Fishing harbour development in India

(Deepu A. V., Afsal V. V. and Joice V. Thomas, NETFISH, MPEDA)

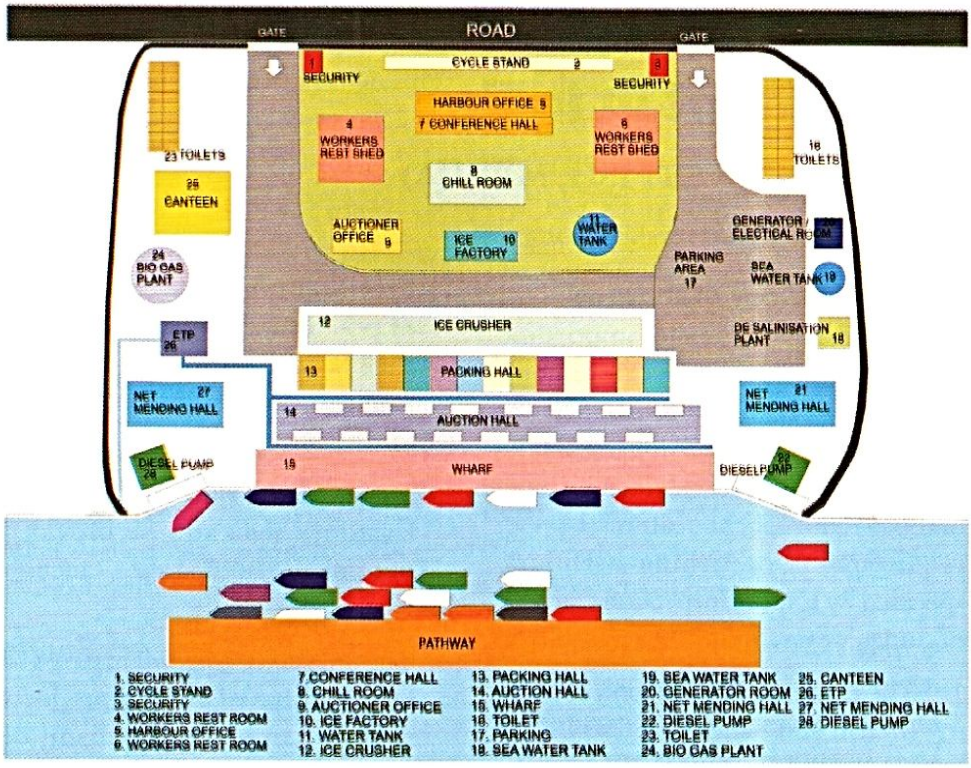
Fishing harbours in India are gaining much attention now-a-days considering their important position in the seafood quality chain. The conditions prevailing in a fishing harbour may have consequences not only on human and environmental health but also on fish price and exports. Since the fishing harbour is an area whereby the sea caught materials pass through to the consumers, proper infrastructure development and strict implementation of code of conduct of responsible fishing as well as good handling practices are very important. Although bulk of fish landed in fishing harbours in India are destined for the local markets who have consumer rights advocacy on quality, it is crucial to improve the quality of the catch landed. The fishing industry as a whole can also be affected by the economic loss due to rejection of seafood consignments based on quality and other issues by overseas buyers. While having the right infrastructure at the right place, management and maintenance of fishing harbours are crucial considerations as well. Considering the importance of fisheries sector and fishing harbours as the threshold of the huge amount of fish products exported from India, concerted efforts from Government, stake holder groups and extension agencies are required to upgrade our fishing harbours to international standards. This article gives an overview of a model fishing harbour and its effective management.

Fishing harbour standards

Standards of major importing countries (mainly European Union) and Export Inspection Council of India have to be considered while constructing or modernizing a fishing harbour. The salient features of the requirements of fishing harbours specified by Export Inspection Council of India are as follows (Anon, 2007):

1. The Landing sites /auction centres of fish and fishery products shall be located at a site ideal for the purpose and shall be free from undesirable smoke, dust, environmental pollutants and stagnant water.
2. The design and lay out of the landing sites /auction centres shall be such as to preclude contamination of fish and fishery products handled.
3. The landing sites /auction centres shall be properly covered to protect the fishery products from environmental hazards such as sun light, rain, wind blown dust etc.
4. The floor shall have sufficient slope for proper drainage and to avoid stagnation of water.
5. Raised smooth platforms, which can be easily cleaned and disinfected, may be preferably provided in the landing sites/ auction centres for the display of fishery products.
6. Proper drainage system shall be provided to facilitate easy removal of wastewater.
7. Provision of adequate quantities of potable water or clean seawater shall be made in the landing sites /auction centres for cleaning and sanitation.
8. Appropriate number of flush lavatories shall also be provided out side the landing sites /auction centres.
9. The utensils & equipments used to handle fish and fishery products shall be smooth and made of corrosion free material, which is easy to clean and disinfect and kept in a good state of repair and cleanliness.
10. During loading & unloading of fishery products, there must not using any equipment and practices that cause unnecessary damage to the edible parts of the fishery products.
11. Sign boards prohibiting smoking, spitting, eating and drinking shall be exhibited in prominent positions
12. The un-loading and loading activities shall be done rapidly to avoid the spoilage of fishery products. Care shall be taken to avoid contamination of fishery products during loading and un-loading.
13. Fishery products shall be properly iced to avoid temperature abuse. The ice used shall be of good quality made up of potable water with its source.
14. Vehicles emitting exhaust fumes

