OVERVIEW OF ISSUES OF CONCERN TO FISHERIES MONITORING CONTROL AND SURVEILLANCE IN THE NORTHERN INDIAN OCEAN

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MANAGEMENT ISSUES

Although the objectives of fisheries management are often perceived differently by the many persons involved in the activity, it is generally recognized that long term sustainable use of fisheries resources is the overriding objective of conservation and management and that appropriate management measures should be adopted on the basis of the best scientific evidence available, taking into account relevant ecosystem, environmental, economic and social factors. In practice, governments often give less emphasis to biological considerations or economic performance, or both, in favour of considerations of reducing conflicts in the fishery. Nevertheless a number of governments and authorities now perceive the advantages of formulating a fishery management plan for each fishery, which may be amended either annually or at appropriate intervals to take into account any changes in the fishery situation.

Authorities are gradually learning about the precautionary approach to management and exploitation of living aquatic resources (as set out in the FAO Code of Conduct for Responsible Fisheries), which could provide a basis for setting the framework in which stocks are protected and the aquatic environment is preserved. The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures. In operating the precautionary approach, states should take into account such reference points as levels and distribution of fishing mortality and the impact of fishing activities, including discards, on non-target and associated or dependent species as well as environmental (including biodiversity) and socio-economic factors.

The adoption of conservation measures that regulate fishing activity (e.g. closed seasons and areas, restrictions on types and use of gear, etc.) may be used in conjunction with effort reduction programmes, to avoid overexploitation. However, used alone, they fail to address causes of the management problem, which often includes excess capacity and how to reduce it in a fishery. In the absence of effort reduction (or, at the very minimum, freezing it at present levels) the long term potential is often poor for improvement in the status of stocks and sustained welfare gains for fisherfolk.

Management approaches for artisanal and industrial fisheries will be different, but the principles upon which management arrangements are based will be similar. Moreover the implementation of arrangements for artisanal fisheries will be more difficult to achieve than in the industrial fishery, principally because of the larger number of fishers and fishing units involved. Where fisheries are unmanaged, or poorly managed, overcapitalisation will occur and capital will not receive an economic return and subsidies will often be paid to financially support their operations. This subsidization of fleets can exacerbate fisheries management problems.

The implementation of management arrangements, or plans, often poses difficult decisions about access arrangements and resource allocations and in most instances the need to exclude individuals already operating, or intending to operate, in a fishery. Moreover, it is not possible to concurrently satisfy the interest of all groups involved in the sector and for this reason opposition to the introduction of management measures often results. However, in many countries it has been shown that when fisherfolk are closely involved in formulating management measures and implementing the whole process, then fishery management can be better than when civil servants alone take decisions. It hardly needs to be said that, without a strong political commitment to fisheries management, the structure of management plans may well fail at the implementation stage.

Monitoring, Control and Surveillance (MCS) programmes are required for fisheries both under national jurisdiction and on the high seas, as an integral component of management and these programmes are required to ensure that management arrangements, once in place, are observed and not undermined by non-compliance (i.e. failure of fishers to abide by local and national laws, sub-regional or regional conventions, licensing terms and conditions, management requirements, etc.). However, it should be clearly understood that there is a need to build consensus among external and local resource users to increase compliance rather than put exclusive use on the repressive side of enforcement of sector policies.

This paper does not describe in detail the background to MCS in every country of the region, but it does attempt to highlight the principal issues which need to be addressed by fishery managers when using MCS to assist them in their task.

DEFINITIONS AND THE CODE OF CONDUCT

In 1981, FAO organized in Rome a technical consultation of international experts in MCS for fishery management. The experts agreed on the following definitions:

Monitoring:

> Involves the collection, measurement and analysis of fishing activity on catch, species composition, effort, discards, area of operations, etc., which is to assist fishery managers to arrive at management decisions.

Control:

> Involves the specifications of the terms and conditions under which resources can be harvested, normally contained in national legislation and provides a basis on which management arrangements are enforced.

Surveillance:

> Involves checking and supervision of fishing activity to ensure national legislation and terms of access and management measures are observed. This activity is crucial to ensure that the resources are not overexploited, poaching is minimized and management arrangements are implemented.

Countries may decide to undertake MCS in their territorial seas and adjacent EEZs with specific regard to:

(i) Fisheries (to ensure that information necessary for fisheries management is collected and that such programmes are implemented and observed), or

(ii) As part of an integrated or multi-task national administration and security activity (concerning exercise of sovereignty and law enforcement, customs and immigration duties, etc.). The approach adopted by a country is likely to reflect the economic importance of its fisheries sector, because there is little sense in having an elaborate MCS activity if its "maintenance" costs exceed national revenue from the sector.

