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Small-scale fisheries

Managing the unmanaged

Can we manage small-scale fisheries? Can we afford not to? This issue examines a spectrum of challenges at many levels - ranging from strategies for the future to safety at sea, and strong political commitment to help the small-scale fisherman.

Small-scale Fisheries

Managing the unmanaged

Managing small-scale fisheries is a major challenge for the global community. Enough has been said about their plight. What needs to be done and how?

Small-scale fisheries was debated intensely at the recently concluded meeting of the Committee on Fisheries (COFI) in Rome. The subject aroused great interest also in previous meetings of COFI. But there was a tone of intensity and urgency at the latest meeting, the 27th – as the report on pages 5 to 8 of this issue of ***Bay of Bengal News*** shows.

A majority of COFI's members strongly urged the setting up of a dedicated COFI sub-committee or a specific work programme on small-scale fisheries to address the long-term developmental needs of small-scale fisheries.

This suggestion has merit. Small-scale fisheries is one of the most un-organised and unmanaged areas in global food production.

How big is small-scale fisheries?

Some 38 million people worldwide are fishers and fish farmers, according to the FAO document 'State of world fisheries and aquaculture, 2004'. Of these, 26 million are into capture fisheries (marine and inland), the remaining in aquaculture. Over 78 million people are dependent on small-scale fishing and ancillary activities such as processing, trade, etc. for their livelihoods. These estimates exclude the millions of people who are temporary fishermen in marine areas and elsewhere.

How unmanaged is small-scale fisheries?

So un-managed that even a precise definition is elusive. An expert consultation on small-scale fisheries in 1975 proposed a 53-word omnibus definition. Another FAO group in 2005 concluded that it would be inappropriate to formulate a universally applicable definition for small-scale fisheries. It described the sector on the basis of the range of characteristics that are likely to be found in any particular small-scale fishery (see box on opposite page).

What are the problems of small-scale fisheries? They are very many, as pointed out in the FAO paper "Social issues in small-scale fisheries"

Defining small-scale fisheries

According to an expert consultation on small-scale fisheries development held in 1975 in Rome, "Small-scale fisheries are labour-intensive, and are conducted by artisanal craftsmen whose level of income, mechanical sophistication, quantity of production, fishing range, political influence, market outlets, employment and social mobility and financial dependence keep them subservient to the economic decisions and operating constraints placed upon them by those who buy their production."

According to the FAO Technical Guidelines for Responsible Fisheries, No.10 ("Increasing the contribution of small-scale fisheries to poverty alleviation and food security," Rome 2005), small-scale fisheries can be broadly characterized as a dynamic and evolving sector employing labour-intensive harvesting, processing and distribution technologies to exploit marine and inland water fishery resources. The sub-sector (conducted full-time or part-time, or just seasonally), aims at supplying fish and fishery products to local and domestic markets, and to meet subsistence consumption.

Export-oriented production has increased in many small-scale fisheries during the last one to two decades because of greater market integration and globalization. Typically, men engage in fishing and women in fish processing and marketing, but women are also active in near-shore harvesting activities while the men are known to engage in fish marketing and distribution as well. Other ancillary activities such as net-making, boatbuilding, engine repair and maintenance, etc. can provide additional fishery-related employment and income opportunities in marine and inland fishing communities.

Small-scale fisheries operates at widely differing organizational levels – ranging from self-employed single operators through informal micro-enterprises to formal sector businesses. This sub-sector, therefore, is not homogenous within and across countries and regions. This fact must be taken note of when formulating strategies and policies for enhancing the contribution of small-scale fisheries to food security and poverty alleviation.

– Poverty, harsh living and working conditions.

– Weak organisational structure, no social security.

– Lack of access to credit, particularly public finance, dependence on exploitative money-lenders

– Hazard to life and limb at sea through fishing vessels that lack basic safety standards and safety equipment. Vulnerable to floods and cyclones, and to the vagaries of climate change.

– Exclusion from access to other employment opportunities, to health and social services, to roads, markets and other infrastructure. Excluded from participation in social and political processes, and in development planning.

– Diminishing fish stocks and biodiversity. Increasing competition with other users of coastal resources, conflicts with the industrial fishing

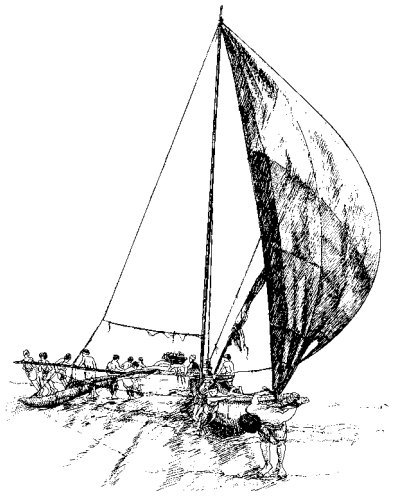
What's the solution? How do we go about it?

Some of the problems listed above are unique to fishers, but many are common to all rural populations. Managing them call for a slew of measures. They demand a combination of resources, political commitment plus political, economic and social reform.

The BOBP-IGO believes, however, that five measures are critical.

• **Open access** is the bane of small-scale fisheries. It leads to fleet overcapacity, indiscriminate overfishing and resource degradation.

A rights-based system of access is needed that respects the interests of both present and future generations, ensures sustainability of resources and optimizes benefits to fishing communities. This is of course easier said than done, but the process must be set in motion.



Such a system would vary from country to country, and within a country as well, depending on the ethos of the community, the resources available, the composition of resource users.

• Fishing communities need **social services** – relating to education, health, housing, insurance, access to government schemes, etc. – which are provided by government departments other than fisheries. Inter-sector co-operation is essential so that fishers can get these benefits.

• **Credit and public finance** are a part of the social services mentioned above, but need special mention because of their importance for fisherfolk communities. Simple and convenient access to credit can make all the difference between self-reliance on the one hand, destitution on the other.

While lack of credit has usually inhibited development of small-scale fisheries, excess flow of capital has contributed to over-capacity. This happened recently with the tsunami reconstruction drive.

• **Introduce the stakeholder approach to fisheries management**

and resource sustainability. The fishing resource is under pressure everywhere, with some exceptions, and sustainability is being endangered. The rationale of the stakeholder approach is that legislation alone can't bring about management, even persuasion cannot. The active co-operation of a number of stakeholders – fishers, the public, fish vendors, retailers, processors, wholesalers and exporters, government departments and scientists, the media, social scientists and biologists, perhaps international organisations and donors – is essential. Representatives of all stakeholder groups come together, discuss individual and collective perceptions of the problem, analyse them and come up with options.

The stakeholder approach to management is participatory. It can be slow. But it is steady, sure and systematic. It not merely widens awareness, it narrows differences, reconciles conflicting viewpoints, facilitates solutions.

During the BOBP's third phase, the stakeholder approach to management was used to tackle an impressive diversity of management problems. To cite an example, community-based fisheries management (CBFM) in Thailand. CBFM came into force in 110 fishing villages of Phang Nga bay whee resource stress was a serious problem. The package of CBFM measures included a ban on trawls and push nets within 3 km of the shoreline; construction and installation of community spawning cages; culture of finfish, oysters and mussels; voluntary surrender of resource-damaging push nets by fisherfolk in return for gillnets; installation of artificial reefs to keep out trawlers; mangrove reforesting and sea ranching; construction of a floating pontoon on the sea; setting up of a community learning center; enrolment of fishermen themselves as voluntary rangers to monitor fisheries and ensure compliance with management effort. The project was a huge success.

The stakeholder approach was also used with ornamental fisheries in Sri Lanka; reef fisheries resource management in the Maldives; tackling the resource problems posed by two fisheries in Bangladesh (push nets and set bagnets) that employed thousands of subsistence fishers; participatory training of fisheries officials in Tamil Nadu, India; tackling shrimp culture problems in Andhra Pradesh, India; use of PRA as a tool for data collection and analysis in West Bengal, India; setting up of a marine park in Malaysia.

The fragile nature of small-scale fisheries may make drastic management changes difficult. New management approaches, locally relevant and appropriate, need to be tried.

- **Empowerment of small-scale fisherfolk communities:** Social and economic empowerment have been discussed above, but political empowerment is even more critical. Self-help groups of men and women, co-operatives and other forms of organisation would catalyze action and serve as forums for co-operation with government and other institutions, for expression of grievances, for problem-solving.

In sum, managing of small-scale fisheries is a large-scale challenge. It can be undertaken by the government only through a stakeholder approach that involves social scientists, biologists, the media, and the fishers themselves.

A COFI Sub-committee on small-scale fisheries may provide critical inputs into understanding of present problems, but the burden of action has to be shouldered largely by governments worldwide. Political will and commitment are crucial. Other action is often quick to follow.

– Y S Yadava

Paintings by school children in India, Maldives and Sri Lanka depicting post-tsunami reconstruction.

Committee on Fisheries Examines Various Global Problems at 27th Meeting in Rome

FAO Headquarters, Rome

A summary of the discussions and decisions of the 27th session of the FAO's Committee on Fisheries, which met in Rome early in March.

The 27th session of the FAO Committee on Fisheries (COFI) was held from 5 to 9 March, 2007 at the FAO headquarters in Rome. Senior government officials from more than 100 countries plus observers took part. Mr A Hettiarachchi of Sri Lanka chaired the meeting.

The Committee on Fisheries (COFI), a subsidiary body of the FAO Council, was set up in 1965 at the 13th session of the FAO Conference. The Committee provides a global forum to review the FAO's programmes, examine major issues in international fisheries and aquaculture, and negotiate global agreements and instruments.

The 27th session discussed progress in the implementation of the FAO Code of Conduct for Responsible Fisheries (CCRF); rehabilitation of fisheries and aquaculture in countries affected by the 2004 tsunami; social issues in small-scale fisheries; combating illegal, unreported and unregulated (IUU) fishing; implementing the ecosystem approach to fisheries, including deep-sea fisheries; strengthening regional fishery management organizations (RFMOs) and their performances. The COFI also heard a presentation of the "State of World Fisheries and Aquaculture (SOFIA) 2006" before the meeting officially opened.

At the opening session, Mr David A Harcharik, FAO's Deputy Director-General, pointed out that the FAO's Fisheries Department had been renamed Fisheries and Aquaculture Department, in view of the growing importance of aquaculture.

Code of Conduct: Many members provided information on measures they had adopted to implement the Code. These included efforts to disseminate information about the Code, particularly among small-scale fishing communities, and progress in international plans of action (IPOAs). The Committee agreed that progress had been made in implementing the Code; but members needed to do more both individually and collectively.

Capacity and overcapacity in fisheries: The Committee reaffirmed linkages between overcapacity, allocations, overfishing and IUU fishing, and highlighted the need for both national and regional action. Some members said that while addressing the problem of overcapacity, the right of developing States to develop their own fisheries and participate in high-seas fisheries should be taken into account.

Many members described national initiatives to combat IUU fishing. Some members referred to monitoring, control and surveillance programs and vessel monitoring systems as basic tools to curb IUU fishing.

Regional Fishery Bodies: Recent conferences have urged FAO to strengthen its role on setting up a global capture fishery statistics database to provide information on fish stocks. In view of the primary role of regional fisheries management organizations and regional fishery bodies in data collection, it has been recommended that FAO should consolidate the catch data of RFBs into a single database under the general guidance of the CWP (Coordinating Working Party on Fishery Statistics).

Support on Code of Conduct: Many members thanked the FAO for the technical assistance it provided to support implementation of the CCRF and related instruments, especially on the management of inland and marine capture fisheries and the development of sustainable aquaculture. They asked that a greater share of the FAO's budget be allocated to fisheries and aquaculture to enhance capacity-building.

Reconstruction of livelihoods after the tsunami: Members commended the FAO for prompt and sustained support in tsunami rehabilitation, in areas such as damage and needs assessment, planning for sustainable rehabilitation, donor coordination, etc.

Many members said that massive and uncoordinated assistance triggered by the tsunami and the higher efficiency of new vessels had raised concerns about over-capacity. The Committee said this issue should be addressed, with FAO assistance as needed, through effective fisheries management arrangements.

Members were told that many boats provided through emergency assistance failed to meet minimum safety standards. FAO and other UN agencies should address the problem in collaboration with affected countries.

The Committee welcomed the emphasis in the tsunami rehabilitation programmes of some members in areas such as institution-building for fisheries management, habitat restoration, safety at sea, infrastructure rehabilitation, post-harvest activities and aquaculture development.

The Committee recommended that FAO should report more extensively on lessons learned from post-tsunami rehabilitation, and disseminate results widely. Some members stressed the need for better donor coordination, inclusion of local expertise, and greater emphasis on technical assistance in the face of severe natural disasters. Some members called for greater flexibility in procedures by the FAO to enable more rapid response to emergencies. Many members also urged further work on early warning systems for fishing communities. Members should strive to develop proper disaster management frameworks and supporting legislation.

COFI Sub-Committee on Fish Trade: The Committee noted the importance for developing countries of international trade in fish and fish products. Many members stressed the need for technical advice and assistance from FAO to improve market access for small-scale fisheries from developing countries. Some expressed concern about the increasing complexity of safety and quality requirements for fish and fish products, and the burden they imposed on developing countries. Many members noted the need for simple and practical traceability schemes for small-scale fisheries.

Ecolabelling: On the draft International Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Capture Fisheries, the Committee recommended that FAO undertake further work on minimum requirements and criteria for ecolabels in inland capture fisheries.

Guidelines for Fish Trade: The Committee noted that an expert consultation had been held in Washington DC, USA, in January 2007, on technical guidelines for responsible fish trade. The Committee agreed that FAO should convene a technical consultation to consider these guidelines.

COFI Sub-Committee on Aquaculture: The Committee highlighted the importance of addressing socio-economic impacts of aquaculture, improving planning and policy development, ensuring food safety and human health, developing best management practices, developing risk assessment methodologies and guidelines for better management of aquaculture. The Committee asked FAO to implement the recommendations of the third session of the Sub-Committee on Aquaculture – particularly the need for technical assistance to members.

The Committee underscored the need for better information and data on aquaculture in support of sustainable development. The

Mr A Hettiarachchi, Chairman of the 27th session of COFI

Dr Faathin Hameed, Deputy Minister, Ministry of Fisheries, Agriculture & Marine Resources, Maldives at the COFI meeting.

Committee also recognised the role of certification and better management practices as part of an ecosystem approach to aquaculture; the FAO was requested to conduct expert workshops to develop guidelines on aquaculture certification. Thailand and Brazil confirmed their readiness to host such workshops in Bangkok and Brasilia.

Chile and Thailand confirmed offers to host the fourth and fifth sessions of the COFI Sub-Committee on Aquaculture in 2008 and 2010 respectively.

Social issues in small-scale fisheries: The Committee noted the precarious living and working conditions of small-scale fishers – which resulted from insecure rights to land and fishery resources, inadequate health and educational services and social safety nets, exclusion from wider development processes. The opportunities of small-scale producers, processors and marketers to benefit from globalization were often compromised by inadequate access to markets and deficiencies in financial services, know-how and capacity. Sustainable fisheries was a pre-requisite for sustainable livelihoods of fishers, it was pointed out.

The Committee stressed that policies and development programmes must be tailored to specific needs in particular locations, countries and regions and types of small-scale fisheries. Some members urged greater clarity in defining and classifying different categories of small-scale fisheries.

The Committee noted the positive experiences of several countries in mainstreaming small-scale fisheries into national development policies. It was desirable that lessons from these experiences should be shared through case-studies, south-to-south and fisher-to-fisher exchanges. The Committee stressed that human rights principles should be recognized and adopted to eradicate poverty and bring about responsible fisheries practices.

The Committee expressed support for the "strategy of action" noted in paragraph 23 of COFI/2007/6. It stressed the need for a rights-based approach to managing small-scale fisheries that respects the interests of present and future generations, ensures resource sustainability, and optimizes the flow of benefits to fishing communities.

Several members cited successful examples of capacity-building and empowerment in small-scale fisheries – such as literacy programmes, leadership training, and strengthening of fisher organisations. Differing views were expressed on the potential of small-scale fisheries to alleviate poverty.

Traditional forms of fishing rights and tenure, wherever these existed in the past, must be recognised, the meeting said. The poor must be protected from any adverse impacts resulting from the transition to rights-based fisheries management – by creating opportunities in areas outside harvesting, including aquaculture. Cross-sectoral policies were needed to integrate fisheries into coastal area management, and reduce the vulnerability of fishers and coastal communities to disasters.

The Committee considered different options to give greater prominence to small-scale fisheries in the FAO's Programme of Work. The Committee noted the strong support from many members for a COFI Sub-Committee devoted to small-scale fisheries.

The Committee welcomed Norway's proposal for a broad-based international conference focusing on small-scale fisheries.

Combating illegal, unreported and unregulated (IUU) fishing: The Committee thanked the FAO for capacity-building activities to enhance implementation of International Plans of Action to combat IUU fishing. Many members described their fight against IUU fishing as one of high national priority because of its economic, biological and social consequences.

The Committee noted the strong support for a Norwegian proposal to develop a new legally binding

instrument concerning port state measures to combat IUU fishing. An expert consultation is to be convened in the latter half of 2007 to prepare a draft agreement and a technical consultation on the text of the instrument.

Ecosystem approach to fisheries including deep-sea fisheries, marine debris and lost and abandoned gear: Members reported on the progress they were making to implement an ecosystem approach to fisheries (EAF). They commended the FAO's efforts to raise awareness in this context, and urged the FAO to complete and distribute quickly technical guidelines on the social, institutional and economic considerations in EAF. Many developing countries requested greater FAO support for capacity-building and technical assistance on implementation of EAF.

Several members raised the issue of the threats posed by climate change. A proposal was mooted for an FAO study to identify key issues in climate change and fisheries and discuss how the fishing industry can adapt to climate change. It was suggested that FAO should take the lead in informing fishers and policy-makers about the likely consequences for fisheries of climate change.

COFI agreed that FAO should convene an expert consultation, no later than August 2007, to prepare draft technical guidelines for management of deep-sea fisheries in the high seas. It was agreed that the guidelines should include standards for identifying vulnerable marine ecosystems beyond areas under national jurisdiction and the impacts of fishing activities on such ecosystems. Some members called for a moratorium on high seas fisheries until the impacts of fishing activities on these ecosystems could be assessed.