A MODEL FISHING HARBOUR



shall not be permitted inside the landing sites /auction centres/ fishing harbour.

15. Suitable measures shall be taken to avoid entry of animals, birds and insects inside the landing sites / auction centres.

A model fishing harbour

The site selection for construction of the fishing harbour is an important aspect and harbour should be constructed in such a way that water will not enter the harbour premises even at the highest high tide times and boats can be moored at any time without any effect of high and low tide levels.

Wave action shall be controlled by constructing break waters. Water movement in the harbour area is also very important; stagnation of water in the harbour and its premises may create unhealthy envioriement. Hence no construction is allowed in harbours blocking the smooth flow of water

A model fishing harbour shall encompass the following infrastructure

- A compound wall with gate to prevent entry of stray animals and unrestricted entry of people.
- Broad and separate parking area for different vehicles like two wheelers, four wheelers, insulated vans etc.
- A neatly constructed drainage channel towards land side of the auction hall to collect the waste and connected with Effluent Treatment Plant (ETP).
- ETP for waste water treatment
- Auction hall with raised platforms and fly proof netting
- A neatly constructed wharf
- Separate net mending hall
- Rest room for workers
- Bathroom & Toilet facility
- Availability of electricity, fresh water and proper lighting at harbours
- Availability of good quality crushed ice
- Permanent waste bins for depositing and collecting non degradable wastes

Auction hall should have proper height to make the fish handling easy. Raised platforms should be constructed in due consultation with stakeholder groups. Proper lighting should be provided in the auction hall as well as in the premises of the fishing harbour. The floor slope of the auction hall should always always be towards the drainage channels and not towards the open water. Flooring material should be non-slippery and strong enough to withstand rough usage. Wharf area should be big enough to enable easy handling of fish. Slope of the wharf area should not be towards open water but should be towards land. Wharf area should be properly concreted. Net mending hall and rest rooms should be provided for workers in the harbour.

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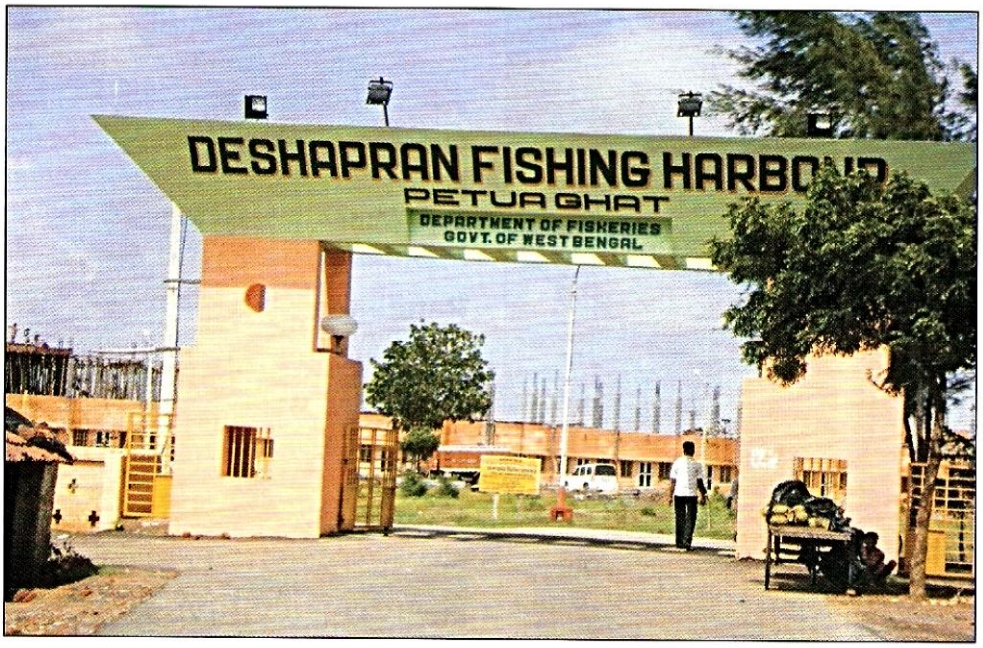
Fishing harbour development in India