The FAO Conference in October 1995 unanimously adopted the Code of Conduct for Responsible Fisheries. It provides a voluntary but necessary framework for national and international efforts to ensure sustainable exploitation of aquatic living resources in harmony with the environment. Article 7.7 makes reference to the need to implement effective fisheries monitoring, control, surveillance and law enforcement measures. The Code and associated guidelines on particular subjects, includes further elaboration of issues approved in the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea on 10 December 1992 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, which was adopted by the UN Conference on 4 August 1995. The project "Assistance to developing nations for the implementation of the Code of Conduct for Responsible Fisheries, in fisheries management and in fisheries monitoring, control and surveillance" (GCP/INT/648/NOR) is in fact a response to the FAO resolution 4/95 which requests FAO to make advice available for implementing the Code.

SOME ISSUES OF INTEREST TO MCS IN THE SUBREGION

The sub-region of the northern Indian Ocean has a number of different fishery management situations; these range from the local, specific stock and specific fishery of perhaps a few tonnes through to a number of different trawl fisheries and then in the Gulf of Oman and Arabian Sea an unexploited resource of mesopelagic fish with a potential exceeding a million tonnes. There is a valuable fishery for tuna both on the high seas and inshore. In addition there is the situation of coral reef fisheries where areas need to be conserved for objectives not only related to fisheries. Many fisheries are much affected by the seasonal monsoon conditions.

Table 1. Northern Indian Ocean, nominal marine catches by country

Iran	226 500
UAE	114 739
Oman	100 116
Pakistan	433 456
India	2 564 602
Maldives	118 183
Sri Lanka	236 200
Bangladesh	300 452
Myanmar	719 328
Thailand (West coast)	855 006
Malaysia (West coast)	508 128
Indonesia(West)	638 160

Source: *FAO Yearbook of Fishery Statistics, Vol. 86, 1998 (data for Western Indian Ocean, Statistical Area 51 and Eastern Indian Ocean, Statistical Area 57)*

The overall fish catch in this subregion is dominated by the catch of India. The area is characterised by the presence of inshore fishing vessels that either use handlines, gillnets or traps for exploiting the resources. Small purse seiners are frequently found in the area. Large trawlers, tuna purse seiners and tuna longliners operate in deeper waters off certain countries. Pole-and-line fishing is common for the catch of tuna. Small trawlers are found throughout the sub-region.

Marine parks and reserves also have a role to play in a number of fisheries and here again the procedures for monitoring, control and surveillance will need to be adapted to the management priorities.

Crucial to effective management is the work of a legal unit and the ability of magistrates to be in a situation to deal with fishery offences. Frequently there is a need to reduce conflict between inshore and offshore fishermen. Such problems can be mitigated when there is commitment by national institutions to address such issues. In some countries there has been an attempt to involve fishermen in the process of rights-based management, in a number of forms, which involve the fishermen in decision-making. Quite often the community management aspect can be facilitated at the start by a simple recognition of the advantages of such management through a bylaw or law that can be applied at the local level.

Vessel Monitoring Systems (VMS) can play a useful role in fisheries management. Fishery commissions can also assist international co-operation for management. Certain migrating stocks such as tuna and kingfish in particular are the object of international agencies which monitor their trends in abundance.

COUNTRY ISSUES

ISLAMIC REPUBLIC OF IRAN

Along the coast of the Gulf of Oman and the Persian Gulf there are some 120 trawlers and five vessels fishing tuna. The traditional fisheries constitute most of the fleet, with 3 176 GRP boats less than 9-m length, with outboards and 2 567 large and medium wooden dhows of 12-20 m length with inboard engines. They use gillnets, longlines, fish and lobster traps and target demersals and small and large pelagic species; some of the dhows can trawl. However, finfish trawling is apparently banned in the Gulf, although there is a closed season on trawling to catch shrimp. As the result of a buy-back programme the number of trawlers was reduced.

At Bandar Abbas a five-storey building is the headquarters of a vessel tracking and monitoring system, provided through a company called Kafa, based on a system developed by Racal. The system will cover the Strait of Hormuz, with stations located at regular distances of 20 km. After being well established it may be extended to cover the whole coast of the Gulf and Sea of Oman. It is based on radio communication linked to a radar network for inshore waters, which can be connected to satellite communication to cover more distant waters. There would still be a need for vessels to be properly marked, as required under Article 22.c.8 of the 1993 Fisheries Law.

Enforcement of fisheries regulation is undertaken by the Disciplinary Forces of the Ministry responsible for the fisheries sector. A number of open GRP speedboats of approximately 8-m length, with two 200 hp Yamaha outboards, are used to patrol waters subject to fishing.

Common offences are associated with fishing without a permit (although free), fishing in a closed area or season and trawling at an unauthorised time.

A number of trawlers based on Bandar Abbas are authorised to trawl 7 miles offshore along the Iranian coast in the Gulf of Oman.