The meeting reaffirmed the important role of marine protected areas (MPAs) in biodiversity conservation and fisheries

Small - scale fishers - Bangladesh

management. The FAO was encouraged to complete early its technical guidelines on design, implementation and testing of MPAs.

COFI agreed that FAO should continue its work on biodiversity mapping as an important contribution to the implementation of EAF.

Many members expressed concern on the safety at sea of fishing vessels, particularly small vessels. FAO was urged to continue collaboration with IMO. It was suggested that FAO should develop guidelines on best practices for safety at sea. COFI should consider developing an IPOA (International Plan of Action) on the subject.

Strengthening regional fisheries management organizations (RFMOs): Japan informed the Committee about a joint meeting of five RFMOs for management of tuna stocks, held in Kobe, Japan, in January 2007. Many members supported the idea of joint meetings of non-tuna RFMOs with a mandate and objectives similar to those of the tuna RFMOs. FAO was asked to provide assistance and advice for the process.

Many members requested FAO to continue supporting RFMOs and RFBs (regional fishery bodies) on issues of concern to them such as overcapacity, improvement of fleet statistics, and issues that undermine the effectiveness of RFMOs.

FAO's Programme of Work in Fisheries and Aquaculture: The Committee expressed dissatisfaction with the level of the budget assigned to the Fisheries and Aquaculture Department, which was not commensurate with the importance of its work and the expectations of the international community. The Committee urged relevant FAO Governing Bodies to allocate more resources to the department. Many members stressed that major activities of the department should be funded by the regular FAO programme. They expressed concern at the increasing proportion of extra-budgetary funding for support to these activities. They requested a more detailed report on such funding, in the interest of greater transparency and accountability.

Other matters: Some members noted the active role of NGOs in promoting responsible and sustainable fisheries and aquaculture round the world. They stressed the need to develop, within the framework of COFI, a fair and equitable process to promote dialogue between members and NGOs.

It was agreed that the 28th session of the Committee would meet in Rome in the first quarter of 2009.

Secretariats of Regional Fishery Bodies Meet in Rome

Some 40 regional fishery bodies (RFB) exist on this planet. They are diverse in size, age, and scope. Some are a part of the FAO (such as the the Indian Ocean Tuna Commission or IOTC), some are not. Some are global, some regional. The BOBP-IGO, for example, is an RFB in the Bay of Bengal region. Each body has its own development mandate, its own acronym, its own headquarters and secretariat, its own funding mechanism.

The secretariats of the RFBs have set up a network. The First Meeting of the Regional Fishery Body Secretariats Network (RSN-1) was held at the FAO headquarters in Rome on 12-13 March 2007, soon after the meeting of COFI (Committee on Fisheries) – reported on pages 5-8 of this issue of BBN. Twenty seven secretariats, including that of the BOBP-IGO, took part, aong with representatives of the FAO and office-bearers of some other organizations.

Here are some highlights of what was discussed and decided at RSN-1.

— Mr Ichiro Nomura (Assistant Director-General, FAO Fisheries and Aquaculture Department) opened the meeting. He said the FAO would continue to support the RSN. He said that illegal, unreported and unregulated (IUU) fishing was one of the greatest threats to sustainable and responsible fisheries. Effective fisheries governance, regional and global, was essential to tackle the problem.

— The Secretary of COFI, Dr Ndiaga Gueye, said that COFI-27 had acknowledged the strong input of regional cooperation in facilitating the implementation of the FAO Code of Conduct for Responsible Fisheries and related instruments. He pointed out that COFI had urged that RFMOs (regional fisheries management organizations) should be strengthened, and best practices developed for them.

The Chairman, Prof Denzil Miller, highlighted several issues from the COFI-27 Draft Report as being important for RFBs. These included

- Implementation of the Ecosystem Approach to Fisheries (EAF) and the problem of fisheries bycatch;
- The suggestion that with the increasing number of organisations engaged in international fisheries, the FAO should assert its leadership as the universally representative fisheries institution. Strong and ongoing cooperation between the RSN and FAO is globally important.
- Continued discussion and work on harmonization of catch documentation.
- A Norwegian proposal for an international conference on small-scale fisheries.
- Measures to combat IUU fishing.
- Threats posed by climate change to the EAF, along with development of technical guidelines to include standards for management of deep-sea fisheries on the high seas.
- Strengthening RFMO performances, particularly the outcomes of the 2007 Tuna RFMOs Meeting.
- The request of many COFI Members for FAO to continue supporting RFMOs and RFBs on such issues as overcapacity and improvement of fleet statistics.

Small Scale and Inland Fisheries

— RSN-1 noted that small-scale fisheries received significant attention in COFI, and that this trend is likely to continue in

future. It was acknowledged that small-scale fisheries increasingly interacts with large-scale fisheries.

Mr Nomura acknowledged that COFI has not been very clear in its approach to small-scale fisheries. He asked for RSN's advice on how the theme of small-scale and inland fisheries should be addressed at future COFI meetings. He also invited RSN inputs on agenda items for the next meeting of the Advisory Committee on Fisheries Research, to be held prior to the next COFI meeting.

— RSN-1 agreed that the profile of small-scale and inland fisheries should be raised so as to attract sufficient resources. It was strongly suggested that a document outlining some of the key issues should be developed well in advance of COFI-28 to allow endorsement by the RFBs concerned.

— It was noted that the RSN can provide a useful contribution on priority actions for small-scale and inland fisheries to be communicated to FAO and other sector stakeholders. It can also provide guidance and advice should an extra-budgetary FAO programme for small-scale fisheries be developed.

— RSN-1 agreed that a Norwegian proposal for a global meeting on small-scale fisheries would offer a unique opportunity for inputs from RSN members.

— The meeting discussed external factors affecting fisheries management. These included governance and overcapacity concerns in small-scale and inland fisheries, effects of climate change and impacts from land-based pollution.

— Disaster preparedness by small-scale fishing communities and the need to improve inter-agency cooperation with other international organisations dealing with fisheries issues, such as CITES and WTO, were also discussed.

Concern was expressed about lack of information on combating IUU fishing. The information systems needed were lacking too, especially in developing countries. A lack of human and financial capacity to deal with unregistered vessels was a cause for concern. Additionally, it was noted that IUU fishers often engage in criminal activities unrelated to fishing.

Coping with overcapacity

— RSN-1 discussed overcapacity and difficulties in dealing with it, such as lack of essential data, unreliable statistics, lack of political will, and valuation of resources. It was noted that one approach that has met with some success is the development of alternative livelihoods. It was suggested that information in this context should be shared. A precautionary approach to overcapacity (*i.e.* limiting fishing capacity wherever this was possible and avoiding wanton deployment of excess capacity) was suggested by some members.

— Mr Kevern Cochrane, Senior Fishery Resources Officer, FAO, presented an update on information requirements concerning the ecosystem and fisheries management by RFBs. During discussions, it was pointed out that developing countries needed more support to improve their ability to implement EAF. The need to address threats posed by climate change and its potential effects on fisheries was also stressed. RSN-1 acknowledged that the calamitous predictions often made about the potential effects of climate change made the jobs of fisheries managers harder and more complex.

RSN-1 recognised that different approaches to the EAF will be taken in different types of fisheries, such as small-scale and industrial fisheries as well as marine and inland fisheries. RSN-1 agreed that education and information exchange are key elements for an effective EAF.

RSN-1 noted that considerable resources may often be required for RFBs to fully engage in the EAF, since a wide range of expertise (including scientific, legal and socio-economic) was necessary to fully address all EAF requirements. But a gradual expansion of more traditional fisheries management approaches would also be helpful; this had already been implemented by a number of RFBs and national fisheries management organisations.

— RSN-1 discussed the possible role of an RSN website in facilitating and coordinating information exchange. This could assist the Network to avoid duplication of its activities, promote the RSN's visibility and provide information on meetings. But a strong website that was systematically vetted and updated would require resources. It was agreed to circulate a concept note for further consideration, with an option for FAO to host the site.

— The next meeting of RSN may be held in 2009, immediately following COFI-28, with an informal meeting of participants being scheduled for noon on the first day of COFI.

Small Vessel Safety and Sustainable Coastal Development

Jim Sandkvist, Vice President, SSPA Sweden AB, Gothenburg, Sweden

Making fishing vessels safer is one of the most fundamental measures to improve sea safety. But most international legislation to ensure sea safety relates to vessels larger than 24 meter (m). Vessels under 12 m are not covered by any international legislation – and are very often outside the pale of national regulations as well.

Safety at sea is frequently discussed at SIDA-funded training programs dealing with "Sustainable Coastal Development and Maritime Safety Management," conducted every year. This paper is an experience-based rather than a technical discussion of safety at sea for small fishing vessels. It applies SSPA's experiences from 15 years of engagement in international multidisciplinary coastal zone development programmes in different parts of the world.

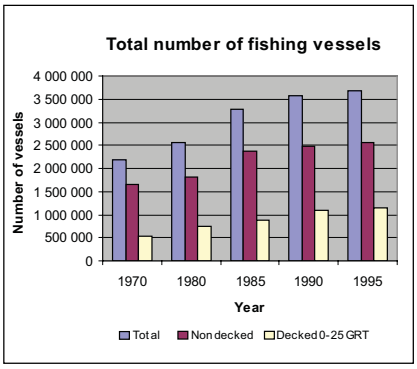
The paper discusses both a top-down and a bottom-up approach to improved safety of small fishing vessels – which would encourage and ensure sustainable coastal development. The paper provides impressions, lessons and recommendations concerning the design and operation of fishing vessels, institutional requirements for sea safety, search-and-rescue procedures, safety training, and safety standards and regulations.

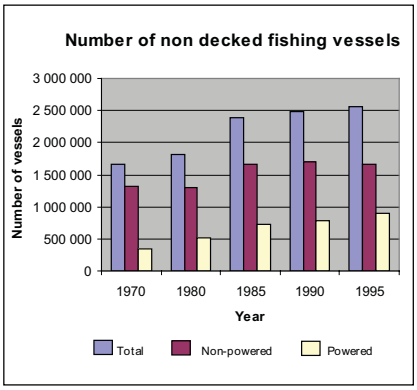
This article is based on a presentation made by Jim Sandkvist at the Third International Conference on Fishing Industry Safety and Health, Mahabalipuram, Chennai, 1-4 February 2006.

Fishing fleet

The world's fishing fleet has almost doubled over the last 25 years. In 1995, the fleet consisted of about 3.6 million vessels. Two-thirds of the vessels were undecked; vessels generally less than 12m in length. (*FAO Fisheries Circulation No. 966* and *Bulletin of fishery statistics 35, Fishery fleet statistics, FAO, 1998*.)

The fishing fleet often consists of small boats and canoes. These are central to the family and the local economy in coastal municipalities and communities. But small vessels (under 12m in length) used for fishing and transportation figure prominently in accident statistics – worldwide but particularly in developing countries.





Jim Sandkvist

A multi-disciplinary approach

Improving fishermen's safety at sea requires a multidisciplinary approach and the efforts of stakeholders at various levels. National and international regulations must be followed, local awareness must be raised, financial support provided to fishermen and boat owners, fish handling quality must be improved.

Regulations and guidelines for small vessels

Maritime authorities are normally responsible for registering large vessels, but very often, small vessels (smaller than 12 or 24 meters) come under the domain of fisheries. It is suggested that national regulations and guidelines should be established for design, construction and equipment of small vessels. A system for inspections to follow up the regulations should also be established. The regulations should be adapted to local conditions and

should be practical, so that they can be implemented.

A vessel classification system should be in place. It should include different categories of vessels, operational standards and categories. It should specify design criteria by size, loading capacity, the maximum or minimum number of persons that can board the vessel, It should state whether the vessel can be fitted with an engine. If yes, what should be the maximum power of the engine. There should be guidelines for emergency and safety equipment, such as fire fighters, life jackets, life rafts, radio, compass, sea charts, etc.

Fisheries Authorities

The fisheries authority is responsible for sustainable development of the fishing industry and for protecting the marine resource. Catches are regulated through different quota systems such as "total allowable catch" and different types of individual quotas. Different zoning systems could be introduced to separate artisanal fishing from industrialised trawling. (See *Risk and dangers in small–scale fisheries, ILO 2000; The state of world fisheries and aquaculture, FAO; Safety at sea as an integral part of fisheries management; FAO Fisheries Circular No 966 (2001*).

Coast Guard and/ or Navy

The Coast Guard and the Navy are other maritime authorities responsible for safety at sea. In several countries, they take primary responsibility for search and rescue (SAR) work when vessels or fishermen are missing at sea. The work is often undertaken in co-operation with voluntary SAR organisations.

Rescue services organisations or fire brigades

Rescue services organisations or fire brigades go into action for near-shore rescue work, while the Coast Guard and the Navy take care of rescue operations further offshore.

NGOs and volunteers

In developed countries, where search and rescue are well organised, NGOs have an important role to play. NGOs and local voluntary organisations should be encouraged in developing countries as well. Since they know local conditions well, they are capable of rapid response.

Port authorities

Most small vessels land their catches on the beach or in harbours or ports. The port authorities are responsible for monitoring and control of the landed catch. Port authorities could also measure catches if a quota system is introduced.

Meteorological services

Weather-related accidents are common everywhere, as FAO statistics bear out. Reliable weather forecasts are therefore crucial for safety at sea, and early warning systems are necessary, particularly in places vulnerable to cyclones and hurricanes. These are organized in some countries by meteorological institutes.

Boatbuilders and designers

A fishing boat often retains a certain buoyancy even if flooded with water, even if it turns turtle after an accident. It then serves as a floating device for its occupants. Local designers and boatbuilders must be trained in incorporating such safety features. Their choice of boat design, construction materials and fish handling methods is usually based on tradition, and on access to cheap and renewable materials. The co-operation of boatbuilders and designers is essential to make boats better and safer, and to introduce new regulations.

Families

The wives and children of seamen and fishermen ought to be as aware of occupational safety as the men themselves. The family plays a vital role in reducing accidents. Families' concerns for the safety of fishermen, and their strong stake in such safety, are factors that should be utilized to lower accidents and accident risks at sea.

The local community and the local economy depend on the family. So do co-operatives, local NGOs and small firms.

Safety training should be imparted early in school, particularly in coastal areas. The long-term effects would be invaluable.

The boat owner and the crew

The boat owner should be responsible for the safety of his crew, and for the vessel being in good condition. It should be registered with the relevant national authority for use as a fishing or transportation boat. It should fulfil criteria for stability and loading capacity.

The boat owner or captain is expected to:

- ensure that the vessel is in good condition and registered according to the rules.
- be responsible for the vessel being manned only with well trained and skilled crew;
- be responsible for the safety equipment on board the vessel being in good working condition.
- be responsible for the navigation equipment being in sound working order;
- be responsible for the fishing gear or other gear onboard the boat;
- ensure that the vessel is not overloaded with fish catch, goods, or passengers;
- ensure that the vessel does not go out in bad weather or when storms or cyclones are forecast.

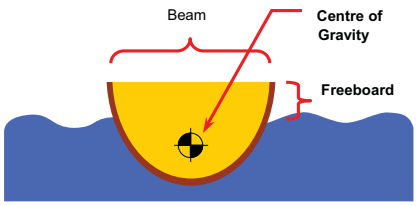
A frequent cause of accidents is that the crew lack training.

All crew members should know to swim. They should be well-trained in vessel handling and gear-handling in good or bad weather, also in handling safety equipment in bad weather. The crew should be well-versed in vessel stability, should know where to place catch, goods, or passengers for the best stability. The crew must be aware of the vessel's loading capacity and act accordingly, in relation to fish catch, goods, and passengers.

The crew must keep abreast of weather forecasts. It should stay ashore if weather conditions worsen.

The safety of fishing vessels depends to a large extent on their technical standards and on how they are operated. Safe design supports safe handling. Choice of construction material and good maintenance are vital.

A system of boat classification in accordance with their stability and seaworthiness is essential. However, in many countries, there is no register or classifying system for small vessels.



Stability

The stability of a boat is its ability to withstand heeling and to resist capsizing.

Important parameters in this context:

- Vertical centre of gravity
- Beam
- Freeboard
- Free surface area

To ensure sound stability, the boat should have a low vertical centre of gravity. This will happen if the entire load is stowed low in the boat. The load includes fishing equipment, food, tanks, catch, etc.

A larger beam, and to a certain extent a larger freeboard, helps ensure stability. Large free surfaces endanger stability. "Free surfaces" include half-loaded tanks, bilge water and loosely stowed catch. It is very important to keep the free surfaces to a minimum.

Capability to stay afloat is another important property. This is achieved by two factors – good stability, and watertight compartments or other devices for buoyancy,

The stability can be tested in safe areas (preferably near the shore) and with the boat dry and without load. While in this condition, the boat shall fulfill the following:

- With all crew members sitting on the same gunwale, the boat shall withstand capsizing.
- In this condition, the boat shall also have enough freeboard so that no water enters the boat from the side.

A boat that does not meet these two criteria should be modified to meet them. Outriggers would considerably increase stability.

Traditional out-rigger construction, Tanzania.

One criterion for buoyancy is that the boat should not sink with all crew members standing in the boat when completely swamped. Wood is a good construction material for buoyancy. The rib collars would make the boat unsinkable besides improving its stability. A watertight compartment can be built in. A floating element such as foam plastic can be arranged inside the hull. The floating elements could be combined with a fixed ice box in a fishing vessel.

Free surfaces should be avoided – by keeping bilge water away, dividing large tanks into smaller

tanks, dividing the catch into smaller portions, etc.

Construction

Small locally manufactured boats have their own traditional hull forms based on local fishing techniques, sea conditions and construction materials.

Owners and users of small traditional fishing boats like *bankas* and dugout canoes should be aware of their advantages as well as disadvantages.

- Small boats are open and therefore not quite convenient for sleeping or cooking facilities.
- The crew are exposed to sun and rain.
- Not adaptable to use of large and heavy fishing gear.
- Usually not adaptable to most kinds of mechanically operated fishing equipment.
- Not very durable.
- Weather-sensitive.
- Being open, they must usually return to base daily.
- Fish-holding capacity is limited.

The use of smaller fishing vessels also means the following:

- Low cost.
- No harbour or special installations are required, they can be hauled up the beaches along the coast.
- The fisherman can live in the proximity of the coast adjacent to berthing areas and therefore remains in rural surroundings, instead of migrating to towns and causing housing and other social problems.
- Dispersal of small boats along the coast enables widespread fish supplies, often without the additional cost of road transport increasing the cost of distribution.
- No slipways needed for servicing. Therefore inexpensive to maintain. Dugout canoes require no caulking.
- Local skills and local materials are used in their construction, thus providing local employment.

