and affects the sea bottom environment, making it less suitable as a habitat.

3. Trans-shipments. An enormous amount of fish is trans-shipped legally from catcher vessels to carrier vessels at sea. This saves fishing time and sailing time for the catcher vessels. Unfortunately. without a very large observer programme it is quite possible that large amounts of fish can be trans-shipped without the knowledge of the country of origin of the fish -- despite log-book procedures. This was not a feature ofunder-recording which any of the expert panel could quantify, though there was a general feeling of unease about trans- shipments.

There was also a single observer report of under-recording on a tuna long-liner. Under present joint venture rules, Indonesian vessels have observers on board only for the first year of the programme. Even when observers are on board, their reports of landings have been found to differ significantly from officially recorded landings. A member of the expert team reported l2t of'official' versus 20t of'observed' southern bluefin tuna on one occasion. Thus it might be that total tuna declarations are little more than half the actual catches -though the information is too sparse to confirm this.

The same expert suggested that a 'considerable quantity' of shrimp and tuna is illegally trans-shipped to Singapore from Indonesian waters. but was unable to suggest quantities for this aspect.

It would he reasonable to assume that trans- shipment happens to the detriment of Indonesia, hut it has been impossible to put figures against this.

4. *Trans-National* Landings. Many foreign boats, notably frotn the Philippines, are reputed to fish in Indonesian territorial and archipelagic waters, although they have licenses to fish only in the EEZ waters (Mathews and Monintja, 1997, Monintja and Mathews, 1996). This means that they fish in waters reserved for medium and small- scale fishermen, and land the fish elsewhere, sometimes as 'high seas' fish. One expert suggested for each tuna landed in Indonesia from the north eastern sector of the country three were landed in the Philippines, and that the quantities involved could be as much as 60,000t of tuna per year from this sector alone (Mathews Monintja, 1996). An estimate of double this, or 120,000t of tuna 'lost' nation- wide, has been suggested.

Survey Method 2: Medium-sized Fishing Businesses

This survey is for motorised medium boats (5- 1 5GRT) mainly engaged in the fishery for small pelagic species. One main landing site is chosen per regency (county); the main gears are identified; and the catches of 5 boats per gear per landing site are counted. Total landings are derived by the use of multiplication factors.

These fisheries usually operate close enough to their home bases that all the fish they catch will be retained as saleable. through the use of ice and/or salt. Some of this fish is reputed to be of very low quality on arrival at port. but nevertheless apparently finds a market. Thus most of the problems of by-catches and discards are negligible. Problctns with trans-shipments and trans- national landings could still occur, though neither was reported from definite knowledge by the panel of experts.

Landing at Non-Government Markets

Although there is a good range of fish markets and harbouring sites in Java and Sumatera. from which precise statistics could be expected, there was some concern that in other parts of the country this might be less certain. Boats might land some of their catches away from auction sites (at which they would have to pay extra fees) and these portions of the catches would be unrecorded. While it is not possible for Jakarta-based statisticians to estimate the importance of this practice, if any, it was suggested that the heads of provincial statistical services might already factor these effects into their records before forwarding their figures to Jakarta. No estimate for this possible under- recording effect is therefore included here.

Three other minor problem areas were raised.

Pole & Line Baitfish

Small fish from lift nets (bagan tancap, bagan perahu) are used very widely as live bait for pole and line fishing operations at a ratio of about 1kg baitfish to 5-10 kg of skipjack. It is unlikely that the batifish are recorded before use. On the basis of 89,000t of skipjack landed in 1994, and assuming that most of it was caught by pole and line vessels, perhaps 10,000 t of unrecorded baitfish could have been used.

Glut Catch Effects

Several points were raised with regard to the effects of glut catches, especially of small pelagics, on accurate statistical recording. During times of excess catches (glut), the fishermen were allowed to take lots of fish home from the boats, apparently without it being counted. Helpers at the market (usually small boys) helped themselves liberally to the glut fish. Since the small pelagic fishery makes up by far the largest proportion of national catches (approximately half of all marine catches), and much of this is caught during fairly narrow seasons, it would be reasonable to assume that at least a small proportion is not properly recorded. If this was only 1% of the 1,000,000t catch, the apparent loss would be 10,000t. What is considered to be a conservative estimate of 5% is given here as 50,000t or small pelagics un-recorded during periods of glut.

Personal Catches

One expert pointed out that medium-sized purse seiners set their nets only once every day. While not seining, the crew would usually hand-line for personal fish, and sometimes catch significant quantities. This would not usually be registered on return to shore. While this might be important at a personal level, it might be thought that it does not contribute a very large quantity to the total catches. If we assume that 20% of full-time fishermen are in the purse seining component of the industry (i.e. about 200,000 men) and that each catches 1 kg of personal fish/day on half the days of the year, a further figure of 30,000t of fish/year is likely to be unrecorded.

Survey Method 3: Small-Scale Artisanal and Subsistence Fishing

Small-scale fisheries surveys include all non-motorised and artisanal activities. As with all artisanal fisheries, the landings are scattered throughout the country, and extensive sub- sampling must take

place. Villages are chosen for recording with a probability proportional to size. Only one village is chosen per district (kecamatan) and five households in each are interviewed every three months. The amount of fish brought home as wages is supposed to be recorded in the surveys. The report forms are analysed in the provinces, then sent to Jakarta for compilation.

This was the area of fishing, which first stimulated the convening of the expert panel. It was first calculated that if each member of each fisherman's family (average size 4 persons) ate l kg of fish per week, which was not recorded, this would amount to:-

$$1{,}850{,}000 \times 52 \times 4/1000 = 384{,}800t \text{ of fish/year}$$

15% of the total recorded marine fish catch! If they ate 2kg/week (which might not be unreasonable) this would obviously increase the actual catches from Indonesian waters by 700.000t or 30%. However, the DGF statistical system does record fish provided as wages. though the multiplier effects on apparent catches if the figures were only slightly incorrect would be very great.

The expert panel also had many comments on the likely truth of the artisanal fisherfolk's replies to statistical questionnaires -- and in many cases these were accepted as areas of concern by our DGF panel representative.