UNITED ARAB EMIRATES

In the UAE municipalities are responsible for enforcement of the fisheries regulations. Joint meetings of staff from the Fisheries Department of the Ministry of Agriculture and Fisheries (MAF), Coast Guard (Ministry of the Interior) Navy and Air Force occur from time to time. The Coast Guard has vessels at sea throughout the 24 hours involved in routine searches of small craft. Vessels caught using undersized mesh, prohibited monofilament nets, or fishing in prohibited zones, have gear and craft confiscated. The nearest municipality is charged with taking a set fine and on presentation of the receipt the Coast Guard will release the vessel and gear. There are some 20 fast patrol craft with the Dubai Coast Guard. Repeat prosecutions may lead to permanent withdrawal of licence. The level of fine for first offence is about D 1000 (about $ 300).

The functions of the Coast Guard in relation to the fisheries relate to (1) safety certification of fishing vessels, e.g. ensuring that the required equipment is on board, (2) emergency search and rescue operations and (3) certification of the size (e.g. GRT) of fishing vessels for registration purposes. Some of these activities overlap with or require co-ordination with MAF. The Coast Guard undertakes a further activity of interest to the MAF, which is sea patrols, which includes a fisheries surveillance activity.

Since 1980 the use of trawlers has been prohibited in waters up to 24 nautical miles from the coast. Shrimps are not caught in UAE waters due to the ban on trawling. At certain times tuna fleets operate off the coast of Fajairah.

Fishing is mainly from locally manufactured GRP dhows of up to 65' using traps, lines and gillnets. The vessels should be registered in the name of UAE nationals. Often the crews come from Pakistan, India and Bangladesh. There are about 14 000 registered fishermen. Both traps and gillnets must have a stretched mesh of at least 2 inches (5cm). Some effort is being made to stop ghost fishing by traps, through use of material that decays after three days in certain parts, thus allowing fish to escape.

OMAN

Landings from the traditional fishery fluctuated between 81 000 and 148 000 t since 1985. The number of licences for traditional boats has been fixed since 1982, with no new entry. No monofilament gillnets are permitted in the fisheries.

The shrimp fishery, dominated by catches of *Penaeus indicus* and *Penaeus semisulcatus*, around Mahout Island in the Gulf of Masirah, is not controlled either by closed season or closed area, although the annual monsoon season enforces a closed season between May and August when no fishing takes place. The fishery, for some 200 to 500 t per year, by 200 to 300 fibreglass boats with outboard motors, using cast nets, is also not harmful to either the stock or the environment.

The spiny lobster (*Panulirus homarus*) is one of the principal shellfish species traditionally fished by tangle nets and traps. The annual production during the 1994 fishery season was estimated at 623 t. The present minimum capture size regulation is the 80mm carapace length.

Divers take abalone, in relatively small quantities, with snorkel but not scuba, off Dhofar. The most serious decline has been in landings of a migratory species, kingfish *Scomberomorus commerson,* which have stabilised at a relatively low level of about 4 000 t compared with landings in 1988 estimated at 28 000 t. Certain parts of the coast have been designated as marine reserves.

The overall quota for trawled fish is 25 000 t per year, but there seems to be no continuous review of the quota, or of the number of vessels authorised.

Catch of foreign registered trawlers, licensed to fish Oman waters, is reported to have increased from 13 368 t in 1985 to 23 366 t in 1996. Ribbonfish (8 000 t) made up the largest species. There were 2 737 t of cuttlefish. Trawlers are only permitted to fish beyond ten nautical miles from the coast in depths exceeding 50 m, along the coastline named Al-Wusta (to the south of which is Dhofar and to the north of which is Shargiah, Muscat, Al-Batinah and Musandam). Eighteen trawlers are permitted to operate. The trawlers are not permitted to catch crustacea such as shrimp, lobster nor kingfish. It is reported that the allowable stretched mesh size is 120 mm in the codend. In 1998 from 17 July to 17 November there was the first closed trawling season. A ban on discards, which previously made up about 40 to 60% of the catch, was also introduced at this time. If the ban is enforced, so that all the fish has to be landed for sale for human consumption or the fishmeal plant, the viability of trawling may well be in doubt.

A ministerial decree (3/82) and 1983 amendment (59/93) followed the 1981 first royal decree on fisheries (53/81). New bylaws were issued in 1994 (4/94). There is a reference to permitting 16 species to be discarded at sea. In theory crustacea and cuttlefish should not be caught, but since they are caught in a zone where trawling is permitted, no prosecutions are brought. The 1998 ban on discards will have changed the situation.

Foreign registered tuna longliners fishing with permit in Omani waters catch approximately 9,000 t of tuna, mainly yellowfin. About 100 longliners mainly with the Taiwan (Province of China) flag normally target tuna during March and April. Besides yellowfin tuna, substantial catches of shark are also taken.