Traditional wooden boat built on the beach in Tanzania.

- Small boats are traditionally so constructed that they remain afloat if they capsize. The fisherman regards his small boat as his “life raft”.
- Small boats are able to operate in very shallow areas.
- Often indispensable in places inundated by floods.
- Can be propelled by oar in the event of engine failure.
- These boats can be constructed on the beach. No centralized boatyard or expensive equipment needed.
- Are adaptable to various types of fishing gear, *e.g.* hook and line, longline, multiple-trolling rig, gillnet, cast net, beach seine, fish traps, small shrimp trawl.
- When not in operation, they require no hurricane shelter in areas which are subject to such phenomena. In such an emergency they can be weighted with sand or hauled into safe areas.
- Since they are taken out of the water daily, damage through marine borers is avoided.
- Fishermen can be in daily contact with family and friends.
- Improvements to such craft should focus on actions that can improve stability and floatability.

Most traditional boats have evolved and refined over a long period. Today some of them get fitted with large engines – though they were

not designed for such engines – and go further offshore. Sometimes new materials are introduced to "modernize" the vessels without changing the vessel's design and construction.

The boat should be made unsinkable, through wooden construction or through watertight chambers in plastic and metal boats. If the boat capsizes, it acts as a life buoy. Most traditional boats are made of wood and will float after an accident. However, new boats based on traditional models but without watertight chambers will not float, and cannot act as life buoys.

The introduction of modern construction materials such as fiberglass, plastic and even plywood, provides opportunities to increase the boat size, change design and bring in new substitutes for traditional materials. However, if not used in a safe manner, these new materials may lead to severe consequences. Fiberglass and plastics considerably change the buoyancy of a water-filled boat. The boat may sink. On the other hand, proper use of fiberglass will modernize the design and improve safety.

The use of modern construction materials and their implications for safety, further strengthen the need for training, safety awareness and control.

An integrated approach to safety at sea.

To improve safety at sea, an integrated approach is required. Regulations and inspections should focus on awareness, support and safety improvement measures, to be implemented in close cooperation with local authorities and stakeholders.

Small fishing vessels do not usually generate enough income for investments in safety measures such as life vests or GPS. The income is sufficient only for every-day sustenance.

The local fisherman needs ownership and control of his boat. Very often, he rents the boat from a local owner, and boat safety depends on the owner. The fact that rents have to be paid regularly sometimes makes fishermen go out even in bad weather.

Micro-financing mechanisms should be considered to support fishermen or groups of fishermen in investments in safer boats. Such investments call for exposure to larger markets with better income opportunites. The development of the local fishery industry is a vital part of coastal zone development in many developing countries.

Insurance schemes need to be introduced for poor communities engaged in small-scale fisheries. The FAO has discussed the possibility of community-based insurance schemes for fisher groups in Africa. The outcome of this initiative is not known.

The system in some West African countries is that fishermen form interest groups. Every fisherman contributes a small monthly fee to a mutual aid fund. In the event of an accident, whatever be the need – assistance for widows, a funeral, vessel replacement, hospital care for an injured fisherman — money is made available from the mutual fund.

Recommendations

The safety of small fishing vessels is a subject that has aroused great interest in various international fora. Recommendations for future work have been made in the Chennai Declaration of 2001 and the SEAFDEC recommendations of 2003. The latter are listed below:

- Leave the definition of small fishing boats and operational range up to individual countries.
- Promote the registration of small fishing boats.
- Promote coordination among concerned authorities on monitoring and control of small fishing boat safety as well as socio-economic considerations.
- Strengthen local authorities and promote policies of safety at sea within coastal communities.
- Promote technical and financial support from authorities, including subsidies, at all levels for issues of safety at sea.
- Identify and promote basic requirements for safety at sea in the areas of :
  - Research on design and construction of small fishing boats including modification of traditional type boats,
  - Safety equipment including fire-fighting and life-saving appliances, and
  - Regular boat inspection systems.
- Implement training and education programs for all stakeholders including fishers and boatbuilders for the basic requirements of:
  - Boat design and construction,
  - Equipment and its correct use,
  - Search and rescue,
  - Occupational health and safety awareness, including the avoidance of dangerous fishing practices, and
  - Awareness of environmental factors.
- Develop and promote the use of appropriate communication systems for:
  - Weather forecasting information
  - Search and rescue systems
- Develop appropriate incident-reporting and investigation systems to improve safety at sea.

BOBP-IGO's Technical Advisory Committee Meets in Chennai

The second meeting of the Technical Advisory Committee (TAC) of the BOBP-IGO, held in Chennai on February 5 and 6, 2007, reviewed past work and the future directions of the IGO. Representatives of Bangladesh, India, Maldives and Sri Lanka took part. Welcoming delegates, Dr Y S Yadava, Director of the BOBP-IGO, briefly discussed work during the year.

In his inaugural speech, Mr Ajay Bhattacharya, Joint Secretary (Fisheries), Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India, said several activities had been carried out by the BOBP-IGO, most of which were relevant and useful for member - countries. He urged that synergies between countries should be built up to the fullest extent.

Dr Md Shiham Adam (Maldives), outgoing chairperson, thanked the Secretariat for its ooperation and support during his tenure as the TAC chair. Mr Ajay Bhattacharya was unanimously elected chairperson.

Report on BOBP-IGO activities

The Director of the BOBP-IGO presented a report on activities carried out by the Secretariat during the reporting period October 2005 to December 2006. He said the Bay of Bengal (BoB) region supported the livelihoods of some 50 million people directly and indirectly. But the capture fishery was declining, and might affect livelihoods, food availability and national economies in the member-countries.

However, the BoB can produce significantly more fish than present landings through improved resource management brought about by scientific technological inputs, better all-round awareness, greater community participation in resource management and co-management.

The BOBP-IGO implemented the following activities during the period:

– A National Workshop on the Code of Conduct for Responsible Fisheries was organised during 9-10 December 2005 in Colombo in co-operation with the authorities in Sri Lanka.

– A detailed assessment of the safety of small fishing vessels in India, Maldives, Sri Lanka and Thailand, the first of its kind, was carried out during October 2005 with the assistance of a consultant from Iceland.

– The IGO took part in a "scoping study" on Tsunami Rehabilitation: Assessment of Policy Support for Sustainable Pro-Poor Fisheries in Tamil Nadu, India. It was commissioned by the UNDP and carried out in association with the World Bank, the DFID and the FAO.

– The Third International Fishing Industry Safety and Health Conference (IFISH-3) was organised in Mahabalipuram, Tamil Nadu, India from 1 to 4 February, 2006, in collaboration with the FAO and the Alaska Centre of NIOSH, United States. A thematic workshop on Post-tsunami Revival of Fisheries Sector and Rehabilitation of Fishing Communities was also organised at the same venue on 6 and 7 February 2006.

– The BOBP-IGO is publishing newsletters and translating FAO Technical Guidelines and International Plans of Action on marine fisheries into local languages. It has also brought out posters and calendars.

– The formidable task of digitizing a select photo collection of over 50 000 photographs is 80 percent complete. The digitized archive will constitute a rare and valuable

resource on small-scale and artisanal fisheries in the Bay of Bengal region.

– New activities: The IGO will partner the FAO in implementing the South Asian activities of a global FAO Project on 'Safety at Sea for Small-Scale Fisheries in Developing Countries'. The 2-year project will start in May 2007 and will be implemented in all member-countries. The IGO will also be a partner in a FAO-IMO project on Small Fishing Vessel Safety in Sri Lanka and India in the wake of tsunami reconstruction and rehabilitation effort.

– Technical assistance was provided to the International Cooperative Fisheries Organisation of the International Cooperative Alliance in conducting a workshop for Fisheries Cooperatives in Sri Lanka; and to a Training Project on 'Promotion of Community-based Fishery Resource Management by Coastal Small-scale Fishers in the Philippines'

– A study was carried out on 'Development of Marine Fisheries and Post-harvest Sectors in Orissa' in collaboration with the UNDP.

Commenting on the presentation, Dr Adam said that Maldives had witnessed a constant increase in tuna production; the new-generation fishing fleet introduced in the country might further increase it. Maldives is trying to introduce aquaculture of species such as groupers; if technical support and expertise were made available, this could give a fillip to aquaculture production.

In response to a query from Mr Parikshit Datta Chowdhury of Bangladesh, the Director, BOBP-IGO said that while funds were sufficient for the IGO's core functions, its Secretariat was small and could benefit from staff secondments provided by member-countries. Such a practice would give the staff concerned wide exposure and experience and would therefore help the countries concerned as well.

– Dr V S Somvanshi of India complimented the BOBP-IGO on its excellent work. He referred in particular to popularization of the Code of Conduct in the region, technical support for post-tsunami rehabilitation, and digitization of the IGO's photo collection.

– Dr Adam expressed happiness with the IGO's work programmes. Its review of sea safety issues in the Maldives was the first of its kind. It would lead to guidelines for safety and construction of better fishing vessels.

– Responding to a query from Dr Adam, the Director, BOBP-IGO said that a web portal for fisheries scientists and institutions in the BoB region, already undertaken, was making progress. So far, information on some 80 fisheries scientists/ institutions had been placed in the portal.

– Mr Abeywickrama of Sri Lanka thanked the IGO for its support. He cited in particular the technical support provided for the development of fisheries cooperative societies in Sri Lanka. Mr J W Rathnayake (Sri Lanka) mentioned the IGO's support for post-tsunami rehabilitation. More support was needed for sustainable development of marine fisheries.

– Mr Rathnayake and Mr B S Yadav (India) discussed the issue of capacity enhancement of the Sri Lankan Coast Guard with support from the Indian Coast Guard (ICG). Mr Yadav said that some initial meetings had taken place on this issue. Mr Ajay Bhattacharya, chairperson of the meeting, said the Indo-Sri Lankan Joint Working Group was working on the issue. It was also discussed with the Fisheries Minister of Sri Lanka who visited India recently.

– Mr Bhattacharya expressed appreciation of the Scoping Study prepared by the BOBP-IGO in association with UNDP, DFID and the World Bank. He said the Government of India proposed to take up a similar study in three more coastal states.

Proposals from Member-Countries:

Discussing the status of marine fisheries in Bangladesh, some major constraints to sustainable development, and some of its national priorities, Dr Rahman said that the BOBP-IGO could take part in HRD for marine resource assessment, development of mariculture technology and marketing and exchange of technical know-how among member- countries. A joint management plan for hilsa should be considered on a priority basis between India and Bangladesh, and possibly Myanmar as well.

Discussing marine fisheries resources availability, production and management in India and current problems, Dr Somvanshi said the recently published National Marine Fisheries Census 2005 revealed that some three million people depended on marine fisheries for their livelihood – a much higher figure than what was earlier believed. About under-exploited resources, he said only some 30-35 000 metric tonnes of tuna was being harvested, against a potential of about 2 46 000 metric tonnes. The TAC noted that the marine fisheries sector in India needs more management inputs and also sound strategies for harvesting species like tuna that are grossly under-exploited.

Fisheries in the Maldives cannot be discussed without discussing tuna fisheries, Dr Adam said. In recent years, the tuna fishery has been inhibited by the growth of bait. Also important is the coastal fishery, which includes resources such as scads, jacks, breams, emperors, wahoo, sharks, groupers, marlins, bait fishes and the aquarium fishes. The government's priorities include socio-economic betterment of fishing communities, diversification and post-harvest improvement, pearl culture, manpower development and sustainable fishing practices.

On the scope of BOBP-IGO's work, Dr Adam noted BOBP's strength in

documentation and manpower building. Issues like community-based fisheries management, in which BOBP had taken part earlier, needed new inputs. Studies on the socio-economics of reef fishing communities and on innovative methods of catching bait fish could also be considered. Dr Adam emphasized the need for a regional management plan for shark fisheries. The BOBP-IGO could play an important role in developing a management plan for shark fisheries covering India, Sri Lanka and the Maldives.

Mr Abeywickrema said the tsunami had inflicted damage estimated at US $ 900 million on physical assets in Sri Lanka. More than 75 percent of the fishing fleet had been either destroyed or damaged. The Government was striving for speedy recovery. He expressed concern at the quality and seaworthiness of new fishing vessels provided to fishers who had lost their boats to the tsunami.

On other priorities for fisheries development, Mr Abeywickrema described efforts to set up a state-of-the-art fish market complex, improve the deep-sea fishing capacity of fishers, better the infrastructure and revive the shrimp sector. Licensing of fishing vessels and awareness-creation programs had been undertaken.

Secretariat: Work Plan

The Director, BOBP-IGO presented the work plan for 2007. He said the IGO would continue translating CCRF documents into local languages. He sought the co-operation of member-countries in organising a fisherfolk week during the current year. The Secretariat proposed two new programmes for implementation in 2007: on monitoring, control and surveillance (MCS), and on management of hilsa and sharks.

Proposal on Monitoring, Control and Surveillance

Presenting a proposal on MCS, the Director, BOBP-IGO said that an effective and implementable legal framework was essential for resource management and conservation. But lack of data, manpower, and awareness were major constraints to an effective MCS regime. The proposed programme would bridge this gap through HRD activities, strengthening the legal framework, mobilizing expertise and motivating stakeholders.

Mr B S Yadav described the work of India's Coast Guard (ICG) in implementing MCS in fisheries. Sri Lanka requested training assistance for their Coast Guards by the ICG.

The Maldivian delegation said that a draft Fisheries Master Plan to be submitted to the President included plans to implement an MCS. Only longlining was permitted for foreign fishing vessels in the EEZ, and registration of fishing vessels was not mandatory. But logbooks had been introduced for fishers. Maldives has an enabling legal system to support full introduction of MCS, but regional and international collaboration are necessary for the success of the MCS programme.

The Bangladesh delegation said the main problem it faces in implementing MCS is lack of manpower to enforce existing laws like registration of trawlers and motor boats. Catch size monitoring is also difficult for the same reason. Piracy and robbery are other important MCS issues. Bangladesh needs the BOBP-IGO's support for hands-on training and technical support in satellite monitoring of stocks.

The TAC agreed to convene a regional Workshop on MCS in June/ July 2007 in Bangladesh, subject to the concurrence of the Government of Bangladesh. It suggested that BOBP-IGO Secretariat seek technical support for organising the Regional Workshop from FAO or other agencies such as the MCS Network.

Proposal on management of Hilsa and Sharks

The Secretariat presented a detailed overview of the proposed programme on management of Hilsa fisheries in India and Bangladesh and management of shark fisheries in Maldives, Sri Lanka and India. Dr Rahman proposed that Myanmar be also be included in the Hilsa management plan. He said that Bangladesh has established some management plans for Hilsa but a lot more needs to be done, especially in cooperation with neighboring countries such as India and the Myanmar. He suggested a joint management policy, especially with regard to the juvenile fishery.

The TAC agreed that the following agencies could help prepare a management plan on Hilsa fisheries: Bangladesh Fisheries Research Institute; Ministry of Fisheries and Livestock, Bangladesh; Central Inland Fisheries Research Institute, India; and the Fishery Survey of India. An appropriate co-operating agency from Myanmar would also be identified. The first meeting will be held in July/ August 2007 in India subject to government concurrence.

Mr Md Shainee of the Maldives expressed appreciation of the idea of a regional action plan on sharks. The TAC identified the following institutions for the activity — Fishery Survey of India; Central Marine Fisheries Research Institute, India; Marine Research Centre, Maldives; Ministry of Fisheries, Agriculture and Marine Resources, Maldives; National Aquatic Resources Research and Management Agency, Sri Lanka; Ministry of Fisheries and Aquatic Resources, Sri Lanka. The TAC agreed to convene the first meeting in September 2007 in Sri Lanka subject to government concurrence.

Third TAC meeting: The Committee agreed to convene the third meeting of the TAC during late 2007 in Sri Lanka, subject to government concurrence.

Sea Safety Programmes in Bangladesh

Md. Giasuddin Khan, *Deputy Director, Department of Fisheries, Bangladesh*

Bangladesh has a coastline of 714 km and an Exclusive Economic Zone (EEZ) of 164 000 km^2 of which the continental shelf takes up 44 percent. The country has a vast river network and a dynamic estuarine ecosystem. A drainage basin — covering also parts of India, Nepal, Bhutan and China, with waters draining into the Bay of Bengal – intersects the coastal zone of Bangladesh. The coastal zone includes coastal plains, islands, tidal flats, estuaries, and neritic and offshore waters. It houses several natural mangrove forest ecosystems, including the Sundarbans that supports a rich aquatic biodiversity.

This paper was prepared for the Third International Conference on Fishing Industry Safety and Health (IFISH-3), held in Mahabalipuram from 1 to 4 February, 2006.

The total fish production in Bangladesh is 2.10 million mt, of which marine fisheries accounts for around 21.66 percent. The fisheries sector contributes 5.71percent of the total export earnings and 4.92 percent of the GDP, and employs 1.2 million people (full time) and 12 million people part-time. Total fish production has been increasing over the decade, mainly because of aquaculture. 92.7 percent of marine catches are landed by artisanal fishers who employ smaller and less efficient fishing boats and gear to catch post-larvae and juveniles.

Unplanned and uncontrolled expansion of fishing activities, particularly in the inshore artisanal sector, have reduced the potential of marine fishery resources. On the other hand, a number of fish species remain unexploited or under-exploited. But for Hilsa (*Ilisha tenualosa)*, pelagic fishery resources have remained untapped. The government recently sanctioned 50 offshore boats to diversify resource exploitation.

Because of rough weather conditions in the bay over three quarters of the year, safety at sea is an important issue. Deaths of fishers and loss of boats and gear are common. A number of rules relating to fisher safety and seaworthiness of fishing vessels are being implemented by the Mercantile Marine Department (MMD). The 'Bangladesh Fishing Vessel Equipment Rules, 2005' are a part of the Bangladesh Merchant Shipping Ordinance, 1983 (Ministry of Shipping).

The Department of Fisheries (DoF), which manages marine fisheries resources, issues licenses only to fishing boats that have obtained registration certificates from the MMD. The Marine Fisheries Ordinance, 1983 and subsequent rules address issues like fishing effort control, mesh size control, closed seasons, marine parks and sanctuaries, zoning of fishing areas

…, but not matters relating to safety of fishers at sea.