Frame Survey Multipliers

The most recent frame survey of villages was held 20 years ago (though it is due to be up-dated next year), so the total numbers of fishermen may be grossly underestimated. It seems unlikely that only 1% of an archipelagic country's population utilises the marine resources directly. Furthermore the multipliers used are from agricultural rather than fisheries surveys, so the fishing population might even be twice as great as currently estimated, i.e. 4 million fisherfolk rather then 2 million. It could be expected that many of these would have fishing only as a minor or seasonal income, but it would still be reasonable to inflate the apparent catches to allow for 4kg of fish/fisher/week, as in the calculation above, to add a further 380,000t of general small fish to the national catches.

Household Survey Recalls

There were also serious doubts concerning the recall ability of householders on the amount of fish recorded as having been given as wages in surveys conducted only once every three months. This could be checked easily, but no firm data are available at present, so no additional estimate as a result of the query has been included here.

Local Fishery Targets

Some of the expert panels suggested that provincial statisticians were under pressure, perhaps subconsciously, to try and show an increase in landing records each year. This needs to be investigated further. As with the 'landing at non- government markets' above, no estimate of under-recording has been included here.

Benefits to the Fisherman from Under-Reporting

In many surveys and questionnaires, the respondents are known to under-state the amount or value of their produce, because correct figures would mean hefty taxes. Respondents may want to land their fish

Table 3 : Possible Under - Reporting Estimates

Fishery Type	Component	Possible Scale of Under-Pcporting (tons)
I. Big Business	By-catches	90,000
	Discards	400,000
	Trans-shipments	Probable - could be large
	Trans-national landing	120,000
	Sub-total	**61 0,000++**
2 Medium Business	Landings at non-govt markets	No estimate - could be large
	Pole & line baitfish	10,000
	Glut catch effect	50,000
	Personal catches	30,000
	Sub-total	**80,000++**
3 Small Business	Autoconsumption	No estimate - could be large
	Frame survey multipliers	380,000
	Household survey recalls	No estimate
	Local fishery targets	No estimate
	Under-reporting **by** fishermen	No estimate
	Illegal catch methods	No estimate
	Sport ftshing etc	No estimate
	Sub-total	**380,000++**
	Total	**1,080,000++**

anywhere except a government landing site where not merely is the auctioneer paid a fee, but a percentage of the profits is automatically deducted as tax. Or the respondent may want to simply go home with his catch.

Worldwide experience suggests that the likelihood of obtaining accurate artisanal fish catch statistics through verbal recall questionnaires is poor, and sometimes 0%. This is an area in which local acceptability of the recorders and the local knowledge of their seniors would be very important. No estimate of under-recording can be provided.

Catches by illegal Methods

No fisherman will say that his catches have come from illegal fishing methods (meaning dynamite of cyanide in Indonesia). If it lands at a fonnal market, he simply ascribes it to some reasonable legal gear.

An important impact of illegal fishing methods is the damage they do to the remaining stocks and the environment. Dynamited or cyanided coral can no longer be a sustainable habitat; the killing of fry and juveniles by these methods can be likened in some ways to recruitment over- fishing. No estimates can be sensibly made of the small tonnages lost as a result of these methods, but they may be the most insidious in terms of reducing the long- term national yields of several prime reef-dwelling fish species such as groupers and wrasses.

Sport Fishing, Beach Cleaning ctc

In some countries, most of the revenue from fishing comes from commercially managed rod and line sport fisheries, These are insignificant in Indonesia, but the weekend fisherfolk who supplement their family diets with fish caught from rod-and-line or beach-gleaned shellfish will certainly not be considered part- time fishermen. No estimates of their takings are included here, though they would certainly run into tens of thousands of tonnes.

Under-Recording Summary

A summary of all these possible elements of under- reporting is provided in Table 3. The team was only able to suggest:-

- approximate under-reporting figures for seven elements,
- an additional three might be large but unknown contributors, and
- five more were identified, but estimates could not be made.

Despite the vagueness of these statements, the team concluded that in spite of the complexity and sophistication of the statistical system, *the under-recording problem for Indonesia's marine fisheries is probably at least 1,000,000 tonnes/year or an additional 33% over that currently recorded.*

Identification of Unresolved and New Issues in Fisheries Management

Let us therefore think of the under- recorded fish landings as an un-resolved problem of fisheries management. The estimated under-recording suggested by the panel is of the order of one third of the total national marine catches, and it could be substantially more than this. The features which have led to the production of these figures should be factored into the setting of total allowable catches (TACs) by the DGF. But how could this be done?

It is suggested that the level of landings as defined by the fisheries statisticians should be maintained as the official Government figures. However, catch level estimates should be raised so that the relationship between stock assessment estimates and commercial license allocations for total allowable catch purposes (calculated and set respectively by other divisions within DGF) should take full account of these quantified concerns by senior scientists.

Standing stocks and total allowable catch levels in Indonesia have been subjected to downward revision recently as a result of a recent reappraisal carried out by Indonesia/FAO/DANIDA in 1995 (FAO, 1996). On the basis of this, it was suggested that total available stocks might be much less than those thought to be present in 1991(Martosubroto et al.,1991). The national MSY levels are now thought to be about 3.6 million tonnes plus tunas, against the previous estimate of 5 2 million tonnes plus tunas. This revision has serious implications for fleet investment and infrastructure support policies, which must be addressed by the DGF staff.

We can take precautions against 'the unknown' as part of accepting that some features of stock assessment are too vague. and that landing statistics do not measure catches accurately. The precaution would then be to lower TAC levels appropriately. Under these circumstances it would be better to have:

(1) a transparent policy to set up a system to measure the actual amounts of each species landed by each gear (already in place - national fisheries statistics),

(2) then the wisdom of senior wise men is called upon to make additions (multipliers or actual tonnages) to a second set of statistics.

(3) On the basis of these second calculations, and in comparison with TACs calculated by the research and development parts of the industry, the number of licenses to be issued for the next fishing period would be calculated.

Approximate though such a system would be, it should be more realistic and responsible than allowing licenses to be issued to the limit of the TAC, while 'knowing' that actual catches are greatly in excess of recorded landings. This is what the Precautionary Principle is all about!