At least twelve small patrol boats for the Royal Oman Police are based at Muttrah and carry out normal work of a coast guard. There is intermitted liaison of the Fisheries Department with this section of the Police and with the Navy and Air Force. The Fisheries Department has been assessing possible use of a vessel monitoring system. The large trawlers fishing off the Omani coast normally carry observers.

Pakistan

There are two coastal provinces (Baluchistan and Sindh) covering the 990-km coastline.

The Baluchistan Provincial Fisheries Administration has offices at nine points along the 750-km coast, for monitoring fishing activity and collecting statistics. There are six (approx. 45 feet length) patrol craft (of which three are operational) involved in fisheries inspection and

mainly checking the licences of fishing craft coming in from Sindh. The patrol craft operate up to 12 nautical miles from shore, with craft of the Maritime Security Agency working further offshore. The 1986 Law prohibits shrimp trawling, or purse seining for sardines, but, in spite of this, some of these operations do occur. When a vessel is arrested at sea it is first brought to a port and then the catch is auctioned. Funds from the sale are kept on deposit in case the fishermen wins the court case, which is usually heard within 6 to 7 days. Within the period August 1997 to October 1998 there were 238 arrests; value of fine exceeded US$ 400 thousand and value of confiscated catch exceeded $ 300 thousand.

There is no minimum legal mesh size, but normally the gillnets are of 4 to 5 inch stretched mesh. It is understood that a number of communities practise community fisheries management.

Personnel of the Navy staff the Maritime Security Agency. There are some 800 personnel. Their objective is to implement the MSA Act of 1994 with regard to fisheries as well as search and rescue and anti-pollution activities. There are four 58m vessels and a number of smaller craft for this work. There are also two Britten Norma islander aircraft. Any foreign unlicensed vessels, or large trawlers caught in the 35 nautical mile zone are immediately brought to port.

The 35 nautical mile limit that regulates foreign trawlers operations apparently does not take into consideration the availability of trawling grounds. The location of trawling grounds accessible to these trawlers should be located on a chart.

Staff of the Marine Fisheries Department do not accompany MSA patrols. Boarding of fishing vessels for inspection takes place after transfer, by an inflatable craft, of the boarding party to the vessel to be inspected. There is no clear procedure for checking fishing location, catch composition, log book, gear, etc., which can be fed back into fishery management processes. The control room of the MSA is operated for 24 hours daily.

Ten tuna longliners gain authorisation to fish in the EEZ for about six months in the first half of each year. Previously the vessels carried observers, but this practise has now been discontinued.

Although the Sindh authorities prohibit trawling in creeks and in an area one mile from shore there is in reality a situation where trawling appears to continue. The codend of these trawls is normally of 25 mm with an inner pocket of 10 mm. Set bag nets and purse seine nets are also prohibited but are known to be used. There is no limit to the number of vessels that may fish and no effort is made to freeze or reduce entry into the fishery. Some twenty years ago FAO recommended that only 450 to 600 trawlers be authorised, but numbers now approximate 2000. A closed season, in June and July, for shrimp trawling, (agreed by processors) does however appear to function. Other regulations prohibit dynamiting and the landing of small carp and lobster.

The Exclusive Fishery Zone (Regulation of Fishing) Act, 1975, extends to the whole of Pakistan and to waters within the exclusive fishery zone of Pakistan. Regulations pertain to (a) size of meshes and type of net, (b) size and quantity of fish which may be caught, (c) conditions to which licences may be subject, (d) registration of craft and gear, (e), fees and (g) area, etc. Further more detailed directives were issued as Exclusive Fishery Zone (Regulation of Fishing) Rules, 1990. By notification of 1992, certain officers of the Pakistan Navy and

Maritime Security Agency, along with Fishery Officers, were given powers to enforce the 1975 Act. The Sindh Fisheries Ordinance 1980 and the Baluchistan Sea Fisheries (Amendment) Act 1986 regulate fisheries in the two provinces.

India

Details of the fisheries are presented in the two preceding papers. In general, the marine fish catch seems to be stabilising and in some zones declining. The more common management measures include closed fishing seasons, for example during the monsoon and inshore closed areas. In order to address the problem of decline in catch per unit effort and catch, there is a need to consider introduction of further management measures.

The majority of vessels operate inside the 50 m depth contour. Fisheries management responsibility is split between the State Governments (Provinces) for the territorial sea (an area up to 12 nautical miles from the coast) and the Government of India (GOI) for all foreign fisheries and for the area outside the territorial waters.