Coastal fishing operations & outputs

Different fisheries have different target species. The trawl fishery, and in particular the shrimp trawlers, target penaeid shrimps. The ESBN (estuarine set bag net) fishery, which is the predominant fishing method used by artisanal/ coastal fishers, largely targets juvenile fish. The key commercial marine shrimp species are *Penaeus monodon* (tiger shrimp), *Penaeus indicus* (white shrimp), and *Metapenaeus monoceros* (brown shrimp). The major commercial landing of finfish species comes from hilsa, pomfret, catfish, hairtail, croaker, shark, Indian salmon, Bombay duck and jewfish. Hilsa is the only single-species pelagic fishery in the commercial sector operated with mechanized boats.

During the last two decades, marine fisheries has expanded rapidly, thanks to initiatives taken in the 1970s. The marine catch has gone up from only 95 000 tonnes in 1975-76 to about 455 207 tonnes in 2003-2004. The sector has an estimated 22 500 non-mechanised and 21 400 mechanised fishing boats plus 120 industrial trawlers (46 shrimp trawlers, 74 finfish trawlers).

This fleet has been permitted to expand with a further 50 trawlers for fin fish to be used in the deeper waters of the EEZ. More than 167 400 fishermen are employed in marine fisheries, and an estimated 185 000 people in shrimp fry collection. At present, only one-third of the EEZ is covered by these fishing vessels.

Artisanal fishing crafts and gear

Artisanal fishing operations in the estuaries and coastal waters used to be carried out by traditional craft until the mid-1960s. The process of mechanisation was started in 1966 (through the Bangladesh Fisheries Development Corporation and the Bangladesh Jatio Matshyajibi Samabay Samity) with import and introduction of marine engines.

According to a survey conducted by the DOF in 1984-85, a total of 17 331 boats were in operation in the marine artisanal and small-scale fishery, of which 3 317 were mechanised boats. A later survey (in 2001) showed a drastic increase in mechanized boats to 22 500. But only about 5 000 of these are registered by the MMD.

Three types of traditional boats exist in the country. These are plank-built "Dingi" and "Chandi" and dugout 'Balam'. These boats are operated by oar/ sail. The Dingi, Chandi and Balam are 6-7 m, 10-15 m and 10-20 m in length respectively. These boats are mainly used for ESBN and gillnets. Mechanised boats are operated by 9-33 HP engine with 6-10 crew on board. The gross tonnage of these boats is 7-8. But most of them catch only 2-3 tonnes per trip of 4-6 days. The gear mostly used with these boats are drift gillnets, behundi nets (MSBN) and longlines.

Artisanal fishing gear include those operated by mechanised, motorised and country boats. There are five different types of gill nets, three types of set bagnets, trammel net, bottom longline, beach seine and shrimp seed collecting gear. The ESBN are the most widely used and widely distributed artisanal fishing gear in Bangladesh, as in several other neighbouring countries.

Monitoring, control and surveillance (MCS)

The MCS system exists in practice only for the industrial trawl sector. A practical approach would be to deploy limited MCS units at coastal ports and rely heavily on stakeholder management, with the traditional village community structure providing the basis for MCS. Ideally, MCS should be implemented by a combination of mechanisms – licensing by the authority and monitoring of gear and landings at designated ports. The prospects for co-operative stakeholder policing in this sector are poor, but there are no alternative strategies. At present, a speedy MMD system for licensing mechanised boats is in progress.

Management issues:

Management of marine fisheries focuses on the industrial trawl sector, and is carried out by a marine wing based in Chittagong. There is no management and monitoring of the artisanal sector which operates out of Barisal, Bhola, Patuakhali, Barguna and other areas where fishing pressure is heavy. Community participation in management planning and implementation is totally absent.

Fishermen's safety measures and the provisions of the Marine Fisheries Ordinance (MFO), 1983

This ordinance prohibits some methods of fishing, names fish species that cannot be caught during a particular season, stipulates mesh sizes of fishing nets, prohibits the landing and carrying of fish below a certain size and catching of fish species at certain times of the year.

The ordinance has provisions for regular monitoring of fishing effort and monitoring of fish catches. But safety measures for fishers are not covered by this ordinance. It should be reviewed and safety protocols included.

Licensing of fishing vessels

There is a substantial discrepancy in fleet size figures between the MMD (which has registered 4 000 mechanised vessels) and the DOF (which says that the fleet comprises 50 595 vessels).

The 1999/ 2000 DOF estimate of 28 698 vessels for the artisanal fleet may be reasonable.

Status of GoB programmes for fishermen's safety at sea

The DoF routinely carries out a dialogue with the MMD, which is principally responsible for fishers' safety at sea, and with other departments that are concerned with fishers' safety measures *e.g.* the Disaster Management Bureau, the Bangladesh Coast Guard and the Bangladesh Navy.

The DOF brought in an interesting community programme to strengthen sea safety – introduction of community radio in the coastal district of Cox's Bazar. This was done through the FAO/ UNDP's Empowerment of Coastal Fisher Community Project (ECFC). The project encourages coastal communities to organise themselves into attaining their collective goals – economic, social, educational and political.

Coastal district fishery officers have now been empowered to take up fisheries licensing and legislative work. This is a follow-up to the recently developed Marine Fisheries Strategy Document which has said that nursery grounds up to five kilometers from the coastline should be protected to strengthen recruitment in deeper waters.

Bangladesh Fishing Vessel Safety Equipment Rules, 2005

Fishers' safety at sea is covered by rules framed under the Bangladesh Merchant Shipping Ordinance, 1983 — the Bangladesh Fishing Vessel Safety Equipment Rules, 2005, to be specific. However, the MMD is not in a position to effectively undertake the registration survey (prescribed in the rules) or examine vessel sea worthiness and safety equipment on board, because it is short of manpower and there are no office establishments all along the coast line. The power of boat licensing has been delegated to Coastal District Fishery Officers. So the MMD and coastal district fishery officers should work together to make boat licensing effective.

Rules framed under Bangladesh Merchant Shipping Ordinance, 1983 (Ord XXVI of 1983)

Some relevant provisions (those that relate to sea safety) are:

1. Marking of vessels: The name of the vessel should be entered in bright colours on a dark background.
2. Marking with retro-reflective materials: Everything including life jackets.
3. Stowage of safety appliances.
4. Training manual on board fishing vessels.
5. Fishing vessel safety certificate.
6. Life-saving appliances.
7. Radio equipment.
8. Navigational equipment/ aids.
9. Fire-fighting appliances.

NGO activities and community organisations in coastal fisheries

Training and awareness programmes are being undertaken to some extent by some NGOs. These programmes are presently being done separately by each of the NGOs. But jointly planned and implemented programmes would be far more effective.

Fisher safety issues addressed by the DoF/ FAO ECFC Project

The philosophy of the ECFC Project was based on sustainable livelihoods. This Technical Assistance Project, piloted in 118 fishing villages of Cox's Bazar district, aimed at empowering coastal fishing communities. Currently the project is attempting to implement its exit strategy.

Several lessons have been learnt from the ECFC model. These can be considered as Best Practices, as key elements for sustainability. They cover all stages of project formulation, implementation and post-project activities. They enable the project to organise, mobilize and manage human capital towards achieving collective economic, social, educational and political goals.

Government agencies, community organisations and donor agencies are keen to expand this model to the rest of the country.

Socio-economic development and capacity-building

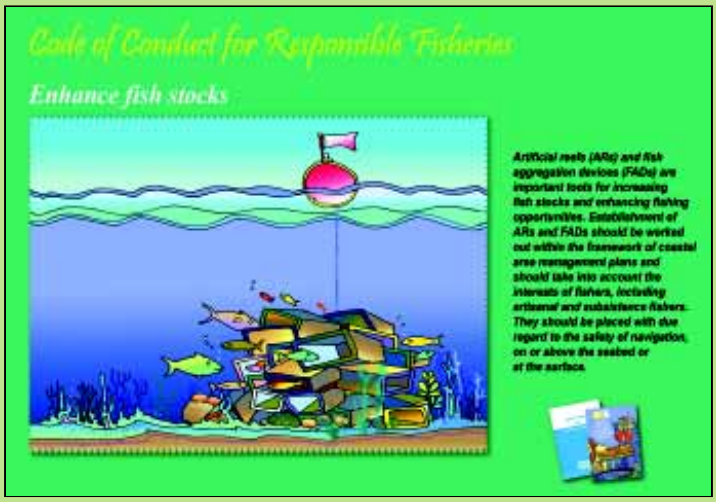
A major weakness of marine fisheries administration in Bangladesh is that it is weakly staffed; technological know-how is inadequate and limited to fishery biologists. There are no experts/ professionals in several areas of marine fisheries. For example, no gear technologists, fishery economists or socio-economists.

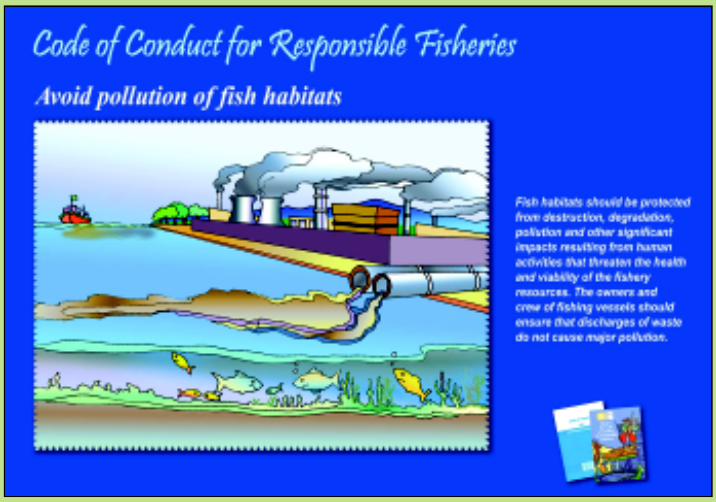
A GoB- funded project is in the pipeline to address the issues of rehabilitation of the fishers and their safety at sea. The DoF will help develop a sustainable community radio programme, through institutional soft credit support.

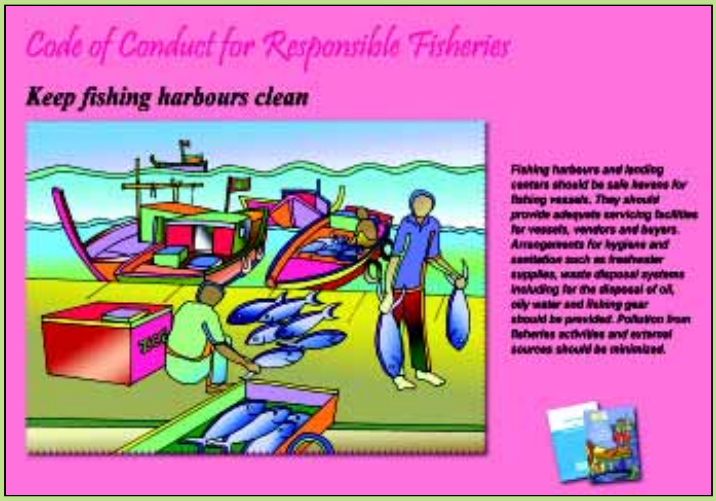
The way forward

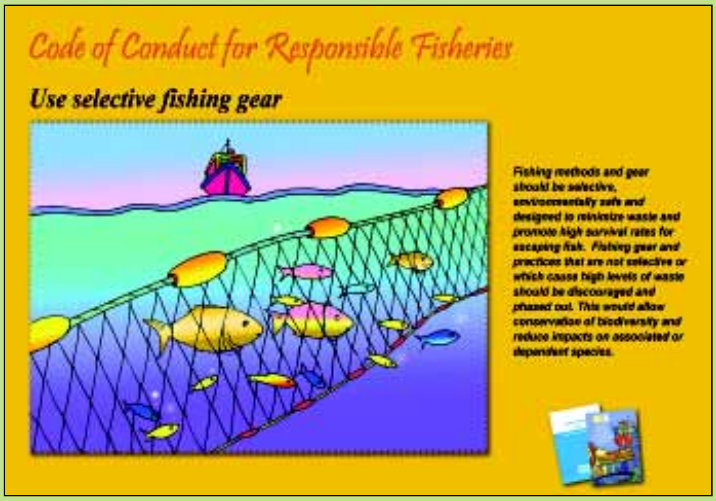
The DoF should be pro-active in liaising with other ministries to ensure that rules related to the safety of fishers at sea are implemented. The MMD (Ministry of Shipping), the Bangladesh Navy and Coast Guard and the Disaster Management Bureau should be involved in the effort through an institutional coordination mechanism. Assistance from international organisations such as the FAO may be obtained in this context, perhaps under the umbrella of the Code of Conduct for Responsible Fisheries.

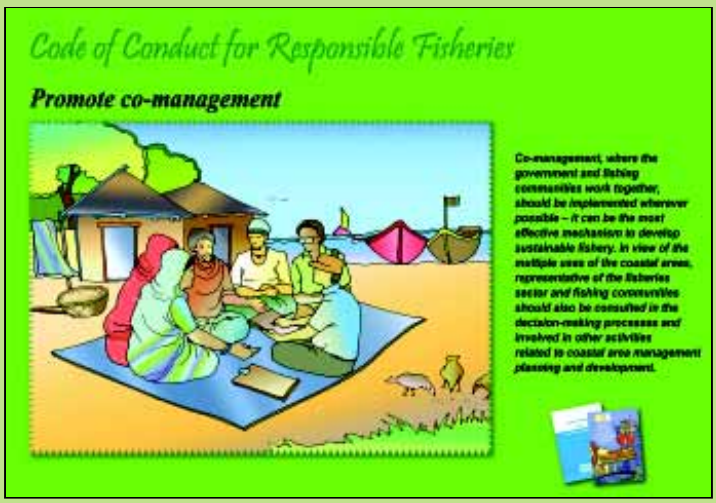
BOBP-IGO Posters Promote Code of Conduct for Responsible Fisheries