In India, many harbours are on the rail to development. Fishing harbours like Thoppumpady, Sakthikulangara, Puthiyappa, Beypore and Ponnai fishing habrorus in Kerala,



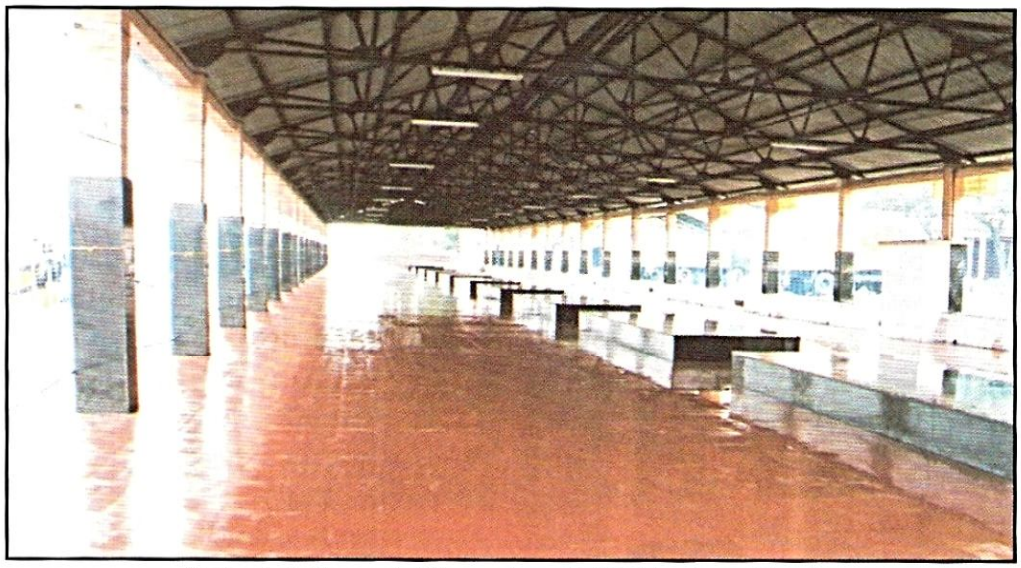
Deshapran fishing harbour under construction in West Bengal

Kakinada fishing harbour, Andhra Pradesh

Dhamra and Paradeep in Odisha, Muttam in Tamil Nadu, Kakinada in Andhra Pradesh, Petuaghat in West Bengal, Mangrol and Porbanthar in Gujarat, etc. are being upgraded with the financial assistance of various agencies in India and abroad. National Fisheries Development Board (NFDB) under Ministry of Agriculture is the major agency that provides funds for the construction and upgradation of fishing harbours in India with wide schemes for infrastructure development of harbours. Besides, the state fisheries department of the various states also takes steps to create new fishing harbours and upgrade the existing ones. Mangrol and Dhamra fishing harbours were upgraded with the FAO assistance. It is noteworthy to mention that some private fishing harbors are also coming up in certain states considering the vast importance of fishing harbors in the hygienic food supply.

Fishing harbour management

Effective management of fishing harbours is also as much important as that of infrastructure development. In India, fishing harbours are mainly controlled and operated by the concerned State Fisheries Department and some of them are under the control of Port Departments. But it is noticed that government bodies alone cannot run the fishing habrours effectively without the participation of the stakeholder groups. A co-management or participatory approach is the best way with the active involvement of the people who are working inside the harbours. Munambum fishing harbour in Kerala state has proved a successful model for managing fishing harbours by creating a co -management society with the active participation of government and stakeholders. Munambam fishing harbour is the property of Department of Fisheries, Govt. of Kerala. The day-to-day activities of the harbour was controlled by the Department of Fisheries whereas, the developmental works including construction, maintenance, etc. was carried out under the supervision of Harbour Engineering Division of Govt. of Kerala. For the better management of the fishing harbour, a management society was formed for this harbour with the active support of the Marine Products Export Development Authority (MPEDA) and Department of Fisheries, Govt. of Kerala. Now the day- to-day activities of the fishing harbour are controlled by the society. The revenue collected from the fishing harbour by way of toll charges, rent etc., is going to the society account, which is being utilised for infrastructure development and other activities in the harbour. The control, administration and management of the affairs of the society are under the control of the Governing body which



Raised platforms in Munambam fishing harbour, Kerala

comprises 14 members including the nominees from Government bodies like State fisheries, Port, MPEDA, NETFISH, MATSYAFED and stakeholder groups such as boat owners association, fishermen and workers union etc. The society directly plan, implement and manage the operations in Munambam fishing harbour with the help of the above two management committees. It has been empowered to make various revenue collections such as entry and parking charges of vehicles, landing/handling charges of fishing crafts, wharfage, and registration and licensing of auctioneers, rent of shopping complex and canteen etc. A code of conduct has been successfully implemented and observed in this harbour by the management society. Many officals from various states are trying to emulate the Munambam model to the fishing harbours of their state. By all means it would be the best method to operate the fishing harbours in a most hygienic manner.