Legislation was enacted to extend the EEZ to 200 nautical miles in 1976 (The Territorial Waters, Continental Shelf, EEZ. and Other Maritime Zones Act, 1976) and to address foreign fishing in 1981 and 1982 (The Maritime Zones of India, Regulation of Fishing by Foreign Vessels, Act 1981 and its Rules of 1982). Fisheries regulations for Indian registered fishing vessels fishing in the area outside the territorial seas and on the high seas could be drawn up in the framework of the 1976 Act and conditions for fishing could be attached to a licence. More preferably, a specific Act to cover fisheries within the EEZ., linked to fishery management plans, could be drawn up. The Central Government has pledged to assist all coastal States in the implementation of State fisheries laws and through assistance in acquiring patrol vessels. It is understood that various maritime State Governments/Union Territories, with the notable exclusion of Gujarat (which has such an important fishery), have Marine Fishing Regulation Acts.

The only Indian legislation that mentions “undertaking measures for the conservation and management of offshore and deep-sea fisheries” is the Marine Products Export Development Authority Act, 1972.

Offshore patrols come under the authority of the Indian Coast Guard under the “Ministry of Defence of Central Government” and the Navy in particular, to enforce the two Acts of 1976 and 1981 dealing with fisheries. There appears to be a fairly close co-ordination with the Indian Coast Guard for assistance in the offshore enforcement of foreign vessels. Coast Guard officers receive a week-long fisheries familiarisation course in the areas of fisheries enforcement for which their services are required e.g. fishing materials, fishing gear for the deep sea, fishing licences and logbooks, endangered species.

The Coast Guard requires all foreign fishing vessels to call to the Coast Guard with position and catch data each morning. This information is to assist the Coast Guard in its patrol planning by knowing where vessels are expected. The information and catch data could be of assistance to fisheries and research personnel.

The Environmental Protection Act of 1986 provides the framework for regulations covering marine parks.

The Commissioner for Fisheries Development is answerable to the Joint Secretary Fisheries within the Department of Animal Husbandry and Dairying of the Ministry of Agriculture. A number of important institutes and research institutions have responsibility for the sector and are answerable to the Minister of Agriculture.

Maldives

The pole-and-line tuna fishery takes place within 30 miles of the shore. Over 20 species of baitfish are utilized, most of which are highly fecund and not in danger of overexploitation.

While the reef stocks generally are lightly exploited, the giant clam and bêche de mer (sea cucumber) fisheries have been placed under management to avoid overexploitation. Certain areas have been specifically reserved as coral diving sites; this does not stop local fishers from carrying on traditional fishing activities, but it does stop intensification of fishing. The main objective has been to preserve certain areas for the observation of sharks by visiting divers.

No purse seining, gillnetting or longlining of tuna is allowed within the 75-mile zone. The office of the Atoll or island Chief is responsible for fishing activity in their zone of authority and this includes responsibility for collecting catch statistics. Normally the area of activity of vessels is restricted to certain areas. The use of gillnets is controlled and, as noted above, they cannot be used for catch of tuna.

Coastal resources are reserved for exploitation by Maldivians. Skipjack tuna, which makes up about 90 000 t out of a total annual catch of some 105 000 t, is by far the most important resource. Foreign fishing is only authorized in the EEZ beyond 75 miles from the archipelago baseline. Prior to a licence being agreed and issued by the Ministry of Trade and Industry (MTI), the Total Allowable Catch (TAC) for the year must be determined by the Ministry of Fisheries and Agriculture (MOFA). All foreign-registered vessels must call into the port of Male both before and after fishing in Maldivian waters. There is also close control of foreign registered vessels, which may require to pass through but not actually fish in the Maldives EEZ.

All vessels should be registered with the Ministry of Transport, as well as with MOFA, but in order to be entitled to free registration as a fishing vessel, fishing from the vessel must occur at least 120 days in the year.

The Marine Research Station of MOFA undertakes stock assessment as well studies of the marine environment and advises government on marine management. MRS advises authorities on quantities of fish that can be exported and advises on restrictions of export of giant clams, turtles and aquarium fish.

The National Security Service (NSS) of the Ministry of Defence and National Security has powers to stop, search, inspect and apprehend any vessel or person suspected of an offence under laws and regulations pertaining to fisheries and marine resources. In 1995, the NSS co-operated with MTI and MOFA to purchase a satellite tracking system (using the INMARSAT-C, integrated with GPS) for foreign vessels authorised to fish in Maldivian waters, where each vessel could carry a transponder, along with a system to monitor water temperatures, thus indicating where tuna – and hence the fishing vessels – are most likely to be. The NSS has a number of patrol vessels and regularly charters an Air Maldives plane for aerial surveillance.

Sri Lanka

New fisheries legislation has been prepared to promote the sustainable development of coastal fisheries. This includes a licensing system for all active fishing methods, declaration of fisheries management areas and conservation-based exploitation, together with substantial fines and the threat of jail terms in the case of violations. In certain fisheries, for example purse seining, a high resource fee is being introduced to limit entry.