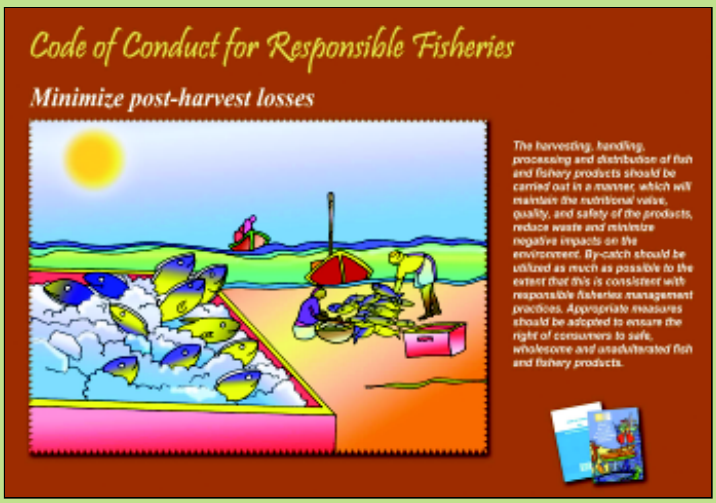




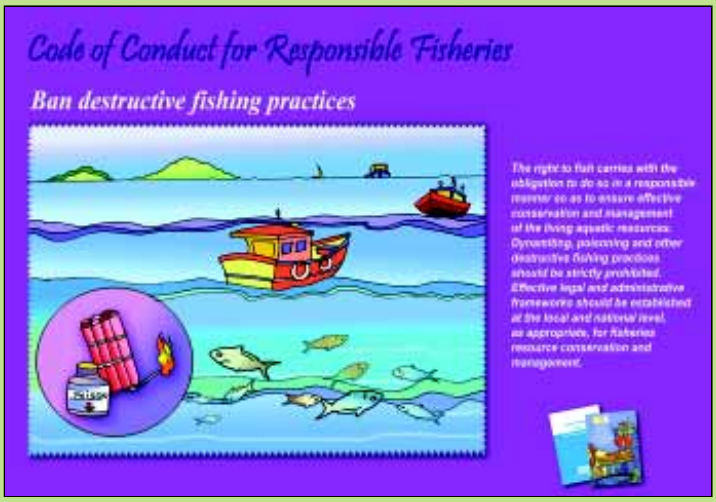


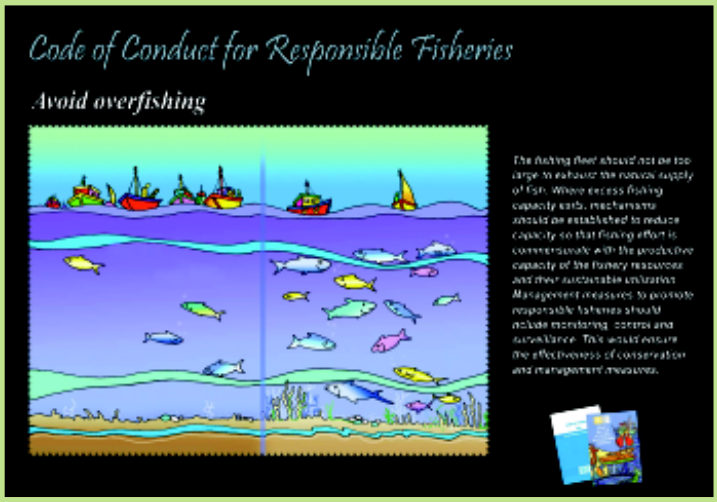


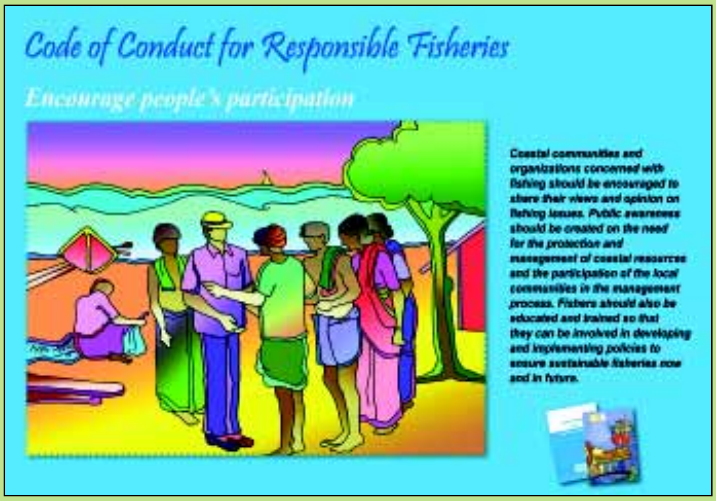


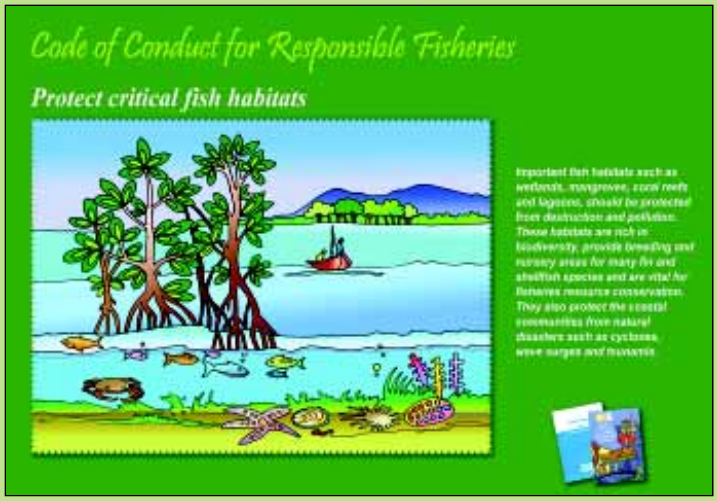


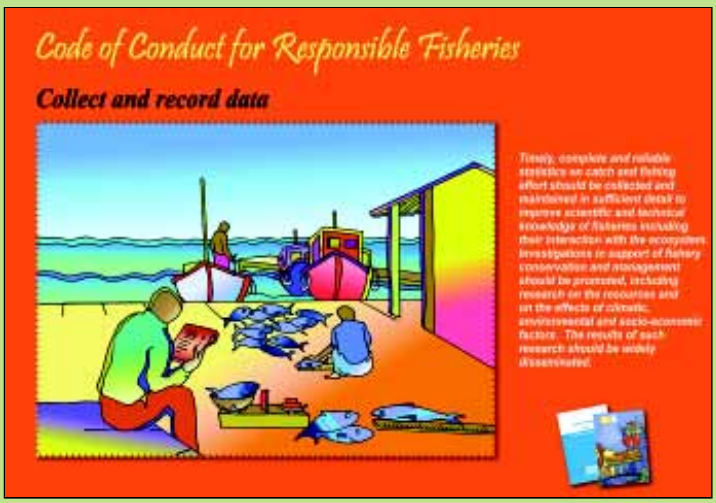
The Code of Conduct for Responsible Fisheries sets out principles and standards of behaviour for responsible fisheries and aquaculture practices. The BOBP-IGO has brought out a dozen posters to dramatize the Code's messages, such as: Enhance fish stocks. Avoid pollution of fish habitats. Ban destructive fish practices. Avoid overfishing. Encourage people's participation. Use selective fishing gear. Promote co-management. The posters will be widely distributed in the member-countries.

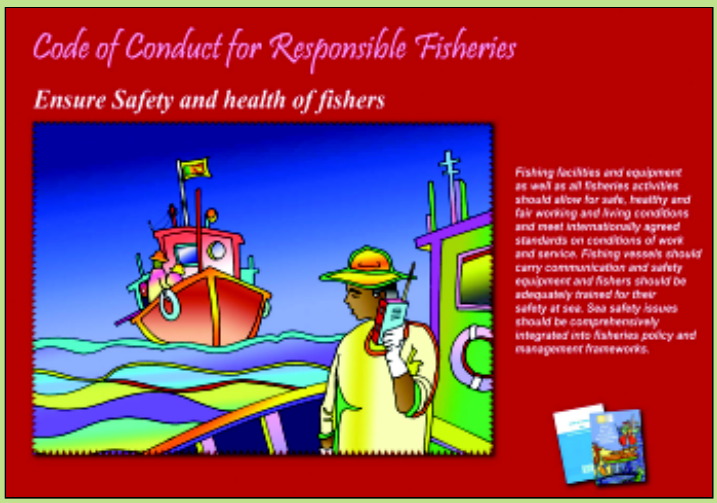












Development of Marine Fisheries in India- Role of the Fishery Survey of India

The Fishery Survey of India (FSI) surveys and assesses marine fishery resources in India's Exclusive Economic Zone (EEZ) to ensure optimum utilization and sustainable development of these resources. The FSI is a part of the Department of Animal Husbandry, Dairying and Fisheries in the Ministry of Agriculture.

R & D in fisheries in India perhaps began in 1946 with the establishment of the Deepsea Fishing Station. It was meant to augment food supply through development of deepsea fishing during the post-second World War. Beginning with just one vessel (a mine sweeper converted to a trawler, **S.T. Meena)** and a few staff, the FSI by 1982 had 28 vessels of varying size operating from 12 bases.

With the declaration of the 200 nautical mile EEZ during 1976, the Government of India started acquiring large vessels to survey demersal, mid-water, pelagic and oceanic resources in the EEZ. In 1983, the FSI was reorganized and upgraded as a national institute with a new set of mandates. Headquartered in Mumbai, the FSI has six zonal bases at Mumbai, Mormugao, Kochi, Chennai, Visakhapatnam and Port Blair. It was recognized as a science & technology institute in 1988.

The institute's sanctioned staff strength of 812 includes scientists, engineers, technicians and administrative staff.

The FSI seeks to meet the data needs of the Indian marine fishing industry for optimizing fishery production, also for regulating resources conservation and environmental protection.

Since its inception, the institute's vessels have engaged in demersal (bottom) trawling, mid-water trawling, purse seining, tuna longlining and squid jigging. The present survey fleet focuses on deepsea and oceanic resources and consists of 13 ocean-going vessels of 30.5 - 40.5 OAL equipped with state-of-the-art equipment for navigation, fish finding and resources survey.

The FSI is a recognised Marine Data Centre under the National Ocean Information System coordinated by the Department of Ocean Development. It holds 50 000 electronic records; about 2 500 are added annually. Scientists take part in survey cruises to collect data relating to fishery resources distribution and abundance in space and time. They also collect biological information and data on oceanographic parameters.

The data collected are processed and published in the form of charts, atlases, bulletins, etc. from time to time, catering to a spectrum of data users.

Apart from publications, the FSI disseminates findings through workshops, seminars, open houses and exhibitions in different maritime states to benefit fishermen, fishing boat operators, etc.

Dr V S Somvanshi became Director-General of the Fishery Survey of India in August 1995, after 15 years of service with the FSI. He has vast experience in marine fisheries research, particularly in fishery resources surveys and assessment and fish biology. He has edited two books, published more than 100 scientific papers, and visited several countries in Europe, Asia and Africa in the course of professional assignments.

Between 1997 and 2002, he served as Vice-Chairman of the Scientific Committee of the Indian Ocean Tuna Commission. He has been a principal investigator on several national and international projects, has served on many R& D committees, and is a Ph.D research guide at several universities.

Publications	
Data products	**Issues**
Fishery Charts	4
Fishery Atlases	2
Bulletins	28
Occasional Papers	11
Special Publications	5
Chartered Vessels Series	8
Proceedings	6
Resources Information Series (Hindi, English, Marathi, Tamil, Telugu, Malayalam, Konkani, Kannada, Oriya)	77
Extension Series	1

Some facts relating to the surveys:

- Demersal resources have been surveyed in all coastal sectors. Stocks are under advanced levels of exploitation.The institute has located a number of new fishery resources and fishing grounds of deepsea lobsters off the south west coat, spear lobster *(Linuparus sommiosus)* and deep sea lobsters *(Puerulus sewelli)* in Andaman waters.
- FSI has been investigating demersal stocks in the outer continental shelf. Intensive trawl surveys are being used to cover all the sectors.
- FSI has done a preliminary survey of neritic pelagic stocks in some sections of the Indian coast by means of mid-water trawling and purse-seining
- Trawl surveys are in progress for obtaining a complete picture of several stocks of deepsea crustaceans and finfishes in different sectors of the continental slope.
- FSI is doing tuna longline surveys to generate scientific

FSI's Survey Fleet

Name of Base and Vessel	Vessel Type	OAL (m)	GRT (t)	BHP	Built in	
					Year	Country
Mumbai						
Yellow Fin	Tuna longliner	36.0	290	800	1989	Japan
Matsya Vrushti	Monofilament longliner	37.5	465	1100	2005	China
Matsya Nireekshani	Stern trawler	40.5	329.26	2030	1978	Holland
Mormugao						
Matsya Vishwa	Stern trawler	36.5	327.18	825	1983	India
Sagarika	Stern trawler	28.8	189	650	1994	Japan
Cochin						
Matsya Varshini	Trawler-cum-Purse-seiner	36.5	268.80	1160	1980	Denmark
Matsya Sugundhi	Longliner-cum-Squid jigger	31.5	245.80	650	1980	Japan
Lavanika	Stern trawler	24.0	151	500	1995	1995
Chennai						
Matsya Drushti	Monofilament longliner	37.5	465	1100	2005	China
Samudrika	Stern trawler	28.8	189	650	1994	India
Visakha patnam						
Matsya Shikari	Stern trawler	39.5	352	740	1979	Holland
Matsya Darshini	Stern trawler	36.5	268.80	1160	1980	Denmark
Port Blair						
Blue Marlin	Tuna longliner	36.0	290	800	1989	Japan

FSI's Charter of Work

1. Survey and assessment of fish stocks and charting of fishing grounds in the Indian EEZ and adjoining high seas.
2. Monitoring of fishery resources for fisheries regulation, management and conservation.
3. Assessment of suitability of deepsea fishing gear with special reference to the concepts of maximum sustainable yield, preservation of the environment and the marine ecology.
4. Marine fisheries forecasting including application of remote sensing in fisheries management.
5. Maintaining data on deepsea fishery resources and dissemination of information to different user groups.
6. Human resources development through training of fishing operatives and assistance to sister institutes in meeting their faculty requirements.

knowledge and a sound data base on distribution, availability, seasonality and migratory trends of larger pelagic stocks in the Indian EEZ and adjoining high seas.

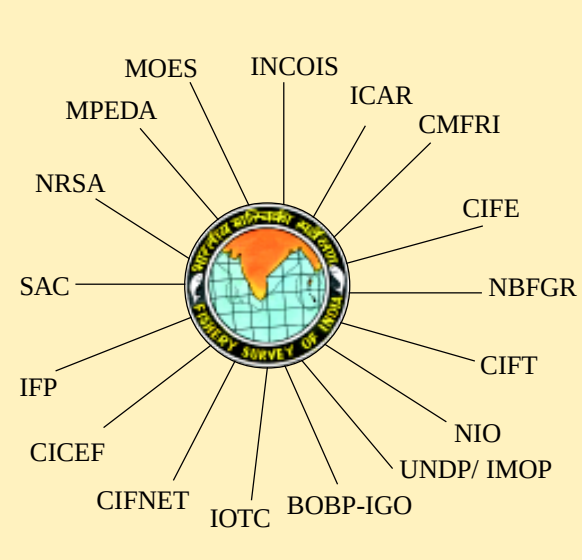
- Through two recently acquired monofilament longliners, Matsya Vrushti and Matsya Drushti, FSI is in the process of popularizing the monofilament longlining technique.
- FSI is currently surveying demersal resources in the deeper waters and continental slope and doing longline surveys for larger pelagic stocks in the EEZ around the A&N islands.
- FSI has initiated studies on krill resources in the Indian Ocean sector of the southern ocean.
- To promote technologies and fishing gear which will not further degrade the marine ecosystem, FSI undertakes fishing with eco-friendly and diversified fishing methods like squid jigging, trap fishing, etc.
- FSI is building up a species inventory of marine fishery resources in the Indian EEZ so as to take measures for monitoring and conservation of marine bio-diversity.
- The FSI has arrived at a figure of 3.92 million tonnes of fishery potential in the Indian EEZ by using different analytical and production models suitable for tropical fisheries. Variabilities of stock densities and biomass of important stocks are being assessed on a yearly basis.
- FSI has been associated with ISRO institutes in developing techniques and in validating the application of remote sensing in marine fisheries.

Human Resource Development

The FSI provides practical on-board training to deepsea fishing operatives and fishermen of maritime states in different fishing methods. It also gives on-board sea-service training to CIFNET trainees so that they become eligible to appear for certificate of competency examinations.

Training is imparted to individual scientists in fish stock assessment, taxonomy, fishing gear, fishery oceanography, etc. FSI is recognized by Mumbai University as a research centre for undertaking studies leading to M Sc (by research) and Ph D degrees. FSI bases have also won recognition from universities in the respective regions.

FSI's Institutional Linkages



Tasks ahead

Short term vision

- Monitoring of demersal resources within 200m depth zone.
- Survey of deepsea demersals beyond 200m depth.
- Survey of coastal pelagic resources.
- Survey of oceanic tuna resources.
- Survey of skipjack and yellowfin tuna by pole and line fishing in Lakshadweep and Andaman & Nicobar Group of Islands.
- Introduction of monofilament longlining for exploration and exploitation of tuna resources.
- Fish stock identification and biodiversity studies using fish genetics.
- Application of remote sensing in forecasting of marine fisheries.
- Investigation of fishery resources in the high seas in the Indian Ocean and Southern Ocean.

Long-term vision

- Completion of exploratory surveys for all types of fishery resources in the Indian EEZ.
- Commercial fishing technologies and innovations.
- Monitoring surveys for fish stock health in the Indian EEZ and fishery strategies.
- Data bank maintenance and networking.
- Large marine ecosystems approach for conservation, management of resources and preservation of environment.
- Habitat management – assessment of risks to habitat.
- Environmental impact of fishing on protected species.
- Sustainable fishery and enhanced food security.

The FSI has vital linkages with several national agencies and institutions associated with ocean studies and fisheries development

The FSI is the nodal institute of the Government of India for matters related to Indian Ocean Tuna Commission (IOTC). Recently, for the first time in India, FSI successfully conducted a tuna tagging programme in the Lakshadweep Islands. FSI is also represented in the Technical Advisory Committee of the BOBP-IGO.

The Government of India's Centrally Sponsored Scheme (CSS) on development of marine fisheries, infrastructure and post-harvest operations, is being implemented through FSI: existing trawlers are converted for monofilament longlining. Likewise, under the CSS on strengthening of databases and information networking for the fisheries sector, FSI conducted a marine fisheries census in Lakshadweep and Andaman and Nicobar Islands and also conducted eight training sessions-cum-workshops on "Strengthening of data collection and fish taxonomy". The FSI also acts as an interface between the Ministry and fishery departments of coastal states for catch assessment surveys in marine fisheries.

The FSI maintains a database of Indian-owned fishing vessels permitted by the Government of India to engage in deepsea fishing in the Indian EEZ. The FSI has played an important role in implementing inter-institutional and international projects.

The FSI is a premier organization in surveying and assessing fish stocks in India. It has helped to popularize various modern fishing techniques, train operatives, apply remote sensing in marine fisheries, promote the Code of Conduct for Responsible Fisheries and eco-friendly fishing techniques. For more details, please visit the website http:// fsi.bom.nic.in

Projects implemented by FSI

1. ICAR-funded project on ***"Investigation on biology of perches in Quilon Bank, Wadge Bank and Gulf of Mannar"***.
2. GEF/IMO/UNDP-funded project on ***"Glo-ballast water port baseline survey"***.
3. ICAR-funded project "***To study the present status of the polynemid fishery along the Maharashtra-Gujarat coasts and to suggest a suitable gear for their sustainable exploitation".***
4. Project funded by Ministry of Environment & Forests, New Delhi, on ***"Investigation in Marine Fish Biodiversity in the Indian EEZ".***
5. Project funded by Space Application Centre (SAC), Ahmedabad, on ***"Application of Remote Sensing and GIS for Marine Fisheries Resources Management"***
6. Project funded by SAC, Ahmedabad on ***"Species-specific fishery forecast***".
7. Project funded by INCOIS on "***Development of Integrated Fishery Forecast Model off the Visakhapatnam Coast***".
8. Project funded by IOTC on "S**mall -scale tuna tagging in Lakshadweep Islands"**

The newly acquired fishing vessels of FSI (top & bottom)

How did the World Fare in Fisheries and Aquaculture in 2004? Let's take a look at SOFIA 2006

The State of World Fisheries and Aquaculture, 2006 (SOFIA 2006) is out – FAO's authoritative wide-ranging macro-analysis of global fisheries and aquaculture for 2004.

SOFIA is perhaps the best-known five-letter word in fisheries! It is the product of a regular exercise carried out by FAO staff and consultants, based on data worldwide. Because of the time taken to collect, compile, assemble and analyse data globally, arrive at conclusions, then present and disseminate it, SOFIA 2006 deals with 2004.

SOFIA 2006 takes up about 175 pages. Like its predecessors, it is in four parts. Part I is a review of world fisheries and aquaculture. Part 2 discusses select issues facing fisheries and aquaculture. Part 3

highlights special FAO studies. Part 4 is an "outlook" for the future. The book comes with a CD-ROM containing a "World fisheries and aquaculture atlas",

This article provides glimpses into the 175-page publication – facts, insights, revelations. (For a copy of this important publication, you may write to the Sales and Marketing Group, Electronic Publishing Policy and Support Branch, FAO, Via delle Terme di Caracalla, 00153 Rome, Italy.)

Part 1: World Review of Fisheries and Aquaculture

Part 1, containing 60 pages, is the biggest part of SOFIA 2006. It is devoted to "Fisheries resources: trends in production, utilization and trade". What appears below is a summary of the 6-page "Overview" of trends in fish production, utilization and trade worldwide, with which Part 1 begins.

Capture fisheries and aquaculture supplied the world with about 106 million tonnes of food fish in 2004. Of this total, aquaculture accounted for 43 percent. Per capita supply works out to 16.6 kg, the highest on record, but to 13.5 kg if China is excluded. Overall, fish provided more than 2.6 billion people with at least 20 percent of their average per capita animal protein intake.

Outside China, per capita supply has shown a modest growth rate of about 0.4 percent per year since 1992 (following a decline from 1987). The rising numbers in aquaculture supply more than offset the effects of static capture fishery production and a rising population.