Conclusion

Fishing harbour development in India is taking place in a swift manner recognising its important role in production of high quality seafo from the country. Besi infrastructure development, effec management system is found to be key aspect for the hygienic operat and smooth management of fish harbours.

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Munambam fishing harbour

CO-MANAGEMENT IN FISHERIES -A BETTER TOOL FOR RESPONSIBLE FISHING.

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Introduction

Co-management is a well known concept in agriculture all over the world. But its establishment in fisheries has not been yet materialised in full swing due to various reasons. In Bangladesh Nishorgo Support Project (NSP) formed to protect and conserve the forests and biodiversity of the country's Protected Areas (PAs) by building partnerships between the Forest Department (FD) and main stakeholders based on mutual trust and shared roles and responsibilities for biodiversity conservation (Anon,2009). Djoudj Joint-Management Plan, in the Djoudj national bird sanctuary and its outskirts in Senegal has been established for the conservation of wet lands. Co-management has been successfully implemented in forestry in the central Africa (Nguinguiri, 2004) while in west Africa it has been implemented well in advance (Sverdrup-Jensen and Rackjaer Nielsen,1998). The above mentioned ones are the perfect examples for the successful implementation and running of Co-management societies and a similar kind in fisheries is yet to come. Though Co-management is a relatively new concept in marine resource management in India, the attempts to establish the Co-management societies gives conspicuous results.

Co-management in fisheries gains much attention in the wake of failure of various government –managed models of fisheries management. Over the last two decades, it has become ostensibly clear that management initiatives will not be effective if the resource users (communities and fishers) are not fully involved in the management process (Brown et al., 2005). Therefore much attention is being given towards Co-management where both government and communities/resource users are sharing decision-making and planning in various degrees.

Co-management societies have found to be the best tool for conservation of fish resources in many Asia Pacific countries. Collaborative management-or Co-management - is defined as a situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources. It can simply be defined as a partnership arrangement in which the fishermen and government share the responsibility and authority for the management of the fishery (Figure 1). Co –Management essentially means people and government collaborating to develop and run a management system. Through consultations and negotiations, the partners develop a formal agreement on their respective roles, responsibilities and rights in management (Pomeroy and Berkes,1997). The failure of many fisheries has paved the way for many musings and ponderings which recognized the presence of fishermen as active member in the fisheries management team for management decisions to be made especially for conservation of fishery resources and aquatic ecosystems. Co-management does not mean total control for management being given to fishermen. It is generally acknowledged that not all responsibility and authority for management should be given to fishermen. The amount of responsibility and/or authority that the government and fishermen have will differ, and depend upon location specific conditions. Effective Co–managements requires good linkages between participating stakeholders.