References

DGF (1996) Fisheries Statistics of Indonesia for 1994.

FAO (1996) Report on *Indonesia/FAO/DANIDA Workshop* on Assessment of the Potential of the Marine Fisheries Resources of Indonesia. March 1995, Jakarta (Ed S C Venema).

Martosubroto P, N Naamin & B B A Malik (1991) Potensi dan penyebaran sumber daya ikan laut di perairan Indonesia. *DJP/PPPO/LIPI.* Jakarta.

Mathews C P & D R Monintja (1996) Tuna management and administrative overlap in the North Indonesia coastal zone. *Unpublishedreport to CRIFI and MREP.* 17pp.

Monintja D R & C P Mathews (1997) Data and information records on the occurrence of rumpon in Indonesian waters. Unpublished report to CRIFI and MREP.

Willoughby N G (1975) Shire Valley Catch Statistics. *Unpublished report to Department of Fisheries, Malawi.*

Willoughby N G (I 98 1) Artisanal Fisheries Statistics. *White Fish Authority report to* Government (of *Portugal.*

Acknowledgements

The authors would like to thank Ir Bambang Wahyudi of Statistics Division. Directorate General of Fisheries, Indonesia, for the time and effort he took to explain the DGF statistical collection system to our 'expert group'. It is no fault of his that the group was sometimes still sceptical. We would also like to thankall those senior fisheries specialists who participated in the group which discussed this problem. Dr Nurzali Naamin and Dr Johannes Widodo were particularly active members.

16. ENCOURAGING FISHERFOLK TO MANAGE THEIR FISHERIES: HOW COMMUNICATION AND AWARENESS CAN HELP

by Rathin Roy
Senior Communication Adviser, BOBP

There is a crisis in fisheries all round the world. While increasing human populations want more and more fish to eat, fishers around the world are having difficulty in meeting the demand because they are catching less each year despite increasing efforts. With awareness of the problems growing, people and governments are now becoming concerned whether the seas, rivers and other water bodies will be able to meet the demand for fish in the future. Which brings us to what the Bay of Bengal Programme, like several other organizations, is trying to do: fisheries management. The issue looked at in a broad sense is rather simple:

* fish are a natural resource, which grow, reproduce and die;
* fishers capture fish;
* if they catch fish faster and in larger quantities than the stock of fish can grow and reproduce, then catches are affected and so is the stock;
* as fish grow scarce they are more expensive to catch and become pricier;
* which gives an incentive to fishers to try harder, and that only makes matters worse.

The answer is to be rational and to ensure that fishers capture only so much of a stock of fish which enables them to keep doing it! But, of course, there is more to it, fish stocks can be affected not just by the act of irresponsible capture, but by the quality of their environments, which in turn are affected by humans through population of waters, destructive fishing methods and so on. So, to cut a long story short, what is of concern is what people do to fish and their environment.

Fisheries management is not so much about managing fish, which left alone seem to do just fine; it's all about managing the way people and fishers capture fish and affect their environment. Fisheries ***management is really people management.***

Before concerning ourselves with how, or if, communication and awareness-building can help with fisheries management, it would be useful to better understand the problem itself.

Why bother with fisheries management?

Fish is food, and for a lot of people the major source of their animal protein. Some have traditionally eaten fish and feel deprived when they cannot get enough. others like the taste, some others are beginning to eat fish instead of other meats for reasons for health. With populations increasing, and expected to double some time during the next two decades, depending on whose calculations you care to believe, the demand for fish is going to increase worldwide. The problem is that marine fish catch peaked in 1989 and has been stabilizing since.

Aquaculture, the growing of fish in controlled conditions in enclosed waters, and mariculture, the ranching of fish in natural open waters, are seen by some as an answer. Although their contribution to fish production is growing, the industry is already beset with its own problems, such as water and land use conflicts. pollution of water. and diseases.

When supply cannot cope with demand, prices rise. It is the poor and often traditional consumers of fish, who find fish disappearing from their food baskets.

Increasing populations of fishers, using more efficient craft and gears, targeting decreasing and stressed populations of fish, is a good recipe for conflict. And conflicts abound in the fishing world.

The need to sustainably provide people with fish as food, ensures the profitability of an industry that provides livelihood to millions of fishers, quite a few of whom are considered poor even amongst the poor. To do so in a socially sustainable manner, by reducing conflicts, is the major reason why everyone concerned with fisheries is talking and worrying about management. Something has got to be done! The question is, how?

Purpose of fisheries management

Fisheries management enables communities and governments, together with their fisheries agencies, to have control over a number of important factors. Namely:

- The exploitation, conservation and sustainability of fisheries resources
- The profitability of the fishery to fishers and others in the industry
- The way in which the fisheries resource is allocated among the community
- The need to address wider social issues, such as conflicts, unacceptable fishing methods, by-catch issues and the environmental impact of fisheries on the environment.

The alternative to management is free access to the resource by all interested parties without any limitation. In such situations, there is historical evidence that fishers tend to increase their capacity to fish through increase in numbers of craft and gear and fishing intensity, with a consequential decrease in catch by individual fishers. The profitability of the fisheries decreases and fish stocks get depleted.

But there is more to the objectives ***of fisheries management.*** At the best of times, fisheries management is a delicate balancing act. The environment sets the limits of the maximum (ecologically) sustainable yield, the means of production determine the maximum economic benefit that can be derived from the ecosystem, and the fishing community and society have to choose options that provide maximum socially feasible yields to meet their needs. The nature of fisheries management goes beyond exploitation of a resource in an ecologically sustainable manner, and the reaping of maximum economic benefits to the art of the possible, determining what is socially feasible. The complexity of multitiered objectives is further aggravated by the fact that there are often, at least in multispecies, multigear, tropical fisheries in the Bay of Bengal region, several stakeholders, each of whom has his own needs and aspirations and, therefore, differing objectives.

Whose problem is it?