Preliminary estimates for 2005 indicate that total world fishery production reached almost 142 million tonnes, an increase of over 1 million tonnes compared with 2004. Although the total amount of fish available for human consumption is estimated to have increased to 107 million tonnes, the global per capita supply remained at about the same level as in 2004 because of population growth.

China remains by far the largest producer, with a reported fisheries production of 47.5 million tonnes in 2004 (16.9 and 30.6 million tonnes from capture fisheries and aquaculture, respectively). But as in earlier years, there are indications that statistics for capture fisheries and aquaculture production for China may be too high. This problem has existed since the early 1990s.

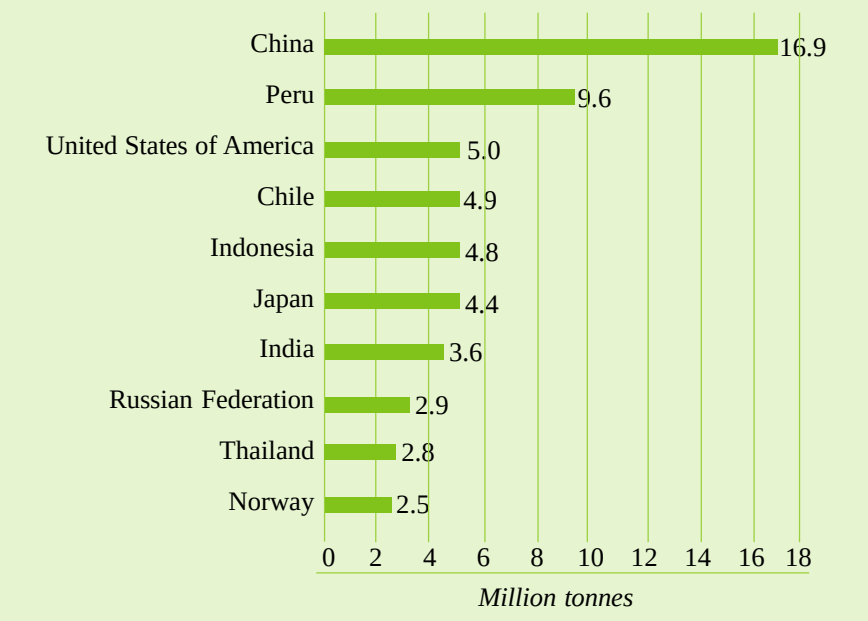
Because of the importance of China and the uncertainty about its production statistics, China is generally discussed separately from the rest of the world.

Global capture fisheries production reached 95 million tonnes in 2004, with an estimated first-sale value of US $ 84.9 billion. China, Peru and the United States remained the top producing countries.

World capture fisheries production has been relatively stable in the past decade. The exception relates to marked fluctuations in catches of Peruvian anchoveta in the Southeast Pacific. Total marine catches accounted for 85.8 million tonnes in 2004.

The Mediterranean Sea and the Black Sea remained the most stable marine areas in terms of capture production. Catches from inland waters, about 90 percent of which occur in Africa and Asia, have shown a slowly but steadily increasing trend since 1950, owing in part to stock enhancement practices, and reached a record 9.2 million tonnes in 2004.

Marine and inland capture fisheries: top ten producer countries in 2004



Aquaculture continues to grow more rapidly than all other animal food-producing sectors, with an average annual growth rate of 8.8 percent per year since 1970, compared with only 1.2 percent for capture fisheries and 2.8 percent for terrestrial farmed meat production systems. However, there are signs that the rate of growth for global aquaculture may have peaked, although high growth rates may continue for some regions and species.

Aquaculture production in 2004 was reported to be 45.5 million tonnes with a value of US $ 63.3 billion. Of

World fisheries and aquaculture production and utilization

	2000	2001	2002	2003	2004	2005[1]
	(million tonnes)					
Production						
Inland						
Capture	8.8	8.9	8.8	9.0	9.2	9.6
Aquaculture	21.2	22.5	23.9	25.4	27.2	28.9
Total inland	**33.0**	**31.4**	**32.7**	**34.4**	**36.4**	**38.5**
Marine						
Capture	86.8	84.2	84.5	81.5	85.8	84.2
Aquaculture	14.3	15.4	16.5	17.3	18.3	18.9
Total Marine	**101.1**	**99.6**	**101.0**	**98.8**	**104.1**	**103.1**
Total Capture	95.6	93.1	93.3	90.5	95.0	93.8
Total Aquaculture	35.5	37.9	40.4	42.7	45.5	47.8
Total World Fisheries	**131.1**	**131.0**	**133.7**	**133.2**	**140.5**	**141.6**
Utilization						
Human consumption	96.9	99.7	100.2	102.7	105.6	107.2
Non-food uses	34.2	31.3	33.5	30.5	34.8	34.4
Population (billions)	6.1	6.1	6.2	6.3	6.4	6.5
Per capita food fish supply (kg)	16.0	16.2	16.1	16.3	16.6	16.6

Note: Excluding aquatic plants
[1] *Preliminary estimate*

the world total, China is reported to have accounted for nearly 70 percent of the quantity and over half the global value of aquaculture production. All regions showed increases in production from 2002 to 2004.

Freshwater culture continued to dominate, followed by mariculture and brackishwater culture. Carps accounted for 40 percent of all production of fish, crustaceans and molluscs. The period 2000-04 saw strong growth in production of crustaceans, in particular, and of marine fish.

In the same period, production in developing countries other than China increased at an annual rate of 11 percent, compared with 5 percent for China and about 2 percent for the developed countries. With the exception of marine shrimp, the bulk of aquaculture production within developing countries in 2004 comprised omnivorous/ herbivorous fish or filter-feeding species. In contrast, carnivorous species accounted for approximately three-quarters of finfish culture production in developed countries.

During the past three decades, the number of fishers and aquaculturists has grown faster than the world's population. In 2004, an estimated 41 million people worked as fishers and fish farmers, the great majority of these in developing countries, principally in Asia. The significant increase in numbers in recent decades is because of a strong expansion of aquaculture activities.

In 2004, fish farmers accounted for a quarter of the total number of fish workers in the primary sector. China has the highest number of fishers and fish farmers, reportedly 13 million in 2004, representing about 30 percent of the world total.

In China, fleet-size reduction programmes to tackle overcapacity are reducing the number of people engaged in capture fisheries. This number declined by 13 percent during the period 2001-04. In most industrialized countries, too, the numbers engaged in fishing and aquaculture are either declining or stationary.

The world fishing fleet comprised about 4 million units at the end of 2004, of which 1.3 million were decked vessels of various types, and 2.7 million undecked (open) boats. While virtually all decked vessels were mechanized, only about one-third of the undecked fishing boats were powered, generally with outboard engines. The remaining two-thirds were traditional craft of various types operated by sail and oars. About 86 percent of the decked vessels were concentrated in Asia.

Many countries are limiting the growth of national fishing capacity or reducing it – both to protect fishery resources, and to make fishing economically viable for harvesting enterprises. Overall, the number of fishing vessels worldwide did not change significantly in either 2003 or 2004.

Just as the world fishing fleet appears to have stabilized, the state of exploitation of the world's marine fishery resources has tended to remain relatively stable.

Over the past 10 to 15 years, the proportion of overexploited and depleted stocks has remained unchanged, after showing a marked increase during the 1970s and 1980s. It is estimated that in 2005, as in recent years, around one-quarter of the stock groups monitored by FA0 were under-exploited or moderately exploited. About half of the stocks were fully exploited, with no room for further expansion. The remaining stocks were either overexploited, depleted or recovering from depletion.

This confirms earlier observations that the maximum wild capture fishery potential from the world's oceans has probably been reached. Fisheries management is necessary to rebuild depleted stocks and prevent the decline of those being exploited close to their maximum potential.

In the case of inland fishery resources, there is widespread overfishing, arising from either intensive targeting of individual large-size species in major river systems or overexploitation of highly diverse species assemblages or ecosystems in the tropics.

Total world trade in fish and fishery products reached a record value of US$71.5 billion (export value) in 2004, representing a 23 percent growth relative to 2000.

In real terms (adjusted for inflation), exports of fish and fishery products increased by 17.3 percent during 2000-04.

China has been the world's main exporter since 2002, and in 2004 its fish exports were valued at US$ 6.6 billion. (China has recorded a remarkable average annual growth of 12 percent in the period 1992-2004.)

The fishery net exports of developing countries (*i.e.* the total value of their exports less the total value of their imports) have shown a continuing rising trend over the past two decades, growing from US $4.6 billion in 1984 to US $16 billion in 1994 to US $20.4 billion in 2004. These figures are significantly higher than those for other agricultural commodities such as rice, coffee and tea.

Shrimp continues to be the most important commodity traded in value terms, (16.5 % of the total value of internationally traded fishery products in 2004) followed by groundfish (10.2 %), tuna (8.7 %) and salmon (8.5%).

Marine fisheries governance: Regional fisheries management organizations (RFMOs) play a unique role in facilitating international co-operation for the conservation and management of fish stocks. These organizations are the only realistic means of governing fish stocks that occur either as straddling or shared stocks between zones of national jurisdiction, between these zones and the high seas, or exclusively on the high seas.

Strengthening RFMOs in order to conserve and manage fish stocks more effectively remains the major challenge facing international fisheries governance. (see pages 9-10)

Despite efforts over the past decade to improve their management capacity, some RFMOs have failed to achieve their fundamental goal of sustainable management of stocks.

For inland fisheries too, a system of governance is needed for transboundary fisheries and fishery resources. Many of the world's large river basins cross one or several international borders, and many riverine fish species migrate across boundaries. Result: activities in one country may affect fish stocks and communities exploiting the fish stocks in another country.

Unlike capture fisheries, aquaculture activities are generally located within national jurisdictions; governance in aquaculture is therefore a national responsibility. There is growing understanding that sustainable development of the aquaculture sector requires an enabling environment, with appropriate institutional, legal and management frameworks guided by an overall policy.

Notable progress has been made in a number of institutional, legal and management development areas, including the use of various public sector- private-sector partnership arrangements.

In recent years, issues relevant to international trade in fishery products have been prominent. They include labelling and traceability requirements; ecolabelling; illegal, unreported and unregulated (IUU) fishing; the sustainable development of aquaculture; subsidies in production and trade agreements. Some of these issues form a part of the agenda for the multilateral trade negotiations in the World Trade Organization (WTO).

Part 2: Selected Issues in Fisheries and Aquaculture

Part 2 of SOFIA 2006 contains a valuable discussion of select issues

in fisheries and aquaculture. These take up 36 pages. Only a listing of these issues is possible in this article.

- The Code of Conduct for Responsible Fisheries: Moving into the Second Decade of Implementation.
- Sustainable growth and expansion of aquaculture: an ecosystem approach.
- The allocation of fishing rights: an evolving issue.
- Impact of market-based standards and labels on international fish trade.
- HIV and AIDS in fishing communities: a public health issue but also a fisheries development and management concern.

Part 3: Highlights of Special Studies

This 40-page section highlights some special studies conducted by the FAO.

These are listed below:

- Rehabilitation of riverine habitat for fisheries.
- Responsible fish trade and food security.
- Trash or treasure? Low-value/ trash fish from marine fisheries in the Asia-Pacific region.
- Conservation and management of shared fish stocks: legal and economic aspects.
- Marine capture fisheries management in the Indian Ocean: status and trends.
- Refuelling the fishing fleet.
- Causes of detentions and rejections in international fish trade.

Fish production in 2004 and projections for 2010 and later

	Simulation target year						
	2000	2004	2010	2015	2020	2020	2030
Information Source	FAO statistics[1]	FAO statistics[2]	SOFICA 2002[3]	FAO Study[4]	SOFIA 2002[3]	IFPRI study[5]	SOFIA 2002[3]
Marine capture	86.8	85.8	86		87		87
Inland capture	8.8	9.2	6		6		6
Total capture	95.6	95.0	93	105	93	116	93
Aquaculture	35.5	45.5	53	74	70	54	83
Total production	131.1	140.5	146	179	163	170	176
Food fish production	96.9	105.6	120		138	130	150
Percentage used for food fish	74%	75%	82%		85%	77%	85%
Non-food use	34.2	34.8	26		26	40	26

Note:All figures - other then percentages - are in million tonnes.

[1] Based on the statistics available to the FAO fishery information, Data and Statistics Unit in 2000.

[2] Based on latest statistics of the FAO Fishery Information, Data and Statistics Unit.

[3] FAO. 2002. The State of World Fisheries and Aquaculture 2002. Rome.

[4] FAO. 2004. Future prospects for fish and fishery products: medium-term projections to the years 2010 and 2015. FAO Fisheries Circular FIDI/972-1. Rome.

[5] International Food Policy Research Institute. 2003. Fish to 2020: supply and demand in changing global markets, by C. Delgado, N. Wada, M. Rosegrant, S. Meijer and M. Ahmed. Washington. DC.

Part 4: Outlook

The 11-page Part 4 of SOFIA 2006 describes the outlook for the future for fisheries and aquaculture, and does so in two parts. The first part revisits global projections for 2010 in fisheries and aquaculture contained in SOFIA 2004, in the light of what has happened since the projections were made. The second part summarizes important findings of a comprehensive FAO study on aquaculture.

What appears below provides a peek into both parts.

a) Revisiting global projections

World fisheries and aquaculture production have moved towards the figures predicted for 2010. Marine fisheries have reached a ceiling in terms of output. But a growing aquaculture sector is enabling per capita supplies of fish to remain almost constant.

Marine capture fisheries: The image of stagnation provided by marine capture fisheries is false. The stagnation in terms of output in no way reflects a stagnating sector. Not only are landings increasing in some fisheries (exemplified by the fisheries in the Northwest Atlantic) and decreasing in others, but the sector is continuously adjusting to changing political, economic and social environments.

While some stocks are recovering, there is no indication that landings for these stocks will expand to exceed the historical maximum sustainable yield levels.

It seems reasonable to expect that marine capture fisheries production will remain between 80 and 90 million tonnes per year, with an average somewhere in the middle of this range.

Freshwater capture fisheries: Contrary to projections, landings from inland fisheries have remained high and even increased somewhat. The projection for 2010 was that landings would have fallen to two-thirds of the 2000 level. However, the projection was based mainly on records from the organized commercial sector, and failed to take note of the larger subsistence sub-sector. Efforts are now under way by both FA0 and others to improve the official records for both commercial and non-commercial inland fisheries.

Aquaculture : Aquaculture (excluding aquatic plants) production continues to grow both in China and in the rest of the world. It is noteworthy that aquaculture production over the past four years has grown faster outside China (37 per cent) than in China (24 percent). It looks as if the prediction of 53 million tonnes of aquaculture production for 2010 will be met**.**

A first impression is that, at least during the rest of the current decade, aquaculture will contribute to future world fish supplies as was expected in 2000.

Fish utilization: Projections for 2010 were that the quantities of fish used for non-food purposes would decline from about 35 million tonnes per year to 26 million tonnes per year. This does not seem to be happening. In 2004, the quantities used for non-food uses were as high as four years earlier. The main reason seems to be increases in anchoveta landings in Chile and Peru.

b) Medium-term challenges and constraints for aquaculture

FA0 recently concluded a prospective analysis intended to provide insights into the future of aquaculture globally.

The process was complex. The analysis encompassed the preparation of national aquaculture sector overviews for more than 100 countries, five regional workshops, seven reports on regional aquaculture development status and trends, and a global expert survey on aquaculture development using the Delphi Technique.

The material developed in this way was synthesized to form a draft global review of the status and trends in aquaculture development. Subsequently, this document was submitted to a group of experts, who were requested to craft a 'prospective analysis of future aquaculture development.' Here are some highlights from the prospective analysis.

Of the many factors that determine the supply of aquaculture products, those outlined below are expected to play a lead role in the coming decades.

Access to land and water resources, and intensification

There is little new land available for fish farming in most countries

around the world, especially in Asia, the leading aquaculture producer. Land shortage is likely to remain one of the major constraints to aquaculture expansion globally.

Governments have taken various measures to address the issue, such as conversion of agriculture to aquaculture land, and integration of aquaculture into existing farming systems.

In the case of shrimp farming, most existing mangroves are protected against encroachment. Because there is no possibility of increasing land area, one solution is to intensify landbased production. In fact, intensification is becoming a growing trend in aquaculture worldwide. But costs go up with the level of intensification; not all farmers are expected to intensify.

The unavailability of freshwater could also limit future aquaculture development. Its use in aquaculture is frequently regarded as a loss for agriculture. In many cases, agriculture has been given priority in the allocation of water.

Access to adequate feed: fishmeal, fish oil and "low-value/ trash fish"

The use of aquafeeds will continue to play an important role in aquaculture development and production. Their availability and the cost of feed can be critical constraints to aquaculture.

With the predicted global increase in aquaculture production, the demand for aquafeed will continue to grow. One tends to be optimistic about the supply of fishmeal and fish oil for aquaculture feed. But demand from developing economies such as China may have a profound impact on overall supply and demand.

The use of low-value trash fish in aquaculture is also an important factor for future development. It is projected that, by 2013, China alone would require 4 million tonnes of low-value trash fish to sustain its marine cage culture. It seems the use of low-value trash fish in aquaculture feed is unlikely to be sustainable. There are also concerns that the continued use of low-value trash fish will generate environmental effects and biosecurity risks.

Greater capitalization and diversification of production systems and species: In spite of limited land and water resources, aquaculture entrepreneurs, attracted by high prices, are likely to find new ways of producing sufficient fish to meet demand.

Greater production requires greater capitalization. In the long run, aquaculture employers will have to use less labour and more capital to maintain the profit margins needed to stay in business. Therefore, an allocation of productive resources towards the production of high-commercial-value species, away from low-value species, can be expected.

Aquaculture of non-food species such as ornamental fish farming is an industry full of promise. Because of its growing potential for increasing rural employment and income and generating foreign exchange earnings, governments are increasingly promoting the culture and trade of ornamental fish. However, the outbreak of diseases is a threat to the development of this industry.

Ecotourism is an emerging industry and has the potential to spread throughout the world. A number of countries are promoting aquaculture-related ecotourism. Recreational fisheries in lakes and reservoirs play a significant role in Central and Eastern Europe.

In Malaysia, there is a growing interest in integrating aquaculture operations with tourism, such as marine cage culture and "put and take" fishing ponds. Offshore sites are a potential area where aquaculture-related ecotourism could be further developed.