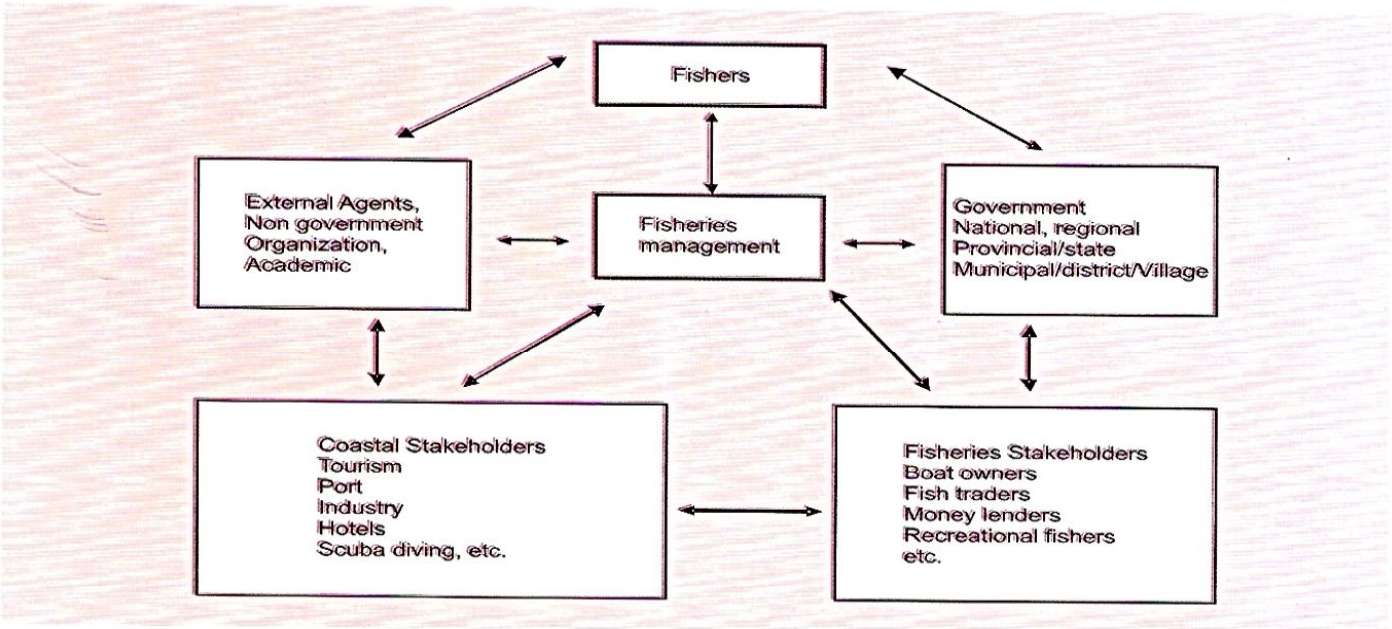

Figure 1. Fisheries management is a partnership (Pomeroy and Berkes, 1997)

Co-management is a Process

Co-management should be viewed not as a panacea to solve all problems of fisheries management, but rather as a process of resource management that will adjust over time in response to changes in trust, credibility, legitimacy, and success of the partners and the co-management arrangements (Anon 2008). Presently no simple management solution can be found suitable for every fishery on account of different ecological, technological, economic and social conditions and needs within the fisheries sector.

Co-management helps to overcome the distrust, fragmentation, and inefficiency of many existing fisheries management arrangements by providing a forum for action by the partners on regulation, negotiation, conflict management, sharing of information and dialogue and communication (Anon 2008). Co-management is adaptive; that is, through a learning process, information is shared among partners, leading to continuous modifications and improvements in management (Anon 2008). The success of co-management form is purely depending on the active involvement of all partners in it.

Nature and advantage of Co- management system

1. It is a transparent, autonomous and smooth manage ment process
2. More economical that requires less to be spent on administration and enforcement
3. Provide an effective platform for sharing of knowledge/information among partners
4. Most appropriate localized solutions to local problems are possible through management strategies and regulatory measures adopted in Co management.
5. Fishermen's indigenous knowledge and expertise are highly used to provide information on the resource base and to complement scientific information for management.
6. Create a greater sense of ownership over the resource which can provide a powerful incentive to conserve and protect the resources rather than to over exploit
7. True and voluntary involvement in the formulation and implementation of management and regulatory measures resulting in a higher degree of acceptability and compliance
8. Effective and swift implementation of management decisions is possible
9. Increased communication and understanding among the partners which can minimize conflict.
10. Provide an opportunity to improve stewardship, management decision-making, and communication between government and fishermen.

Fishermen Management Council Alapad (FIMACA)

A co-management society named "Fishermen Management Council Alapad (FIMACA)" has been formed in Alapad Panchayat , in Alapuzha district, Kerala can be shown as the perfect example of the Co management societies which contribute much towards the protection and conservation of fishery wealth. This society has been formed by the concerted attempt of The South Indian Federation for Fishermen Societies (SIFFS) Trivandurm . There are fifteen wards in this Panchayat, all belong to a single community with the traditional institution called

"Karayogam functioning in all wards. 78 "Thanguvallams" using ring seine nets with FRP boats which function as "carrier boats" for ring seine fishing are being operated from this panchayat. There are 27 members in the governing body of this society with due representation of the artisanal fishery, the ring seine sector, mechanised sector, scientific community, policy makers, panchayat raj institutions, trade unionists, and researchers, etc. The president of the Alappad Panchayat is acting as the chairman of this society while the opposition leader of the panchayat is functioning as the secretary. This society has taken certain important decisions such as

1. The fleet size of the ring seine boats should not be allowed to grow further.- Presently there are 78 "Thanguvallams" operate from this Panchayat and no more vessels would be introduced by them rather replacement of any of the vessels if necessary.
2. No night fishing- They agreed to avoid night fishing as a step to curb the over fishing.
3. Implemented 22 mm mesh in gill nets
4. One vessel is allowed to have only one fishing trip per day to reduce the fishing pressure. They do not attempt for a second fishing trip in a day after releasing their catch at harbours.
5. A vessel can use only one carrier boat reports says that this society is functioning smoothly till date with the active cooperation of fishermen belonged of this Panchayat which brought many accolades to this society. Recognizing the success of this co- management society nearby Panchayats have also initiated to implement the similar kind of society in their regions