Fishing is the business of fishers: If fisheries management means changing the very way fishing is practised, we are talking about changing the behaviour of fishers. Government fisheries agencies do not fish, but they regulate fisheries, and often promote them. Fishers, whose livelihood comes from fishing, would not fish unless there is a market for the fish they catch. Fishers in Bangladesh who target juvenile *hilsa,* for instance, do it because there is a ready market for it; for some, it is traditional fare

which they like. For most others it is the only form of the prized *hilsa* they can afford. Customers, through their purchasing power, drive demand with their preferences and dislikes.

Then there are groups and agencies with environmental, human rights and socio-economic concerns who object to, advocate and agitate against certain types of fisheries and their impacts. It is easy to write them off as troublemakers and adversaries, but they have a voice, and often can mould public opinion and move the legal system to bring the fishing industry to a grinding halt. So, it would be foolish to ignore them, even more so because in many cases they may be right or have a valid or legitimate point. All these and still others are stakeholders in fishing, and it is also their problem.

Too often in the past there has been a tendency to see fishing and fisheries management as the task of the government fishery agency alone. The fishery agency determined what needed to be done, enacted rules and regulations, and then spent enormous amounts of time and money to try and enforce rules and regulations. People rarely support laws and regulations governing their lives unless they believe in them. And it is difficult to believe in something in whose design and development you have had no role. Participation is not just a fashion in development; it makes sense, ensures better development acceptable to all, makes enforcement easier, and reduces costs to the government by getting the involved stakeholders to manage their own business.

Fisheries management deals with multiple stakeholders, and sustaining a fishery resource requires the active participation of all stakeholders, sitting together, setting objectives, devising means and methods, agreeing on fisheries management plans and finally implementing and enforcing what they have agreed to. It is time fisheries agencies set aside their notions and perceptions and realized that participatory, negotiated fisheries management is not just the way to go, but the only way to go.

What kind of a problem is fisheries management?

Traditionally, fisheries management has been done by fisheries biologists, resource assessment experts, fishery agency officers, police and the Coast Guard, all of whom have important roles. However, fisheries management is all about how to catch fish, where and when to catch them, which fish to catch at what size and, most importantly, how much to catch, to ensure basically two things:

- One, that the fishery resource will be sustainable into the future; and
- Two, that the business of fishing will continue to be profitable

Looked at this way, fisheries management becomes more complex – it is about livelihood and survival, it is about who has the right to fish and how much of it; in other words, it is about the allocation of user rights. These are political, social and economic issues, which are not only highly emotional issues but issues about which people are ready to fight. The fact that most water bodies in which fishing is practised are common property resources makes matters more complicated. Anybody with craft and gear, technically speaking, can go out and fish in the sea or in a river. How do you go about managing and controlling an activity which, by its very nature, is an open resource with unlimited entry?

Fisheries management, stripped of all its drama, reduces to not only deciding what and how much fish can be caught but who should catch it. Since we are talking about a limited but renewable biological resource, it is obvious that the people who can benefit from it are also limited. The problem is that this means there will be people left out of sharing the pie, as it were. Traditional fishers, who have fished for generations, and often know no other form of occupation, have at least a historical or traditional right to

fish. And they are the majority of fishers in the Bay of Bengal region. With the recent boom in fishing, particularly in offshore fishing and coastal aquaculture, a lot of 'outsiders' have got involved in, and invested in, fishing and aquaculture. And this has naturally generated envy and ill feeling. Particularly in the case of coastal aquaculture, when 'wasteland' overnight stat-s generating large earnings for outsiders, it is only reasonable for the local person to wonder 'Why not me?' and look for environmental, social and economic reasons upon which to build their challenge.

In fisheries, unlike in agriculture or forestry, the ecosystem is more complex, and while science has developed a lot in the past it is still not easy to come up with answers quickly to questions such as how much of this species can we catch to ensure sustainability?' Given this problem, we are dealing with a situation where no one stakeholder has the 'right' answer. To a certain extent everything is negotiable. This is even more so the case when we include the socio-political and economic aspects of the problem. The nature of the beast is such that the only hope is to bring stakeholders together to negotiate management.

What makes such negotiations complex is that several stakeholders are involved, with different perceptions of the situation, the problems and the solution options. The stakeholders, as they involve fishers, fisheries biologists and consumers, to mention just three, also have different levels ofawareness of the issues. Worse, the different stakeholders have different levels of organization and political clout. For example, a small non-governmental group, or a seemingly insignificant group of activists, can get good media coverage, use legal leverage and sway local, national and international public opinion and bring enormous political pressure to bear, unlike a fishery agency shackled by rules, regulations and bureaucracy.

To summarise. fisheries management, by its very nature, requires the involvement ofmultiple stakeholders, with differing levels of awareness and political power, to reach negotiated agreements. The issues are multidisciplinary, are not firmly grounded in clear logic, and the state of the knowledge does not allow for black-and-white answers to questions. Stakeholders often see each other as adversaries rather than as groups on the same side working together to solve the same problem. One group's benefit is seen as another group's gain, and this is unacceptable. So, how do you go about promoting, facilitating and enabling fisheries management? And, what role can communication and awareness-building play in all this?

What can communication and awareness-building do?

Given the nature of the problem, the first task would be to bring the stakeholders together, to better understand their problems, to agree on:

* the need for, the benefits of and the methods of fisheries management
* the objectives of fisheries management;
* the solutions;
* who does what and how; and
* how it should be enforced

Which is quite a handful, to say the least.

Let us take it one step at a time. A problem in fisheries that requires management can manifest itself in many ways. Catch per unit effort could be declining, the size of fish caught could be getting smaller.

more juveniles are being caught , or even fish not targeted by the fishery are being caught, all leading to waste of resources, poor landings, and reduced earnings and profit. There could be conflict between groups targeting the same species or fishing in the same area?. Or, as in the case of aquaculture, the people living in the coastal region could be complaining about the environmental and social impacts of aquaculture.

The first task would be to identify all the stakeholders: those interested in the activity, those dependent on the activity, those affected by it, those opposed to it and those in government whose responsibility it is to regulate it. This can only be done by communicating with the stakeholders, starting with the most obvious ones, and evolving a stakeholder map through discussion about the activity and its various stakeholders.