The farming of seaweed has expanded rapidly. The seaweed industry provides a range of products generating an annual production value of US $ 5.5-6 billion. There are indications that the seaweed industry is likely to expand in the coming decades.

Access to capital: With progressive intensification and diversification of aquaculture to systems and species requiring sophisticated technologies, access to capital will be a key factor for development. Capital will be needed not only for investment and operating costs, but also for aquaculture insurance.

While access to capital might not be an issue in developed countries, it is certainly a stumbling block to aquaculture development in the developing world.

Environmental management: Intensification may sustain the profitability of farming operations, but it does so at a cost.

Farmer and consumer associations, civil society and institutional buyers such as supermarket chains and other key stakeholder groups are actively promoting the development of standards and codes aimed at ensuring an environmentally and socially responsible aquaculture. Such improvements have been noticeable worldwide for a number of commodities, particularly salmon.

Rising energy costs: Even before the current global energy crisis, energy costs represented an important share of the production costs in many commercial aquaculture operations. With further intensification and the use of more sophisticated technologies, it is likely that more energy will be needed, thereby exacerbating the energy cost problem.

As for land and water, aquaculture must compete with other activities for energy. To alleviate this problem, researchers around the world are seeking low-cost energy sources. More efficient pumps have been suggested as one of the options. Another is the use of recirculating systems. Wind-powered pumps are being used on a limited scale in freshwater

aquaculture in many countries, but their capital cost is high.

Human resources development: Human resources development is pivotal to the future of aquaculture. Can progress in building the human capacity of the public and private sectors keep pace with new developments in technology, international trade and legislation?

Related issues, many of which are beyond the control of the aquaculture sector, include the so-called "brain drain", or migration of trained personnel from developing to developed countries, and the loss of human and social capital because of the effects of HIV and AIDS in many parts of the world, particularly in Africa, and natural disasters, such as the 2004 tsunami.

Research and development: As aquaculture continues to feel the pressure to expand, research and development will be a key. Research faces the challenge of providing policy-makers and practitioners with cutting-edge knowledge and innovations.

Aquaculture development has been hampered, however, by three factors relating to the fundamental requirements of research and development: insufficient funds, lack of core research staff and weak research infrastructure.

lnformation and communication technologies and networking :

Continuous dramatic advances in information and communications technologies are creating new opportunities for communication. Governments and other stakeholders in aquaculture development need to tap these opportunities. lnformation exchange through networking is likely to play an important role in the development of the sector.

Access to markets: Growing national and international markets and the ability to trade in these markets will strongly influence the growth of aquaculture. International trade of farmed fish has been going up.Trade expansion has also induced some countries to apply high import tariffs on fish and fishery products, to protect domestic aquaculture industries.

With the progressive liberalization of trade, tariffs have been lowered in many instances. However, non-tariff barriers have emerged as the main obstacle to trade and market access for exports to developed countries. Exporters are accused of dumping their products, or of benefiting from subsidies. These have led to import curbs and duties. Such disputes are increasingly being brought to the WTO for resolution.

As the industry grows and more aquaculture products move into international trade, the competition for market shares will become stiffer. More disputes can be expected. Access to export markets has also been complicated by regulations concerning product quality and safety requirements introduced by importing countries.

Given the significant contribution of developing countries to global aquaculture production, growing protectionism in developed countries would, of course, reduce aquaculture production in the developing world, and the per capita supply of fish.

The impact of increased protectionism will be felt most keenly by small producers. They may not be able to bear the high costs of compliance and may get pushed out of business. Market diversification may therefore play an important role. One outcome would be the development of niche markets, such as for organic aquaculture products or aquaculture ecolabels.

Further liberalization of fish trade under new agreements could provide new opportunities for expansion of aquaculture. Additionally, in many developing countries, domestic aquaculture industries compete with imports for domestic market shares. To overcome this problem, aquaculture producers and processors are slowly moving towards the development of processed products for both national and export markets.

This value-addition strategy is an avenue for improving the profitability of aquaculture enterprises. There is also a trend towards targeting local urban markets with standardized, value-added "easy-to-cook" or "super-market type" products. As competition for markets increases, these trends are likely to grow and intensify.

Sound policies and governance

Good governance, including political stability, has a major influence on aquaculture development. It reduces the costs of doing business, attracts investment into the sector and enhances the industry's competitiveness.

Greater aquaculture sustainability will be achieved by strengthening farmer associations and by encouraging self-regulation in the aquaculture industry. In many countries, there is no legislation specifically for aquaculture. Instead the sector is governed by a multiplicity of ad hoc laws.

In countries with incipient aquaculture industries, governments may invest substantial sums in building institutions and establishing governance arrangements for aquaculture. As law enforcement is a constraint in many countries, strong emphasis will be placed on increasing self-regulation through farmer associations. Self-regulation is likely to grow and become a norm.

Government support

Generally, a government's commitment to strong support for the aquaculture sector is a prerequisite for the sector's sustainable development.

The level of commitment will vary within and among regions. But it is expected that in countries where aquaculture contributes substantially to growth, poverty alleviation and food security, the commitment will hold, and that the level of support will increase.

Bangladesh Fisheries Research Institute: Powering New Technologies for Fisheries Development

Fish and fisheries are integral to the culture and heritage of Bangladesh, and play a significant role in nutrition, employment generation and foreign exchange earnings.

The Bangladesh Fisheries Research Institute (BFRI) was established in 1984. Its goals are:

- To carry out and coordinate research on fisheries and aquaculture in Bangladesh**.** A Board of Governors oversees execution of this mandate by providing policy and administrative guidance.
- To assist in the development of more economic and effective methods and technologies for fish production and eco-system management, and fisheries management.
- To provide training and research-based technology transfer.

BFRI serves as the national resource for technical information on fisheries. It generates and standardizes guidelines for country-wide extension of appropriate technologies in production and resource management. The extension is done by the Directorate of Fisheries as well as by other organizations within and outside government.

Though the Institute was established in 1984, actual operation started only two years later after staff got recruited and initial research facilities set up. The institute presently has some 80 scientists, half of whom have Ph Ds in aquaculture and fisheries disciplines from universities in Bangladesh or abroad. The institute assists the country in achieving the goals of fisheries development set out in successive development plans.

Institutional set up

The BFRI's headquarters is located at the south-west corner of the Bangladesh Agricultural University campus in Mymensingh, some 120 km north of the capital, Dhaka.

Besides the headquarters, BFRI has five research stations — the Freshwater Station, Mymensingh; Riverine Station, Chandpur; Brackishwater Station, Paikgacha, Khulna; Marine Fisheries and Technological Station, Cox's Bazar; and the Shrimp Research Station, Bagerhat. There are also five sub-stations – two dealing with freshwater, at Jessore & Sayedpur; and three riverine sub-stations at Rangamati, Santahar and Khepupara.

Freshwater Station (FS), Mymensingh : This 40 ha station, attached to the BFRI headquarters, is the institute's largest. It has well-established and sophisticated carp and prawn hatcheries, as many as 118 drainable ponds — consisting of 20 mini ponds, 52 nursery ponds (0.1 ha each), 47 rearing ponds (0.25 ha each) and 16 grow-out/ brood stock ponds (1.6-2.6 ha each).

Riverine Station (RS), Chandpur : The 17.2 ha station is situated in the

Dr M A Mazid has been Director General of the BFRI from 1997, after 20 years as a senior officer in the government, and 11 years as teacher and researcher at the Bangladesh Agricultural University. He obtained an MS in marine biochemistry from Kagoshima University, Japan in 1978; a PhD in fish nutrition from Tokyo University of Agriculture in 1980; and a post-doctorate from Kagoshima University, Japan in 1983. He has served as National Project Director for several UN and international projects.

He has written four books and published more than 100 papers in national and international scientific journals. He is the founder-editor of the *Fisheries Newsletter* and the *Bangladesh Journal of Fisheries Research.*

His recent book *"Development of fisheries in Bangladesh: plans and strategies for increasing income and poverty alleviation"* is a significant contribution to fisheries development.

Dr Mazid has received the 20th Century Achievement Award from the American Biographical Institute. The BFRI under his leadership received a gold medal in recognition of its contribution to fisheries research and technology development in 1997.

riverine port city of Chandpur. It has 36 non-drainable ponds ranging in size from 0.12 to 0.37 ha each with a total water area of 8.6 ha. In addition, the station has one carp, one catfish and one prawn hatchery and specialized laboratories.

Brackishwater Station (BS), Paikgacha, Khulna : The only station of its kind in the country. It was established in 1987 to undertake R & D on various aspects of coastal aquaculture and fisheries management. The station is located at Paikgacha upzila under Khulna district and has an area of 30.56 ha. The station has 52 drainable experimental ponds of different sizes ranging from 0.05 to 1.0 ha, and an experimental hatchery for the production of prawn and commercially important brackishwater finfish seeds.

Marine Fisheries and Technology Station (MFTS), Cox's Bazar : This 4 ha station was established at Cox's Bazar in 1991. It is equipped with five specialized laboratories, an indoor cistern complex with 20 cisterns and an outdoor complex with 42 cisterns (200 m^2 each).

Research Achievements

Fisheries research has made a significant contribution to the growth of aquaculture by generating a number of economically viable, socially acceptable and environmentally compatible technologies. These are used by farmers large and small.

Highlights of BFRI's research achievements in aquaculture:

Breeding and seed production of commercially important fish, shrimp and endangered species : Research has been conducted to develop and refine the breeding techniques of commercially important fishes, and to disseminate techniques to the public and to private hatchery operators. Seeds are produced of four endemic major carps (catla, rohu, mrigal and calbasu), five major Chinese carps (silver carp, grass carp, bighead carp, black carp, common carp) and an exotic barb (silver barb), using artificial seed production techniques.

Hatcheries contribute about 99 percent of the total seed production, natural sources only 1percent. Artificial techniques of tiger shrimp and prawn breeding have also been developed by research and transferred to the field.

The BFRI has been conducting research on the conservation of fish biodiversity from 1994. It has successfully developed a package of technology for artificial breeding and seed production of some important threatened fish species using the technique of *in vitro* fertilization. Presently, live gene banks of 12 such threatened species – six carps (Mahseer, Olive barb, Rohu, Reba, Bata and Calbasu); five cat fishes (Pabda, Gulsha, Shingi, Magur and Guzi aor); and a climbing perch (Koi) have been established.

Genetic stock improvement of carp, catfish and tilapia: The BFRI has successfully initiated fish genetic research at the Freshwater Station (FS), Mymensingh since 1988. These generate better breeds and improved stocks for increasing fish production. Besides the institute's own research programmes, a number of international agencies (ICLARM, ACIAR/ CSIRO and DFID-AFGRP) have come forward to support some fish genetic research projects for developing advanced technologies.

Outstanding achievements have been recorded in genetic stock improvement of three important aquaculture species:

- genetically improved strain of BFRI silver barb, *Barbodes gonionotus*;
- BFRI GIFT *i.e*. super strain of *Oreochromis niloticus* and
- BFRI rohu, *Labeo rohita.*

This was done through several generations of genetic selection, which showed a 32 percent, 35 percent and 10 percent superiority in body weight respectively over non-selected control groups of these species.

The improved strains are presently being disseminated in a large number of public and private hatcheries. The all-male population of GIFT is in tremendous demand throughout the country.

Development of pearl culture: A total of seven freshwater mussel species namely *Lamellidens marginalis, L. corrianus,*

Scenic front view of the BFRI in Mymensingh, Bangladesh

L. phenchooganjensis, L. jenkinsianus, Parreysia corrugata, P. favidens and *Novaculina gangetica* were identified in lakes, rivers, ponds and other water bodies of the country for pearl culture. Tiny pearls have been produced in experimental ponds through mantle tissue-operated mussels.

The number of pearls depends on the inserted pieces of mantle tissues. In a single mussel, 5-20 pieces of pearl have been developed; image pearls have been formed with one thin permanent pearl layer (nacre); nuclei pearl did not show good results. The highest survival rate of about 80 percent was found in mantle tissue-operated mussel after two months among three types of operation.

Culture and fattening of mud crab: Crab fattening in now a growing aquaculture practice in coastal regions of Bangladesh. Local fisher groups including women are active in crab farming. A stocking density of 10 000 crablings/ ha ensured better production. As regards crab diet, replacing 50 percent trash fish by slaughter house waste was found effective for culture, and replacement of 75 percent for fattening. On the other hand, it was found advisable to replace 25 to 50 percent of the trash fish by shrimp heads for culture and to replace 50 percent for the sake of fattening.

Research-based technology development

BFRI has so far developed more than 40 improved aquaculture and management technologies (including a number of biotechnology techniques) aimed at increasing aquaculture production. Those found viable in the farmer's field are :

- Monosex seed production and culture of BFRI super tilapia strain;
- Mass seed production technique of climbing perch (*Anabas testudinius*);
- Mass seed production and culture of riverine catfish (*Pangasius* spp.);
- Improved nursery management of carps, catfish, tilapia and prawn;
- Polyculture of carps and prawn;
- Integrated rice-fish and floodplain fish farming;
- Fish culture in pen;
- Improved extensive culture of shrimp in enclosure;
- Crab fattening, etc.

Carps are bred in these happas

Impacts of technologies

All these technologies have been successfully transferred and disseminated to farmers and entrepreneurs in major areas of the country through training and demonstration and through distribution of extension leaflets, booklets and manuals. By adopting these technologies in suitable water bodies, farmers have contributed tremendously to aquaculture production.

The present average fish yield per unit area of water of various aquaculture practices is as follows: carp polyculture in perennial ponds 3 500 - 4 500 kg/ ha; monoculture of riverine catfish 30 000 - 40 000 kg/ ha; monosex culture of tilapia 12 000-16 000 kg/ ha; monoculture of climbing perch 8 000-10 000 kg/ ha; monoculture of silver barb 1 800-2 500 kg/ ha; integrated rice-fish culture 250-350 kg/ ha (only fish) and improved extensive shrimp culture 300-350 kg/ ha. As a result, aquaculture production has nearly doubled itself during the last 15 years.

BFRI has already fine-tuned its major aquaculture technology packages on the basis of regional need and agro-ecological suitability. The institute has been continuously extending newly evolved technologies in collaboration with the Department of Fisheries (DoF) and other GOs/ NGO partners.

It is hoped that the national objectives of food security and poverty alleviation, particularly in rural areas, will be achieved by massive transfer of these technologies all over the country with the help of GO and NGO agencies, and progressive farmers/ entrepreneurs.

The success of BFRI in generating aquaculture technologies and improved resource management practices paved the way for NGO participation in fisheries extension activities in 1988. Before that time, NGO involvement was limited to social service sectors like primary

health care, child education, adult education, and family planning.

Research-Based Information Generation

The Institute attaches special importance to publication and documentation of aquaculture and management technologies for wider adoption. For this reason, extension manuals, leaflets, posters and handouts are circulated freely among government and non-government extension agencies, farmers, entrepreneurs, etc. Training manuals are also prepared on clients' demand. ***Fisheries Newsletter*** and the ***Bangladesh Journal of Fisheries Research*** are being published biannually to document the Institute's activities and research findings.

Working Linkages

The research, training and management activities of the Institute are carried out in close cooperation with various national and international organizations/ agencies and NGOs. Feedback is obtained from them.

BFRI collaborates with national universities and maintains close liaison with them for fisheries R & D. International linkages include the World Bank, the International Development Agency, the IFAD, WorldFish Center, ACIAR/ CSIRO, BOBP-IGO, NACA, DFID, and University of Stirling.

The main national collaborators are the DOF followed by Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), and the Department of Agricultural Extension (DAE). Joint R & D programmes are carried out with NGOs like PROSIKA, BRAC, CARE, Bachte Shikha, Jagoroni Chokra, etc.

Emerging Issues of Fisheries Development

While aquaculture has been making good progress through development of various technologies, some new issues have cropped up. These must be dealt with seriously to maintain the current growth of the aquaculture industry. Some of these issues are:

- Broodstock management and dissemination of improved fish breeds;
- Genetic stock improvement of commercially important species;
- Improvement of aquaculture practices;
- Development of quality fish feeds;
- Conservation of aquatic biodiversity;
- Introduction of alien invasive species;
- Control of infectious fish and shrimp diseases;
- Improvement of quality of aquaculture and fisheries products; value addition and trade related issues.
- Degradation of the aquatic habitat.

Harvesting of carp fingerlings for stocking

The Next Steps

In recent years, inland and marine capture fisheries all over Asia have been declining gradually because of overfishing and deterioration of the aquatic environment. Aquaculture is seen as the most promising option for filling the gap in aquatic food supply.

The available inland closed-water resources of Bangladesh offer excellent opportunities for culture of suitable fish species (both finfish and shrimp). Though aquaculture is still in its infancy, there is enormous scope to increase the present level of aquaculture production fourfold or fivefold through improved aquaculture and management technologies. Proper expansion of evolved technologies is expected to create job opportunities for one-third of the country's population.

The institute is conducting research for biodiversity conservation of threatened fish species like Pabda, Gulsha, Tengra, Koi, Shingi, Magur, Mohashol, Bheda, etc. and for popularizing the culture of small indigenous species. This will help conserve endangered fish species and increase the production of small fishes.

According to a poverty reduction strategy paper prepared by the government, BFRI's main research goal is to increase fish production threefold by the next 10 years through scientific fish farming and open water fishery management practices.

If technology transfer to the field is done right through massive extension, demonstration and training, aquaculture alone can meet half of the country's fish production by the next five years. This requires adoption of the right policy, programs and investment by all agencies concerned.

Status of Sea Safety Programmes for Small-scale and Commercial Fishermen in Myanmar

Than Oo Wai, Department of Fisheries,
Ministry of Livestock and Fisheries, Myanmar.

The Union of Myanmar has a coastline of 2 832 km on the Bay of Bengal (BoB). It shares common maritime boundaries with Bangladesh and India in the BoB and with India and Thailand in the Andaman Sea. The continental shelf covers an area of 230 000 sq km; the central and southern parts of the shelf are relatively wider than the others.

Myanmar's fisheries waters, which include a territorial sea and an Exclusive Economic Zone (EEZ), add up to 486 000 sq km. Its coastline can be divided into three coastal regions: the Rakhine coastal region, the Ayeyarwady or Gulf of Mottama region (the Delta zone) and the Tanintharyi coastal region.

The Rakhine coastal region stretches 740 km from the Naaf river to Mawdin point and covers an areas of 367 780 sq km.