As a result of the introduction of new technology to coastal fisheries, in the late 1950s, there were conflicts between the fishermen using traditional craft and gear and those enterprising fishermen who took the challenge of using motorised boats and nylon nets. In the late 1960s many fishermen wanted to procure motorised boats with nylon nets and in the 1970s purse seines were introduced. In the mid 1980s there was so much resistance from fishermen using other types of gear that measures to limit sizes and number of nets, area of operation and a high licences fee were applied and eventually suspension of the issue of licences, Disputes between coastal trawl fishermen and groups engaged in other types of fishing led to the complete banning of trawling in Chiolaw in response to the representations of fishermen who were against trawling inspire of the effective management system introduced by trawl fishermen themselves. As a result, the Government is implementing a massive programme for the relocation of these fishermen to other fisheries. With a view to limiting the entry to the coastal fishery, some concrete measures have been taken. For instance, the emphasis of the Government in allocation of the producer subsidy (up to 50%) for fishermen to purchase boats, engines and fishing gear has been changed from coastal fisheries to offshore/deep sea fisheries.

A programme to educate fishermen in the importance of fisheries management is being undertaken. This perhaps has to make substantial progress because it is reported that often fishermen continue to take such protected individuals as berried lobster.

Bangladesh

A Director of the Department of Fisheries (DOF) is primarily responsible for marine and shrimp fisheries, the issue of licences and monitoring operations of fishing vessels. The Ministry of Industry is currently authorised to accord permission for acquisition of fishing trawlers in consultation with the Ministry of Fisheries and Livestock. The Marine Fishing Rules, amended in 1993, provide for licensing and monitoring of artisanal fishing boats; they also provide for regulation of mesh sizes, area of fishing and the prohibited methods of fishing. Movement of fishing trawlers is checked from a surveillance point located outside the port of Chittagong. For patrolling of the EEZ, the DOF procured two ships ("Meghna" and "Jamuna") and placed them under the operational control of the Bangladesh Navy. The Coast Guard (under the Ministry of Home Affairs) and the Navy (under the Ministry of Defence) is directly involved in fisheries protection activities in addition to their other normal duties. It is not clear how many prosecutions have taken place relating to infringement of fisheries regulations, although it is known that a number of foreign unlicensed vessels have been arrested in the EEZ of Bangladesh.

The industrial fleet comprises 71 trawlers, but 95% of all landings, by weight, are from the artisanal fleet. The catch of hilsa, by gillnetters classed as artisanal, makes a up a substantial part of the total marine catch; in view of its great importance to food security throughout the

country there would appear a priority to determine MCS procedures for this fishery in support of fishery management.

Fishing in waters having a depth up to 40 m are closed to the industrial fleet. Between 15 January to 15 February all waters are closed to fishing activities by industrial vessels. It is reported that the regulations concerning fishing zone and closed season are being contested in the courts. It is understood that each fishing trip by an industrial vessel requires three permits. As per the Marine Fisheries Ordinance, 1983, the stretched mesh sizes of the codends in shrimp trawl, fish trawl and set bag nets are 45 mm, 60 mm and 30 mm respectively. There is a surveillance check post of the Department of Fisheries at the entry to Chittagong port where vessels can be inspected with regard to gear used, documents, freezing facilities, catch composition, etc. Shrimp trawlers are obliged to land at least 30% of entire catch taken during a fishing trip. Some skippers are introducing turtle excluder devices (TEDs) on their trawls. No new licenses are being issued for industrial operations under joint venture or charter.

At present there are no staff of the Department of Fisheries that undertake inspection at sea, although Coast Guard personnel are authorised to undertake this activity. When the Navy arrest a vessel for illegal fishing it is handed over to the Deputy Director (Marine) who is empowered to auction the vessel as well as the fish and other goods. Crew and other personnel of the vessel are taken for trial in accordance with judiciary procedures.

The Marine Fisheries Rules 1983 apply to both local and foreign fishing vessels. Procedures laid down for obtaining a license and reporting on fish catches are quite detailed. There appears to be no dedicated marine enforcement unit associated with boarding vessels at sea to inspect logbook, catches etc.

Most of the motorized small-scale fishing boat owners hire crew on a catch-share basis. The profit sharing arrangement varies from area to area, on the type of fishery and period of fishing season. For many fishermen, marine fishing is a seasonal activity. In the main seasons (October to February) fishermen migrate from the Chittagong district to the Sundarbans and from the inner regions of the delta out into the sea. Only men participate in the migratory fishing activity. They then establish temporary settlements and live in bamboo and leaf sheds. Fresh drinking water is a major problem. The bigger fish caught are sold fresh to fish traders while the rest are sun-dried on bamboo racks near the sheds. Soon after the termination of the fishing season, preparations for the next season start, including contracting crewmembers, paying them in advance and repairing or purchasing craft and gear. Uncertain factors (weather conditions, current and fish movement) determine the financial success or failure of these ventures

Myanmar

The Territorial Sea and Maritime Zones Law, 1977, of Myanmar, defines the territorial sea as twelve miles, an Exclusive Economic Zone of 200 miles and a contiguous zone 24 miles from the baselines and adjacent to the territorial sea. No one shall conduct any activity in the EEZ in relation to exploration, exploitation or research, without the prior express permission of the Council of Ministers. A law relating to fishing rights of foreign fishing vessels was introduced in 1989 and this was followed by the Myanmar Marine Fisheries Law of 1990 and the amendments of 1993. An FAO lawyer visited the country in 1991 to advise on the legal regime governing fishing and advised on future work needs and fisheries monitoring, control and surveillance requirements.