Munambam Fishing Harbour Management Society

Munambam Fishing Harbour Management Society is formed in year 2000 with a view to looking after the day to day operation of Munambam fishing harbour in Ernakulam district, Kerala. This society is formed under the chairmanship of district collector which consist of 15 members in the government body including the Joint Director Fisheries , Ernakulam as the Secretary and other members from fishermen societies/unions, Boat owners association, government bodies like MPEDA, etc. A sanitation inspector has been appointed by the society to ensure the hygienic operation in this harbour. Being the members of the society, the fishermen and other workers in this harbours plays the major role in the strict implementation and observation of cod of conduct framed for the hygienic operation at his harbour. By including as the members in the management society, fishermen and other stake holders feel their responsibility and consider this harbour as their own property which results in the smooth running of this harbour. The discipline at this harbour is well spread in other parts of the state and these authors themselves heard the comments from the fishermen of northern Kerala about their experience when they visited this harbour. With the revenue collected from this harbour in terms of toll for the entry of vehicles, berthing charge of vessels etc, the society carryout the maintenance and other works at this harbour. Entrusting the society, many of the engineering works could be carried out in swift manner avoiding the usual delay in fulfilling the formalities in government level when the work is being done by the harbour engineering division. Nevertheless, the major advantage received in forming this society is the strict discipline and observance of cod of conduct and hygienic operation procedures being practiced in this harbour making this as the first model harbour in India. Surely, this model has to be emulated to other fishing harbours of the country for ensuring better operation practices in them.

Role of Agencies involved in the Process

Among the various agencies involved in the formation of co –management societies in fisheries sector, Government has to take the major role by providing the necessary legal and policy changes required for the formation of above societies. Government also have to give sufficient support for the formation of these societies by defining the role and function of the various agencies involved in it and empower the agencies by devolving the powers and authority to them. Non government organisation (NGO's)and civil society organisations can take the leadership in running these societies formed in the fishing villages. Scientific organisations, departments and other government agencies can look after the capacity building among the stake holders for the smooth running of the societies. Fisheries departments, NFDB and MPEDA etc can support financially to provide necessary infrastructure developments in the fishing villages such as upgrading the exiting landing centres, harbours etc, subsidy for ice plant, etc .Fishers are the major players in these societies who have to ensure the unerring participation in the process by observance of rules an regulations and implementation of plans as well as sustainable exploitation of resources and stewardship of resources , etc.

Conclusion

Co management is considered to be best tool for the better fishery resource management by dint of active participation of fishermen community, government and other stake holder groups in the joint fisheries management . As follows in many countries, India should also take essential steps to implement co management council in the fishing villages to protect our rich fishery resources.

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FOCUS AREAS

Ornamental Fish Breeding - A High Potential Business.

Lovers of mythology believe that the world's first aquarium was made in India. But India lays claim to less than 1% of the global trade in ornamental fish worth around $ 20 billion. Indian policy-makers and fish export organisations, led by the MPEDA want to convert this growing, job-oriented, small investment and export-oriented business into a livelihood security enterprise through a 'revolution'. The plan is to cash in on India's rich diversity of ornamental fish and varied agro-climatic conditions suitable for their captive breeding & building these into a sustainable export business. Ornamental fish-keeping is the second biggest hobby in the world after photography. The market for it is vast in India and in West Asia, Europe, US and Japan.

MPEDA's effort to fast-track exports by setting up a network of 7,200 ornamental fish breeding farms, including both native and imported stocks, across India is to gain momentum. So far it has been able to set up about 300 units to breed 70 million fish. Exports in 2008-09 have been only worth $ 1.2 million. Prof. K. V. Thomas, the Union Minister of State for Agriculture, whose ministry also convers fisheries, said in Chennai recently that exports of ornamental fish could reach $ 50 million by 2012 and $ 100 million by 2016 – with a slew of development plans initiated by MPEDA, the National Fisheries Development Board (NFDB), private entrepreneurs and FDI.

The first significant FDI in the ornamental fish sector has been by Jodi Fisheries, a joint venture between Joseph Itzkovich, an Israeli consultant who knows the ornamental fish potential in India, and Didier Gendre, a French investor. Itzkovich says ornamental fish breeding and exports, though an immensely high potential business, need patience and perseverance. It cannot be fast-tracked or revolutionised. Jodi aims to make Chennai an export hub of ornamental fish varieties bred in units all over India.

Liberal bank finance and other infrastructure support for breeders and exporters need to be ensured.