The Ayeyarwady delta zone lies between Mawdin point and the Gulf of Mottama. The Ayeyarwady River, together with the Sittaung and Thanlwin rivers, enters the Andaman Sea through nine principal mouths.

This article is based on a presentation made by Mr Than Oo Wai at the Third International Conference on Fishing Industry Safety and Health, Mahabalipuram, Chennai, 1-4 February 2006.

The Tanintharyi coastal zone covers an area south of Mottama up to the mouth of the Pakchan River and includes the Myeik Archipelago and the Andaman Sea.

Marine living organisms depend for their sustainability on coastal mangrove and other forest resources, which serve as breeding and nursery grounds and as a source of detritus. Mangrove forests in the coastal region of Myanmar occupy some 382 00 ha. Of these, 274 795 ha are in the Ayeyarwady delta, 140 024 ha in the Taninthayi, and 64 752 ha in the Rakhine. Coral reefs are abundant in the islands of Myeik archipelago, also in the Rakhine coast.

Marine Capture Fisheries

Myanmar's marine capture fisheries can be analysed in terms of fishing effort in the in-shore and off-shore fisheries.

(a) In-shore fishery – This refers to fisheries carried out five nautical miles from the shore in Rakhine and 10 nautical miles from the shore in the Ayeyarwady and Tanintharyi coasts. The fishing is done by passive fishing gear such as gill nets, drift nets, long lines, and traps. without the use of boats.

(b) Off-shore fishery – This refers to the capture fishery being operated by active fishing gear, with fishing vessels exceeding 30 feet in overall length and 12 H P of engine power.

The off-shore fishing grounds extend from the outer area of the demarcated in-shore fishery areas to the end of the EEZ. The main fishing gear: bottom trawl, purse seine, surrounding net, drift net, long line.

In 2000-2001, the Department of Fisheries (DoF) permitted 1 936 national fishing vessels to operate in the offshore fishery. Of these, 967 used trawls, 77 purse seiners, 778 used drift nets, and 114 used longlines. In the same year, 32 foreign fishing vessels were permitted to operate in the offshore fishery.

Fisheries Waters: The fisheries waters of Myanmar include those within the EEZ, the territorial sea, offshore, inshore waters, all inland brackish waters and fresh waters – 1989 Law, Section 2 (1).

Fisheries resources: Myanmar has a 1 800 km-long long coastline. If

Total biomass and MSY in Myanmar marine waters (*Million metric tonnes)*

Areas	Biomass			MSY		
	Demersal	Pelagic	Total	Demersal	Pelagic	Total
Rakhine	0.194	0.175	0.369	0.160	0.087	0.247
Delta (Yangon, Ayeyarwady, Mon)	0.334	0.505	0.839	0.220	0.252	0.472
Thanitharyi	0.256	0.295	0.551	0.170	0.147	0.317
Total	**0.784**	**0.975**	**1.759**	**0.550**	**0.486**	**1.036**

the large number of estuaries and islands are included, the total length of coastline would be close to 3 000 km. The continental shelf (0-200 meter depth) covers an area of 225 000 sq km.

With a view to identifying new fishing grounds and existing stocks and the rationale of exploitation, a Marine Fisheries Resources Survey and Exploratory Fishing Project was implemented in 1979-83 with FAO assistance. Project activities consisted of acoustic/ experimental fishing surveys with R V Dr Fridtjof Nansan and trawl surveys with a national vessel.

The surveys revealed a biomass of about 1 million metric tonne of pelagic fish and 0.8 million tonne of demersal fish in Myanmar marine fishery waters. Of this biomass, about 0.5 million tonne of pelagic fish and 0.55 million tonne of demersal fish totaling 1.04 million metric tonnes was regarded as annual maximum sustainable yield. (MSY).

Fisheries management and management measures

The DoF in the Ministry of Livestock and Fisheries is responsible for management of fisheries, conservation of resources, extension services, research, and national statistics in fisheries and fishery-related infrastructure.

Though Myanmar's marine fisheries have been growing steadily, there is scope for expanding fishing capacity to tap unutilized resources. This is confirmed by catch reports, and by statistics of landings and surveys. Management measures include licensing; stipulating the exploitable species; listing environmentally-friendly fishing gear and methods; regulation of fishing effort through closed areas and closed seasons.

To ensure sound fisheries management, the Government has promulgated four fisheries laws. Salient features relating to management are:

- Reduction of fishing mortality.
- Preservation of areas, habitats and fishing grounds.
- Protection of specific stocks and species.
- Exploitation of resources on a rational and sustainable basis.
- Curbs on industrial activity harmful to the environment.
- Enforcement of fisheries laws and regulations.

To protect juvenile fish and shrimp, and avoid conflicts between artisanal fishermen and trawlers, trawling is banned within five miles from the shoreline at the Rakhine coast, 10 miles from the shoreline in the Ayeyarwady and Taninthayi coasts. Two months, July and August, constitute a closed season.

Artisanal fishermen account for a major portion of the marine catch. It is therefore essential to meet their needs by increasing their incomes, strengthening their livelihoods and improving their environment. The system of zoning in fishing is meant to protect local fisheries. The DoF gives first priority to local fishermen by permitting them to operate in all zones. Besides, waters between the baseline and the coast, as declared in the Territorial Sea and Maritime Zone Law, are reserved entirely for local fishermen.

The sharp increase in demand for quality marine products has fuelled the exploitation of shrimp and other demersal resources. This has led to resource use conflicts, sometimes violent, between trawlers and small-scale fishermen. To ensure more equitable exploitation and to support the sustainability of small-scale artisanal fisheries, the DoF has sought to limit the size and engine power of fishing boats in inshore areas. The DoF also determines the type of fishery, volume of business by fishing method, the species of fish that can be exploited, size of fish, fishing implements and fishing grounds. All fishing licences stipulate conditions on these points.

The DoF has laid down figures for minimum mesh size and the minimum catchable size for the main fish species. Examples: the mesh size on fish trawl cod ends should not be less than 2.5 inches and 2 inches for shrimp trawl cod ends. The minimum mesh size

Number of inshore fishing vessels in Myanmar (2001-2004)

State & Division	2001-2002			2002-2003			2003-2004		
	Power	Non-Power	Total	Power	Non-Power	Total	Power	Non-Power	Total
Tanintharyi	8 731	2 102	10 833	9 364	1 746	11 110	8 382	2 394	10 776
Ayeyarwady	350	2 414	2 764	977	3 010	3 987	641	1 882	2 523
Yangon	70	-	70	70	-	70	70	-	70
Mon	1 847	19	1 866	2 046	15	2 061	1 844	41	1 885
Rakhine	2 593	10 114	12 707	3 150	10 042	13 192	2 727	11 880	14 607
Total	13 591	14 649	28 240	15 607	14 813	30 420	13 664	16 197	29 861

Number of offshore fishing vessels in Myanmar (1999-2004)

State/ Division	2001-2002	2002-2003	2003-2004
Yangon	478	756	714
Rakhine	48	85	24
Ayeyarwady	574	786	737
Mon	227	267	246
Tanintharyi	402	415	400
Total	**1 999**	**2 309**	**2 121**

Marine Fisheries Production (2000 to 2004)

Unit: Thousand Metric Tonnes

Year	Marine Fisheries Production
2000-2001	949.67
2001-2002	1029.46
2002-2003	1053.72
2003-2004	1132.34

should be 8 inches for large- mesh drift nets and 3.5 inches for small-mesh drift nets.

Socio-Economics

Myanmar has some 2 646 710 active marine fishermen – both full-time and part-time. Some of them also engage in fish processing, marketing and mending of fishing gear. Fishing being a seasonal occupation lasting just a few months, fishermen also take up other occupations such as farming.

Most fishing vessels are owned not by fishermen but by petty businessmen, who appropriate a major share of the catch. The financial status of fishing communities is unknown. Baseline information is now being collected, to improve understanding of the traditional fisheries system.

Policy and Objectives

The principal objectives of the fisheries sector are:

- To promote all-round development in livestock and fisheries.
- To increase fish production for domestic consumption and share the surplus with neighboring countries.
- To encourage the expansion of marine and freshwater aquaculture.
- To improve the socio-economic status of the fisher community.

Ensuring sea safety

A fishing boat registration system has been introduced at specific checkpoints to provide information about fishing boats lost or damaged at sea. Government radio stations broadcast weather reports.

But the system for ensuring safety at sea is inadequate. Nearly all artisanal fishermen live in remote areas. They lack the means, the education and the awareness for safe practices. They do not use life jackets or life rafts – they depend on home-made contrivances such as plastic containers and drums. If they fall ill, they resort to home remedies and indigenous medicines; the organised medical system is expensive. They can't afford radio equipment on their boats. Further, radio telecommunication for small-scale fishing boats is not well developed in Myanmar. It is therefore up to the Myanmar Navy to help fishermen at sea in distress.

Small-scale fishermen urgently need training on the precautionary approach to minimize accidents at sea. They need to upgrade their knowledge of fishing technology. Coordination and cooperation on these issues are needed with international and regional organizations.

Fishing communities in tsunami-affected area

The main tsunami-affected area in Myanmar is the Pyinsalu sub-township, Laputta Township (Myaung Mya District, Ayeyarwaddy Division). In seven villages in the main area of Laputta Township, 25 people were killed, while 289 homes and 123 fishing boats were destroyed. At Kawthaung, Tanintharyi division in the southern part of Myanmar and in Rakhine State, in the western part of Myanmar, some people were killed; some homes and fishing boats were destroyed.

Preventive measures

The DoF believes that the following prevention measures are necessary against the tsunami.

1. Mangrove conservation should be promoted to set up natural barriers against the tsunami.
2. Buildings should be constructed off the shoaling space. Tsunami-resistant features should be incorporated in them.
3. People living on the sea shore areas should be educated about the tsunami.
4. Transport facilities should be available to quickly move people and materials to safe areas.
5. Food, water and medicines should be provided to victims of the tsunami. Other relief works should be undertaken.
6. A tsunami early warning system should be set up. A regimen for emergency evacuation to safe areas should be rehearsed in every region.

New Initiatives on Sea Safety to Help Small-scale Fisherfolk Communities

There's good news for small-scale fisherfolk communities – in the Bay of Bengal region and elsewhere.

A safety-at-sea project will come up in Chennai from May 2007. It will be housed in the office of the BOBP-IGO and will cover small-scale fisherfolk communities in Bangladesh, India, Sri Lanka and Maldives. A similar project will come up in West Africa.

Both projects will be part of a US $10 million five-year FAO global programme on Safety at Sea for Small-scale Fisheries in Developing Countries, headquartered in Rome, with funds from Sweden.

The global programme aims at better and safer livelihoods for small-scale fishing communities globally. It will analyse information, raise awareness, adopt strategies, and formulate project proposals on safety at sea.

Why such a project?

Fishing at sea is perhaps the most dangerous occupation in the world. Loss of life at sea has devastating consequences on dependents. Widows have low social standing. With no welfare system to help them, they and their dependents face destitution.

In South Asia, and in developing countries in general, safety standards for small vessels lag far behind those for larger vessels and industrial fisheries. Accident reporting is unsatisfactory. The IMO has recommended that statistical information on casualties, including fishing vessels and fishermen, should be collected and analysed annually. But few developing countries are able to supply this type of data.

Capacities and capabilities for ensuring safety at sea in the small-scale fisheries sector are lacking in many developing countries. So is knowledge and awareness among government officials, fishers and communities on safety at sea procedures and equipment. Networks and institutional arrangements for dealing with safety-at-sea issues are inadequate.

The new project will seek to address these problems in co-operation with a Global Coordination Unit of the FAO Global Programme.

Recommendations from Chennai Declaration

In South Asia, the project will build on the work of the BOBP and the BOBP-IGO – particularly on recommendations from the **Chennai Declaration** and the **IFISH 3 Conference**. It will

- Provide and analyse data to identify the causes of accidents.
- Educate and train trainers, extensionists, fishermen and inspectors.
- Elaborate on improved fisheries management measures and safety regulations and enforcement of these regulations.
- Apply FAO draft guidelines for construction and repair of small FRP fishing vessels.
- Repair and upgrade vessels constructed for tsunami rehabilitation that are of poor quality, using FAO draft guidelines.

The project will liaise closely with projects concerned with tsunami rehabilitation and reconstruction.

The BOBP/ FAO Regional Workshop on Sea Safety for Artisanal and Small-scale Fishermen was held in Chennai, from 8th to 12th October 2001. It was attended by government officials from seven countries, representatives of Fisheries and Maritime Administrations, the Coast Guard/ Navy and representatives of fishermen's associations.

The Chennai Declaration, adopted at the end of the workshop, suggested a Regional Program on Sea Safety for Artisanal and Small-Scale Fishermen, which could formulate a holistic long-term approach to improve safety at sea for small-scale fishermen. Necessary measures would include analysis of accident data; education and training of trainers, extension workers, fishermen and inspectors; better fisheries management and enforcement; stronger collaboration between fishermen, fishermen's organisations and governments.

IFISH 3 and after

On the basis of this suggestion, BOBP-IGO designed a programme for promoting safety at sea. As part of this programme, the third IFISH (International Fishing Industry Safety and Health Conference) was convened on 1-4 February 2006 by BOBP-IGO, FAO and the National Institute for Occupational Safety Health (NIOSH), USA in Chennai, one of its themes being "Enhancing the Safety of Fishermen in Small-scale Fisheries".

IFISH-3 placed special emphasis on issues confronting small-scale fishermen. It gave participants from developing countries a unique opportunity to interact with experts on fishing industry safety and health.

The workshop made a number of recommendations on safety at sea for small fishing vessels. They related particularly to collection and analysis of data from sea accidents and rules and regulations for safety and communication equipment and vessel construction.

The IFISH 3 conference included a special workshop to review rehabilitation efforts following the 26 December 2004 tsunami. The workshop pointed out that many small fishing vessels constructed with the assistance of NGOs after the tsunami were of low quality, often dangerous for fishing operations, and exposed the fishermen to high risks.

Expected Outputs of the South Asia Project

- An improved system in place for reporting and analyzing accidents involving small scale fishers.
- Rules and regulations for safety and communication equipment and vessel construction developed and introduced.
- Increased collaboration between fishermen, fishers' organisations and government.

NIOSH to assist in occupational safety and health of coastal communities in India

NIOSH (National Institute for Occupational Safety and Health), USA, is to provide technical and other assistance to the BOBP-IGO for two pilot projects – strengthening sea safety, and improving the conditions of salt workers. This was revealed in April 2007 in Chennai by Dr George Conway, Chief of the Alaska Field Station and Director, Agriculture, Forestry and Fishery Program, NIOSH.

Dr Conway and Dr Y S Yadava met fishermen and visited boatyards in Tuticorin and Mahabalipuram. They also visited saltpans and met salt workers in Tuticorin and in the Sambar salt works of Rajasthan.

Strengthening sea safety: "Data collection and analysis are essential to strengthen sea safety," Dr Conway said. Data on accidents and on safety practices in small-scale fisheries may be obtained from several sources - insurance agencies, Coast Guard records, fishermen's associations, Focus group discussions. NIOSH would provide technical assistance with data collection methods and statistical analysis. This technical activity will be conducted in collaboration with the Fishing Technology Service (FIIT) of the FAO's Fisheries and Aquaculture Department.

Post-tsunami relief work in India had led to a deluge of boats, many of them in fibreglass, a material some boatbuilders are not familiar with. Many of the boats were deficient in quality and failed to meet construction standards, and this affected the safety of fishermen. "We will look at what can be done to improve safety standards," said Dr Conway.

In response to a question, Dr Conway said that the SIDA-funded FAO project on sea safety is much larger in scope and size than NIOSH's assistance. "Our inputs will be supplementary and complementary, and relatively modest."

Improving the conditions of salt workers: The BOBP-IGO has highlighted the plight of salt workers in India

through a one-year study completed recently. (See "The saga of India's salt workers" in the March 2006 BBN). The health and safety of the salt workers are crucial problem areas. Says Dr Conway, "The salt industry in India has no parallel. India is by far the biggest producer of salt by manual and evaporative means of production. The salt industry in the U S and in Europe, by comparison, is highly mechanised."

"We have received a request for assistance to salt workers from the Salt Commissioner through the BOBP-IGO. In response, we are assisting the BOBP-IGO in preparing a plan for the health and safety of salt workers. This is a tremendous opportunity to help a rather large work force working under often quite basic conditions.

"Our goal will be to work with BOBP-IGO, the Salt Commissioner, the salt industry and its workers, to make tangible improvements in the condition of salt workers," says Dr Conway.

Digitising Photographs — the BOBP-IGO Experience

Since its inception, the BOBP has recognised the vibrant and compelling role of photography in not merely documenting but promoting and catalyzing development. Photo exhibitions in Chennai and Colombo (1980 and 1981) were the first major photo activities of the BOBP. Just about all of the BOBP's professional staff were prolific camera-persons - though very often, enthusiasm for photography far surpassed talent!

Over the years, BOBP and later its successor the BOBP-IGO, built up a formidable collection of several thousand photographs - both slides and color negatives. These vividly capture both small-scale fisherfolk communities and the work of the BOBP in Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand. The collection was painstakingly catalogued and indexed with the help of a staff documentalist. More than a dozen slide shows were organised. These were prime attractions at the Advisory Committee meetings of the BOBP and the Governing Council Meetings of the BOBP-IGO.

But prints and negatives deteriorate with time. The BOBP-IGO decided to digitize the photo collection to preserve it. About 1 500 negative folders containing some 22 200 photographs have so far been scanned and stored in electronic format. An equal number of photographs still remain to be digitized. Our photo wealth - earlier visible through slides and prints and negatives taking up several shelves in the library - is now invisible, compressed into DVDs. Once completed, the BOBP-IGO's digital photo library could perhaps be one of the richest photographic resources on small-scale fisheries in the world.

Technologies come and go, but photography continues to drive impact in BOBP-IGO's information and documentation effort.

Bay of Bengal News is a quarterly publication of the Bay of Bengal Programme Inter-Governmental Organisation(BOBP-IGO).The BOBP-IGO is a regional fisheries body, which presently covers four countries around the Bay of Bengal – Bangladesh, India, Maldives and Sri Lanka. The BOBP-IGO plays a catalytic and consultative role in developing coastal fisheries management in the Bay of Bengal to help improve the conditions of small-scale fisherfolk in the member-countries.

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