Problems affect people but rarely are enough justification to bring people together to solve them. This is especially so if stakeholders see each other as adversaries, and this is often the case in fisheries. They will come together only if they stand to gain by doing so. and then it will be only if they have commonly held beliefs and aspirations. To find these commonalities, communication helps by understanding each stakeholder's perceptions of the situation, problems, aspirations, interests and solution options and by culling out the areas of agreement from these. Once stakeholders can be shown that commonalities of purpose exist among them, there is incentive to come together to first talk about the agreements, and then to discuss adjustments to differences. Thus, communication can be a tool not only to bring people together but to generate new platforms or fora for discussion.

When stakeholders gather around the table to talk and negotiate. the success of such consultations depends on whether:

- they are speaking the same language (in terms of world views and levels of awareness), and
- they feel powerful enough to make a difference.

In other words, a scientist and a fisher can discuss a concept, like maximum sustainable yield or the need to declare a closed season in spawning areas during particular seasons, only if they understand each other's perceptions of the ecosystem and each other's logic frames. If they are different, no amount of persuasion will help. In such situations, communication can help improve the understanding of perceptions. worldviews and frameworks of logic. Appropriate awareness-building can bridge the difference by building new structures of learning on traditional foundations of knowledge.

The second criteria for success deals with empowerment there cannot be a fruitful consultative and participatory negotiation when powerful government scientists and bureaucrats are pitted against ordinary fisherfolk. The fishers, in order to arm themselves, will need to be helped to organise themselves and be empowered further by government, by giving them control and use-rights over the resources they have relied on for their livelihood security for generations.

Negotiations for conflict resolution are complex as they are. To expect the involved parties to be able to run them and come up with mutually beneficial solution options for consideration is far- fetched. There is a need for mediators or facilitators who, using communication , group dynamics and negotiation skills, will mediate in the negotiations and consultations and help the stakeholders in reaching agreements and decisions.

Finally, good two- way communication builds understanding and trust among. stakeholders and acts as the lubricant to facilitate improved management implementation. monitoring and enforcement. For too

long, communication and extension have been a one-way exercise of those who know, imparting their knowledge to those who do not; sharing the Word, as it were.

What communication and awareness-building cannot do

Awareness does not guarantee practice. People who know about and understand that smoking is not good for them do not always stop smoking! It takes more than just communication and awareness-building to do fisheries management. Fishers will not reduce fishing effort unless, say, price structures or alternative employment opportunities give them the opportunity of increasing their incomes. Communication and awareness-building are necessary but not sufficient conditions. Communication and awareness-building are neither public relations nor propaganda – you cannot use them to fool all the people all the time. Good communication and awareness-building cannot sell a bad programme or an idea indefinitely, nor can it make up for inadequacies and incompetence in other parts of the fisheries management package.

17. GUIDELINES FOR GROUP DISCUSSION

Workshop participants divided themselves into three groups to discuss three subjects: "Selling the idea of precautionary fisheries management"; "Operationalising fisheries management";and "Implications of PA2FM for small-scaleiartisanalfisheries". A list of questions was prepared as guidelines to help initiate discussion. Each group made a I S-minute presentation on its findings through a group leader. Here is a list of the questions and a list of the members of each group.

Group 1: Selling the Idea of Precautionary Fisheries Management

Members of Group 1

Mr Md Azizul Karim. Ms Tuti Sisulowati, Mr Dato' Wahid Jalil, Dr S M Garcia
Mr Sunil Sud, Mr S Muranto, Dr Johanes Widodo. Mr George Chong,
Mr Abdullah Sunan, Mr Sakul Supongpan, Mr Ramian Matondang

1. Who in your system takes basic decisions on the need for fisheries management measures and sets in motion the process which leads to management?
2. What criteria or concerns suggest the need for fisheries management? How do such concerns come to the notice of policy makers? flow do the criteria they use get established?
3. What are the factors that may make policy makers hesitate taking the precautionary route to fisheries management? Can we better understand the forces that affect policy makers and the decisions they take?
4. How do we convince policy makers of the need for precautionary fisheries management? How best can the idea be sold to them? Logic? Political pressure? Environmental concerns? Examples from other countries? Pressure from stakeholders?
5. What are the information needs of policy makers to help them to decide on fisheries management? How easily is such information available to them?How timely is the information?
6. What kinds of information can be used to help policy makers take management decisions in a precautionary frame?
7. What are the ways of visualizing the status and trends of fisheries and their habitats to convince non- technical policy makers to take decisions in favour of precautionary fisheries management?
8. What are the analytical tools necessary to generate information to help policy makers take decisions in a precautionary frame?
9. What kinds of data would need to be collected, how and by whom to feed such analysis'?
10. What changes could be recommended to existing data gathering and information generation processes to facilitate timely provision of information to policy makers to help them in their decision making?

Group 2: Operationalizing Fisheries Management

Members of Group 2

Mr Md Masudur Rahman, Mr Sihar Siregar. Ms Ir Enni Soetopo, Dr Nick Willoughby, Ms Khatijah Hj Noordin. Mr Mohamed Faiz, Mr Gary Preston. Mr A A Kulatunga, Mr Nasiruddin Siregar, Dr Kee-Chai Chong

I. What are some of the more successful fisheries management initiatives in your countries?

2 State the conditions and factors which made such initiatives work well. Is it possible to suggest a checklist of conditions and factors fisheries managers should look for or create to implement successful fisheries management initiatives?

3 Who actually manages fisheries? For example, in your countries:

- Who identified fisheries that need management, and how do they decide which fisheries need management?
- Who develops fisheries policy and what factors go into policy- making?
- How is the policy converted into law, rules and regulations, and by whom?
- What measures are taken to make fishers and other stakeholders aware of the need for, the benefits of and the methods of fisheries management?
- How are stakeholders involved in the actual process of fisheries management?
- Who enforces fisheries management and how? Do stakeholders play an active role in this?
- What are the processes by which laws, rules and regulations relating to fisheries management are reviewed from time to time? What suggests the need for such changes and how does it come to the notice of the fishery agency?

4. Can we think of innovative easy-to-implement fisheries tnanagement methods. from the examples of others and from the indigenous knowledge and local experience of fishers'?