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By-catch and Discards in fishing- A stumbling block to sustainable fishing

Joice V.Thomas, Afsal V.V. and Deepu A.V - (NETFISH - MPEDA)

Introduction

Humans have been known to harvest fish for at least 90,000 years using technologies that have developed from simple harpoons through to huge factory trawlers. Over the last few decades, the controversial fishing issues-the waste associated with the incidental capture, mortality and discarding of unwanted by-catches have increased alarmingly. In response to these by-catch and discards issues, wide cry has been echoed in the world fishing sector to adopt selective fishing techniques to save our rich water resources from the perdition. Discards are found to be more in trawl fishing than others. Trawling in general and bottom trawling in particular are the mainstreams of human interventions involved in the exploitation of seafood resources all over the world. Modern bottom trawl net is equipped with heavy tickler chains and big steel outer boards facilitated to collect as much benthic organisms by digging and thus leading the disturbed organisms being

hauled into the net. After sorting the target species, those with the low economic value which do not fetch any price in the market such as non edible crabs, stomatopods, echinoderms and gastropods along with juveniles and eggs of commercially important fin and shellfishes are thrown back to sea as "discards"

This post harvest loss in capture fisheries and habitat alteration and diversity degradation as a consequence of excessive bottom trawling is a matter of grave concern to most of the developed and developing countries and therefore, a lot of effort has been made to recover and utilize the by-catch.

Global quantity of by-catch and discards

The global commercial fishery has been estimated to generate 27 million tonnes per year of discards and by-catch organisms that are returned to the sea for various reasons, of which the highest rates of discarding have been attributed to shrimp/ prawn trawl fisheries with an estimate of 9.5 million tonnes per year (Alverson et al., 1994). FAO later estimated it as 6.8 million tonnes with respect to total recorded landings of 78.4 million tonnes (FAO, 2005). Shrimp and demersal finfish trawl fisheries account for over 50 percent of total estimated discards.

By-catch landing in Kerala

Definition of by-catch and discards:

Discards or discarded catch is defined as the portion of the total organic material of animal origin in the catch, which is thrown away, or dumped at sea for whatever reason. It does not include plant materials and post harvest waste such as offal (Joice, 2004). The discards may be dead or alive. Discards are not a subset of by-catch since the target species is often discarded whereas the by-catch is the total catch of non-target animals. In Australia's by-catch policy, the term "by-catch" refers to all non-targeted catch including by-product, discards and the biomass that does not reach the deck of the fishing vessel but is affected by interaction with the fishing gear (FAO,2005). By-catch is sometimes defined as "discarded catch plus incidental catch" where incidental catch is considered to be retained non-target species.

Tropical shrimp trawl fisheries have recorded the highest discard rate which alone account for over 27 percent of total estimated discards. Small-scale fisheries generally have lower discard rates than industrial fisheries. Purse-seine, handline, jig, trap and pot fisheries have low discard rates. In geographical terms, the highest discards are in the Northeast Atlantic and Northwest Pacific, which jointly account for 40 percent of discards (FAO, 2005).

Discards in Indian waters:

The quantification of discards in Indian waters has not been estimated so far. However, discards quantified from the Kerala coast during the years 2000 - 01 and 2001 - 02 were to the tune of 2.62 and 2.25 lakh tonnes respectively (Kurup et al., 2003) in the trawl fishing. In Kerala, stake nets, traditional bag nets operated widely in the back waters produces huge quantities of discards mainly the juveniles of Penaeid prawns.

Effect of discards and discard mitigation programmes

The discards may not be important from the economic point of view but their removal from the ecosystem may bring about both direct and indirect effects. The direct effects include damages sustained by organisms coming in contact with the trawl gear and mortality of a significant percentage of discards hauled up (Fonds, 1994). Among the indirect effects, which are not looked in to quite often, exposure to predation (Bryliński et al. 1994), reduction in benthic abundance, diversity and habitat complexity (Pope and Knights, 1982) are most notable. Globally 232 non-targeted species are found killed and discarded in varying proportions while trawling.

Throwing back of discards to sea

A number of countries have instituted fisheries policies and management regimes based on the principle of "no discards". A "no-discard" policy implies a paradigm shift in approaches to fisheries management. It moves the focus of management measures from landings to catches and from fish production to fish mortality. There has been a reduction in by-catch and in discards in many fisheries, particularly those in developed countries (FAO, 2005) which are mainly due to the increasing utilization of by-catch and a consequent reduction in discards in many fisheries, particularly in developing countries. A decrease in effort and change of target species in some major trawl fisheries has also resulted in a reduction of discards. Changes in fisheries regulatory regimes, requiring more selective fishing and prohibiting or curtailing discards, have also contributed to discard reduction (FAO, 2005).