Thailand

Codend stretched mesh size in the trawl nets continues at 25 mm, but discussions are maintained with Fishery Associations on increasing the mesh size to 40 mm. No trawls or pushnets are authorised for use within a distance of 3 km from shore. Phangna Bay in the Andaman Sea is closed to trawling and there is a closed season for pelagic fishing in the zone Prachuab Khir Khan north of Chumporn to a line north of Nakhon Sri Thammarat, during February, March and April. Some scientists report that it is as a result of this closed season that catches of mackerel have stayed high.

Staff of the Department of Fisheries (DOF) have been keeping open the possibilities for establishing further zones reserved for different vessels, control on gears and introducing quotas. For the fishery sector, the 8th Development Plan for Thailand, starting 1997, emphasises the importance of involving communities in management. The FAO Bay of Bengal Programme (BOBP) has been assisting with introduction of a community based management system for fisheries in Phangna Bay.

The DOF refrains from licensing additional trawlers, but some vessels are reported to obtain licences for purse seine and are then reported to switch back to trawl. Official policy is to reduce fishing effort. A committee examines requests for trawler licences, which exceptionally can be granted for replacement vessels. A licence might also be granted on condition the vessels work outside the EEZ. The Department of Harbours undertakes an annual survey of each vessel. Gear licences are issued by the DOF and the fees are nominal (200 Baht[6] per unit for a stake trap, 5 Bahts per metre of headrope in a trawl, one Baht per metre for a purse seine).

Some thousands of Thai vessels (normally with Thai crew) are now fishing outside the Thai EEZ under arrangements that differ from country to country. The monitoring of these foreign operations is not easy.

The Department of Fisheries has 65 patrol boats (3 of 100 feet, 3 of 80 feet , 21 of 65 feet mainly with an aluminium hull and a number of smaller craft). There are four patrol zones in the Gulf of Thailand and one in the Andaman Sea. Ten of the patrol boats operate in the Andaman Sea. The larger craft spend up to 30 days per trip. A small plane of the Ministry of Agriculture is frequently used to monitor fishing areas in the closed season. Inspection procedures target use of dynamite and poison, illegal gear, fishing in closed areas or season, catch of protected species, possession of a valid licence, areas reserved for traps and shellfish culture, etc. Successful prosecution can lead to fines and prison sentences, as well as possible confiscation of the catch, gear and boat.

The Law and Treaty Division (one of some 30 DOF divisions) bases much of its work on the 1947 Fisheries Act (itself more concerned with inland rather than marine fisheries) and recent amendments.

Remarkable for Thailand is the increase in coastal shrimp aquaculture, the relative decline in importance of trash fish in overall landings and the continued diversity of fishing gear (including the common use of squid light luring/dipping gear). International environmental pressures are being exerted on the sector so as to reduce catch of turtles in shrimp trawls.

[6] 1US$ is about 38 Baht

Malaysia

The Malaysian Department of Fisheries is charged with enforcement of the Fishery Act 1985 and the EEZ Act of 1984.

The number of smaller vessels appears to be in decline as a number of fishermen leave the sector and move into other sectors of the resilient economy. Certainly no increase in the number of trawlers is permitted in inshore zones. The number of larger vessels appears to be increasing and may have been chartered to Malaysian companies; they can obtain authorisation to fish in the 'C2' zone (30 to 200 nautical miles from shore, reserved for vessels over 70 GRT) off certain parts of the Malaysian coast. In the 'A' zone of 0 - 5 nautical miles no trawling is permitted, so small boats use anchovy purse seines, hand lines, gillnets and jigs. Small trawlers of up to 40 GRT can work the 5 - 12 nautical miles zone and vessels of above 40 GRT can work in the 12 - 30 nautical miles zone. The minimum authorised codend mesh size in trawls is 37 mm (1.5 inch. When passing through the Malaysian EEZ en route to fishing grounds elsewhere, non-Malaysian flag vessels report on entry and exit to the Department of Fisheries in Kuala Lumpur.