5. Based on your discussion can you recommend:

- Changes in the way institutions concerned with fisheries management function to facilitate the process?
- Changes in laws, rules and regulations to facilitate the process of fisheries management?
- How state, provincial and local level institutions can be involved and empowered to manage their fisheries?
- How can stakeholders of fisheries be encouraged to participate in fisheries management?
- What kinds of incentives and dis-incentives may encourage participatory fisheries management?

Group 3: Implications of PA2FM for Small-Scale/ArtisanaI Fisheries

Members of Group 3

Dr John Kurien. Dr Nik Mustapha R Abdullah, Mr John Fitzpatrick,
Mr S Jayasinghe, Mr Jate Pimoljinda, Dr Stanley Wang,
Mr Robert Napitupulu, Mr Zainuddin Siregar, Mr Rathin Roy, Mr Rene Verduijn

1. Given the socio-economic conditions of artisanal fisherfolk is it really possible for them to manage their fisheries, which more often than not means reducing fishing effort, while still assuring themselves of food and livelihood security?

2. Artisanal fisherfolk have traditionally practised some management measures. Why did they do so? What information, factors and conditions provoked them into taking such measures? How did they get their fellow fishers to join them in such action? How do we learn from fishers?

3. Given our understanding of the above, how can we sell the idea of management and precautionary management to artisanal fisherfolk? What kind of justifications would they need to change? How best can such information be communicated to them?

4. Given that most artisanal fishers are not organized, at least in a fishery sense, what are the implications to management ofdealing with the unorganized sector? Can traditional organizations and social formations be strengthened and utilized for fisheries management purposes?

5. How do we encourage participation of fishers in fisheries management? Is it possible to be participatory without having the power (or, being empowered) to take control of one's resources and destinies? How easy is it to empower fisher communities and organizations in the present political context?

6. Community-based management lends itself to the management of locale-specific, sedentary species of fish. How do we promote regional and inter-community organizations to address the management concerns of shared fishery stocks?

7. Given the socio-political nature of people's organizations, who can have the political legitimacy to organize fisheries? How best can this be done? What can we learn from the experiences of co-operatives in this regard?

8. Participatory stakeholder approaches to management require consultation and negotiation to reach management decisions and implement them in a collective manner. How do we ensure equity in such consultations and negotiations when different groups are at different levels of organization and power? Can awareness alone empower?

9. Can we recommend approaches and methods to involve artisanal fishers and to get them to help in managing their fisheries? Are there any success stories in the region from which we can learn?

18. SUMMARY OF GROUP DISCUSSIONS

Three working groups were formed to discuss the following broad issues:

* Promoting the idea of PA2FM
* Operationalisation of fisheries management
* Implications of PA2FM for small- scale fisheries

Each group was provided with a series of questions on fisheries management issues in countries of the region (Chapter 17). These may be summarised as follows:

* What criteria or concerns determine the need for fisheries management?
* How are fisheries management measures established?
* Who manages fisheries?
* What information is needed in support of fisheries management?
* How can management-related information be best communicated to decision-makers and-those involved in the fishery?
* How can fishery management arrangements be improved?
* What factors promote or impede the precautionary approach?

The groups debated the questions listed in the "Guidelines" as well as other relevant issues. The conclusions of each group may be summarised as follows.

- It was noted that the PA2FM is a subset of the Code of Conduct for Responsible Fisheries (CCRF) which all countries of the region have adopted. The CCRF requires that we concern ourselves not only with the resources but also with people who use the resources. Section 6-l 8 of the CCRF specifically requires preferential protection of the artisanal sector.
- While both people and institutions may have been involved in instituting fishery management arrangements, most decisions were taken centrally. Government, whether Central, Regional or Provincial, was identified as the main decision- maker. The process is generally triggered by a Parliamentary initiative which may be prompted by Parliamentary constituencies (many Parliamentarians come from fishery areas) and use information from them, fisheries associations, NGOs, fishery consultative committees. It could also be triggered by day-to-day interaction between sector operators and fishery administrators.

Major fishery management problem areas identified were:

* Management decisions inconsistent with technical requirements or advice;
* Conflicts between different fisheries sectors (usually large-scale and small-scale)
* A lack of awareness of the need for resource management;
* Non- compliance with fisheries laws and regulations by fishers;
* Inadequate enforcement of laws;
* Conflicting development/management objectives within Government; Inadequate organizational structures for management purposes;

- Inadequate legal instruments or frameworks to allow management;
- Lack of reliable information on fisheries or resources;
- Inadequate international co-operation to deal with trans-boundary problems.

The following actions were required to convince decision-makers and resource users about the need for improved management:

- Improve the information available and submitted to policy makers;
- Use contacts between management authorities and the fisheries sector to promote PA2FM;
- Raise awareness of the need for marine resource management among the general public (not just fishers), especially through use of the media;
- Promote longer-term concerns in fishery sector operators.

A general insufficiency in research in support of PA2FM was recognised. Such research should address not only biological aspects of resources but also economics and social sciences. As well as looking at management options, it should deal with risk assessment, and take account of trends in demography, technology developments, future demands for food and for access to fisheries, rural and urban development issues, etc. The results of the research should be passed on systematically to decision-makers and to industry.

The groups recognised that any measures leading to long- term concerns for the resource by users, such as introducing fishing rights and allocations and increasing security of access to resources, would be valuable. For industrial fisheries these might include long-term licensing, while for artisanal fisheries territorial user rights may be appropriate. The importance of formalising the rights of small-scale fishermen was emphasised. This might be done by purely legal means (e.g. statutory local reef ownership) or through a system ofpayment of user fees for the right to fish. This would instil among fishers a stronger feeling of ownership.

Given the intense nature of coastal fishing in the region, it was concluded that effort reduction would be unavoidable in many areas. Historical precedence plus the basic principles of equity, fairness and right to livelihood argue strongly that, in case of conflict between large-scale and small-scale fisheries, Government should cause large-scale fishery interests to move offshore or even into non-fishery investment options. This was considered to be not merely an exercise in zonation but an implicit allocation of rights, supported by the CCFR and PA2FM.

Merely reducing effort in large-scale fisheries would nevertheless not solve all problems in the small-scale sector. The need to promote PA2FM would still exist. Management measures introduced into small- scale fisheries would be accepted only if they were applied across the board to all fisheries, and if stakeholders were to be involved in the decision-making, monitoring, implementation and enforcement processes. This would require devolution of some (but not all) powers to resource users. Stakeholders including Government should decide on the specific powers to be vested with resource users. Stakeholders including Government should decide on the specific powers to be devolved, and spell out the rights and responsibilities of various parties. It was noted that devolution is a two-way process. It originates from the Government and is requested by stakeholders.

Finally it was pointed out that there were several impacts on the coastal zone, which often interact and have detrimental effects on the coastal environment. There is a need to introduce integrated coastal area

management measures (also in a precautionary way). Given the dependence of fishers on the coastal ecosystem, they should have a say in coastal zone development and management and could justify a key initiating role therein, based on their adoption of the PA2FM.

Group 1 discussion: Promoting the PA2FM

Q1a - Who takes the basic decisions and sets the process leading to management measures?

The group identified Government as the main decision-maker whether at Central, Regional or Provincial level. It was clear that while people and a number of institutions may be involved in the process (see below), decisions were taken centrally.

Q1 b - What triggers the decision-making process?

Generally, the process is triggered by a Parliamentary initiative. This initiative in turn may be prompted by (and may use information from) the constituency (as many parliamentarians come from fishery areas), the fisheries associations, the NGOs (formally or informally contacted), as well as from consultative committees established for that purpose. The initiative may also result from the day-to-day interaction between the sector operators and the fishery administrators. The role of NGOs differs between countries – it can sometimes be very important and formal. It can also be informal. In some cases, public hearings are used as a triggering mechanism (i.e. are at the origin of the decision process).

Q2 - Considering thefactors that might be cited as problems in introducing the PA2FM, how can we better convince policy-makers and decision-makers about the need for PA2FM? How can fishermen also be convinced?

The group identified the required action as follows:

a. Improve the information available and submitted to policy makers (see below for details on the type of information required).

b. Use all opportunities of contact between management authorities and the sector to promote PA2FM. For example, when fisheries or resource crises erupt, when rehabilitation projects (see below) have to be taken up, when development planning is undertaken.

c. Use the media (especially NGOs and the private sector) to advertise issues and reach Parliamentarians.

d. Promote long-term concerns in operators. In order to increase long- term economic considerations, managers may introduce fishing rights and allocations, increasing security of access to resources. For industrial fisheries, long-term licensing has been mentioned. For artisanal fisheries, some territorial user rights could produce the same effect. While not recommending any approach in particular, the group recognised that any measure that raised long-term concerns for the resource by industry would be appropriate.

In case of depleted coastal resources and coastal conflicts, projects for community and resource rehabilitation (as in Thailand) could provide a golden opportunity to introduce PA2FM together with reorganisation of people, introduction of devices to keep large-scale fishing out of the coastal area (e.g. artificial reefs), organising local enforcement, strengthening local organisations, integrating community

support (e.g. clean water supplies, alternative job creation, etc.) The assumption is that people will be more receptive to PA2FM when such projects are being executed. It was also noted that introducing such an approach before the resources are degraded would really be precautionary and probably more effective. It was also noted that in order to avoid dissipation of the benefits this created, a cap on fishery capacity should be established. as also participatory mechanisms to enforce it.

Q3. What kind of information is reuired to convince decision makers, and what would be the nature of such information?

The group recognised a general lack or insufficiency in research, leading to appropriate arguments to promote PA2FM. Such research should address not only biological research on resources but also economics and social sciences. It should not only assess resources and fisheries. look at management options and deal with risk assessment, but should also produce relevant and timely forecasts. In doing so, it should take into account trends in demography and technology development and future demands for food, for access to fisheries, rural and urban development, etc.

The information produced should be supplied systematically to decision-makers and industry. It was recognised that the systematic development of management plans would help in institutionalising the information process, "forcing" (a) managers to request it ahead of time and (b) scientists to keep the information up-to-date and focusing on key issues. Such management plans should preferably be organised on an area basis or by species groups (as opposed to species by species), particularly in the case of multi-species fisheries/resources.

The group noted that in the case of shared or trans-boundary stocks the problems and solutions were similar but that the Government had an even more important and exclusive rote than in purely national resources.

Q4. What are theanalytical tools needed to generate the needed information?

The group singled out the role of fisheries models including bio-economic and socio-economic parameters and dealing with micro- and macro-economics as well as uncertainty. The group stressed, however, that even though the need for more complex models was recognised, the results generated by these models including use of information/communication specialists when available – should be conveyed in a simple and effective way to decision-makers (and the sector).

Management plans should be formulated. Fishery committees should be formed wherever possible to promote active people participation in management.

Croup 2 Discussion: Institutionalizing Fisheries Management

The 1 O-person group contained representatives/resource persons from Bangladesh, Indonesia, Malaysia, Maldives, New Caledonia, BOBP, and Sri Lanka. The group tried to see whether any regional consensus or pattern could be determined in management problems or initiatives.

Q. 1 What are the more successful fisheries management initiatives your countries?

There was a good deal of discussion on what had been said during the meeting, resulting in the identification of three major areas of initiatives:

- Bans on eco-unfriendly fishing gears and methods
- Strengthening legal frameworks to support management needs
- Sound communication systems between government and fishing communities.

Q.4 Are there examples of innovative, easy-to-implement management methods?

This was discussed at the same time as Q. | to try and pin down the difficulties as a way of determining the successes. Most group members knew of problems within their systems caused by the following factors:

- Political decisions that conflicted with technical requirements or advice;
- Conflicts between sectors of fisheries (usually large-scale and small- scale);
- A lack of awareness of the need for management and the value of the resources to others;
- Non-compliance with fisheries laws and regulations by both large-scale and small-scale fishers;
- Inadequate enforcement of laws on both sectors;
- Conflicting objectives, sometimes within government, sometimes at the departmental level;
- Inadequate government structures for management purposes;
- Inadequate legal instruments/frameworks to allow departments to manage as required;
- Lack of credible information from statistical services;
- Inadequate international co-operation to deal with straddling stocks and poaching problems.