The key to relatively good statistics in Malaysia may well be due to the close supervision of enumerators. In each State there is one staff member responsible for statistics, with an enumerator in each fisheries administrative district. The vessels are stratified by GRT and gear and the need for randomly choosing certain vessels for data monitoring is important. All districts are equipped with computers so information on fleets and catches can be kept up to date and sent online regularly to Kuala Lumpur.

There is no plan to increase the number of patrol vessels in the enforcement service beyond the present 100, although there will be some replacements. In the 0 - 12 nautical miles zone patrol craft are the responsibility of State officers. However in offshore waters, beyond 12 nautical miles, the staff based at a limited number of locations maintain overall Federal responsibility. The patrol fleet consists of small open 'Boston whalers' (PL) which cover the 0 - 5 nautical miles zone, (PA class) craft of 45 feet - twin 1 000 hp engines - wooden hull, 55 feet steel hull '300' series and 65 feet steel hull '100'series which cover the 5 - 12 nautical miles and 12 - 30 nautical miles zones, with (PX) craft - twin 1500 hp engines - of 26m (or 100 feet with diving deck) to cover the EEZ out to the boundary (actually about 150 nautical miles). The patrol vessels report regularly their positions.

Much fishing activity is centred on the Ambas and Natunas Islands in Indonesian waters. Many vessels are tempted to fish around oil platforms, where light attracts many fish. A zone of 500 m around the platforms has been gazetted. Drilling for oil is soon to take place in the area jointly claimed by Malaysia and Thailand and this will mean there is a line of gas and oil rigs about 100 nautical miles off the coast.

Many fishing vessels now carry GPS. Malaysian vessels may direct patrol craft to positions where fishing is taking place illegally by vessels without licence. Malaysian vessels have easily identifiable numbers and a wheelhouse painted in a particular colour of the State from where it originates. Trawlers have a diagonal line painted in white on the wheelhouse. Purse seiners and trawlers must keep a distance of 5 nautical miles from marine parks/islands. Traditional craft must not fish within a distance of 2 nautical miles from marine parks/islands. Many fishing craft have been fitted out as tourist craft. The DOF has a number of programmes

to protect turtles, through sanctuaries and hatcheries, as well as turtle excluder devices in trawls.

The vessel monitoring system that has been introduced, on some thirty vessels, has assisted fishery managers to appreciate the movements of vessels in the course of their fishing and in their activities of discharging fish, sometimes in ports that are not their home port. It is expected that all vessels holding a licence to fish will be expected to carry an automatic location device.

Indonesia

In Indonesia the Ministry for Sea Exploration and Fisheries has recently been established. The new structure is expected to lead to improved fisheries management. Directorates-General include Fisheries, Conservation and Protection, Research and Exploration, Institutional Capacities and Coastal and Small Island Affairs.

Under an Autonomy Law, which is to promote decentralisation and which is expected to enter into force in the course of 2000, each district will have jurisdiction over a 4-mile zone measured from the beach and each province will have jurisdiction over the zone between 4 and 12 miles from the beach. The national government will have jurisdiction over the remainder of Indonesia's maritime waters including the archipelagic waters and the EEZ.

There are a number of local management arrangements, such as the Bali/East Java Purse Seine Fisheries Agreement, which regulate the number of vessels and type of gear. However many of the regulations are not enforced. In general, trawl gear is banned; nevertheless in some places it continues to be used but is given another name. It is understood that some local authorities maintain patrol craft for monitoring of fishing operations and the control of illegal entry into a fishery. The Navy has traditionally been influential in the control of fishing and has at times allowed illegal fishing practices to continue.

Many vessels of foreign origin are permitted to fish in the Exclusive Economic Zone, under charter or joint venture arrangement and are registered as Indonesian vessels. There is often a problem with their identification. It is understood that each vessel should carry a logbook. The introduction of a vessel monitoring system is under discussion.

FURTHER OBSERVATIONS

In all situations there is a need to examine the best way of collecting information so as to aid managers set targets and improve the approach towards meeting those targets. Information gathering includes data on catches, landings and species composition as well as components of the catch in detail. Important data on the economics for the operation also need to be collected. Once information is available and assessed, the management regime can be established and regulations introduced. Enforcement of these regulations is a requirement that not only is necessary for adhering to the legal requirements but also as an aid to improving the management regime and modified regulations that can perhaps be more easily enforced.

A difficulty faced by a number of fisheries administrations is the lack of firm advice on what management decisions to apply in the case of a fishery. In practice, it is not easy to introduce or change regulations concerning access, zones, seasons, gear, etc. Certainly MCS can provide information of use to scientists as well as to fishery managers in their assessment of

what is happening to a fishery and on what problems need to be faced so that decisions can be taken. Where management decisions are being enforced there must be a feedback from MCS personnel to decision makers so that reasonable measures can be taken which are indeed applicable. In a number of situations the application of measures to reduce fishing conflicts must be taken both with sensitivity and firmness and this calls for considerable judgement on the part of the authorities.