Q.2 What conditions andfactors made these methods work **well?**

This question was not discussed. Group participants felt that a checklist ofconditions and factors needed to create successful management initiatives was not realistic. Management was often reactive rather than proactive, thus less precautionary than perhaps desirable.

Q.3 Who manages fisheries? a) Who identifies the need for management?
b) How do they decide which fisheries need management?

Government fisheries departments.

Q.3b Who develops the policy and what factors go into policy- making?

Fisheries departments, with occasional external inputs.

Q, 3c How is the policy converted into laws, rules and regulations and by whom?

Policies are given to legal drafting systems (Attorney General's Department) for conversion into legal language. Laws have to be passed by the government. Depending on how the law is framed, Ministers act on rules, and departments on regulations. They can carry out changes without further recourse to the government law machine.

Q.3d What measures are taken to make fishers and other stakeholders aware of the needs, benefits and methods of fisheries management?

Fisheries department extension services are usually responsible, though they still practise a top-down approach.

Public awareness campaigns should be carried out, using all forms of media available in the country concerned: print literature, radio, television, video, comics, posters etc.

Q.3e How are stakeholders involved in the process of fisheries management?

Most answers reflected the top- down nature of fisheries management in the region. In broad terms, stakeholder involvement was minimal (small-scale) though.

There were several instances in which particular groups played a part. Newer fisheries (less established) tended to have a greater stakeholder involvement in their development and management.

The group did not discuss 3f or 3g.

Q.5 On the basis of the discussions, can you recommend changes? Actions?

The group did not look at the sub-questions individually, but suggested the following areas where further action was needed:

Public education and awareness – a multi-media campaign to alert the entire public (not just fishers) to the value of marine resources and the way they should be tapped.

A cost-benefit analysis of what might happen if no action is taken, and the management system is allowed to drift.

Traditional user rights and the idea of 'user pays' generated heated discussion, with differing scenarios painted by different individuals on the basis of their experiences. The end point was recognition of the need to formalise traditional user rights, either by purely legal means (statutory local reef ownership), or by local payment for the right to fish, giving the fishers a greater sense of ownership rights.

Group 3 discussion: Implications of PA2FM to Small- Scale/Artisanal Fisheries

1. The group began by discussing the concept and definition of "small- scale/artisanal fisheries". They concurred with the modified version of what was presented by Dr Serge Garcia in his keynote paper.

A fishery can be broadly understood as a small-scale/artisanal fishery if it has a reasonable number of the following characteristics:

* Fishers have a good understanding of the ecosystem they work in
* Their occupation is ecosystem-based
* Simple technology
* Low capital investment
* High skill intensity

* Low job mobility
* Inter- generational and experiential learning/skill transfers
* Multi-species/multi-gear fisheries
* Highly seasonal occupation
* Linked to agriculture and other coastal occupations
* Dispersed habitats
* Household level of activity
* Owner/operators and labourers in other boats
* Near-shore fishing
* Traditional fishers for several generations and recent arrivals

The group pointed out that given the ecosystem-dependent nature of the activity, the technologies that SSF have evolved over time would tend to have a management orientation because:

* They would be tuned to the local ecosystem
* They would necessarily be simple; efficiency would be relatively low.
* They would be eco-friendly, by the very fact that the technologies have existed for generations without destroying the system

Thus it was felt that SSF are already in a way practising PK2FM and so would be very open to the idea.

2. The group then looked at whether there was sufficient justification to promote PA2FM amongst the SSF sector. The bulk of fisherfolk in the BOBP region are small-scale and their contribution to fisheries production is often considerable. Small-scale fisheries, because of several factors, are increasingly under stress and are displaying symptoms of stock stress and even depletion. There is reason from a resource managetnent point of view to promote PA2FM.

   Most importantly, PA2FM is a subset of the Code of conduct for Responsible Fisheries (CCRF) which all countries have adopted in the region. And CCRF requires that we concern ourselves not only with the resources but also with people who would tap the resource. Further, Section 6-18 of the CCRF obliges us to preferentially protect the artisanal sector.

3. Given the crowded nature ofcoastal areas and the intensity of small-scale fisheries in the region, the only real management option seems to be to reduce fishing effort. So there is a choice of whose effort needs to be reduced -- small-scale, large-scale or both. Based on the principles of equity, fairness and right to livelihood, the group felt strongly that governments should choose the option of requiring the large-scale fisheries to either move more off-shore or even get out of fisheries and move on-shore to non-fishery investment options. This the group felt was not merely zonation but an implicit allocation of rights, supported by the CCRF and PA2FM.

4. The Group felt that merely reducing effort in the large-scale fisheries adjacent to the small-scale sector, making more of the resource available to small-scale fisheries. would not solve all the problems. There would still be a need for PA2FM to be promoted in the small-scale sector, They felt that any management measures introduced amongst small-scale fisheries would be accepted and have legitimacy only if such tneasures are applied across the board to all fisheries.

5. The next issue discussed by the Group related to approaches to introducing PA2FM in small-scale fisheries. Given the scattered and dispersed nature of SSF, the difficulties of enforcing management and the diversity of SSF, the group felt that the only feasible option would be to involve SSF stakeholders effectively in the decision making, monitoring, implementation and enforcement ofmanagement measures. The Group pointed out that this would require devolution ofpowers. It emphasised that the stakeholders, including government, should clearly decide on what powers should be devolved and what should not be devolved, then spell out the rights and responsibilities of stakeholders.

6. Finally the group looked at the coastal contest within which small-scale fisheries and fishers exist. It was pointed out that there were several uses of the coastal zone which often interact and exert detrimental effects on the coastal environment. Given the "tailend" location of coastal areas, they were often used as their countries' garbage bins, with everything finally finding their way to the coast. The Group felt that given the dependence of fishers on the coastal ecosystem they should have a say in coastal zone development and management. The Group recommended that there was a need to introduce integrated coastal area management measures (also in a precautionary way) and that SSF could use the precautionary approach to demand a key role on ICAM for fisheries and fishers.