FAO also reports the reduction of by-catch in many countries due to economic factors such as the cost of sorting catches, crew shortage, efforts to comply with ecolabelling requirements and the introduction of quotas on by-catch species. Improvement in fisheris regulations and improved enforcement of regulations has also played a pivotal role in reducing by-catch quantities. The above matters show how extent the efforts are being taken up in many countries to reduce by-catch in fishing. Unfortunately, a similar attempt has not been witnessed so far in India. Though many states in India have implemented the regulatory measures in fisheries towards protecting the rich fishery wealth from depletion, noticeable reduction in loss of fishery wealth as by-catch and discards have not been recorded. Strict implementation of mesh size regulation in bottom trawling could not be materialised so far. Besides, the ever increasing fishing pressure due to the introduction of more and more big sized fishing units equipped with powerful diesel engines and wide usage of small meshed fishing nets have also increased the quantity of by-catch and discards in trawl fishing in India. A national effort has to be initiated to reduce by-catch and discards by Central as well state governments in India. Non government organisations (NGOs) and media should also contribute with the public awareness programmes to reduce the wastage in fisheries.

How to reduce by-catch and discards

Government and non government bodies, research organisations and policy makers in India should come forward in formulating strategies to reduce by-catch and discards in fishing. Steps should be taken to conserve the fishery resources and also to reduce the by-catch and discards in the fishing sector as given below.

1. Use of selective fishing gears like gillnet, long line to reduce catching unwanted fishes.
2. Implement Turtle Excluder Device(TED), By-catch Reduction Device (BRD) and square mesh panels in commercial trawl fishing
3. Ban bottom trawling during breeding seasons to prevent the destruction of eggs and juveniles
4. Strictly implement the mesh size regulation in fishing sector especially in bottom trawling
5. Modify the design and operation of trawl gears to make bottom trawling more eco friendly
6. Effective use of by-catch for the preparation of protein rich fishery products (value added products)
7. Regulate the number of fishing vessels as per the area available for fishing and fisheries potential
8. The total number of hours trawling should be limited and the distribution of the fleet throughout the different zones controlled by legislation and policed through a satellite vessel monitoring system
9. Establish "no trawling zones" in selective region of continental shelf and slope ecosystems as a measure to recoup the fishery wealth.
10. Marine Protection Areas (MPAs) should be designed to protect habitats and prevent population collapse
11. Implement the fishing holidays to protect the juveniles and sub adults
12. Minimum Landing Size (MLS) system should be implemented to curb landings of juveniles and young ones. This will be most useful as a conservation measure if individuals below the minimum landing size can be measured in situ or returned to the sea alive.
13. Educate the boat owners, workers, middlemen, and those who are involved in the fishing sector about the adverse impact of fishing especially in trawl fishing and necessity of protecting the discard fraction in view of their role in sustenance of marine capture fisheries

By-catch reduction in foreign countries

Several major fisheries and numerous smaller fisheries, which previously made significant contributions to the global volume of discards, have introduced more selective fishing gears, reduced fishing effort or applied other measures that have reduced unwanted by-catch. Examples of major fisheries in which by-catch has been significantly reduced include:

- United States Northwest Pacific ground-fish fisheries, in particular those under the management of the North Pacific Fisheries Management Council (NPFMC). A variety of measures are used including area and seasonal closures, by-catch quotas and total allowable quotas (TACs), and economic measures.
- United States Gulf of Mexico and Atlantic shrimp trawl fisheries where By-catch Reduction Devices and Turtle Excluder Devices (TEDs) are obligatory in certain areas;
- Numerous Canadian and Northwest Atlantic Fisheries Organization (NAFO) fisheries as a result of a range of management measures, changes in target species and reduced trawl effort;
- EU Nephrops fisheries in which square mesh panels are obligatory;
- EU flatfish fisheries where the minimum landing size (MLS) has been decreased for some species; and
- Fisheries in countries with "no-discard" policies (e.g. Norway and Iceland) (FAO 2005).

NETFISH campaign on discards and by-catch:

Network for Fish Quality Management and Sustainable Fishing (NETFISH), as the name indicate, stands for promoting sustainable fishery of the country. Identifying by-catch and discards as one of the root causes leading to the unsustainabilty of fishery resources; NETFISH has included it among the subjects for awareness programmes dealing with conservation and sustainable fishing. A wide range of programmes such as awareness classes, street plays, processions, rallies, etc are being conducted for fishermen and other stakeholders so as to empower them in practicing responsible fishing. In the year 2009-10 alone NETFISH could successfully arrange 649 conservation and

sustainable fishing programmes. The fishermen were taught how by-catch and discards are depleting the fish stock and the various measures to avoid by-catch and discards. They are encouraged in using by-catch reduction devices such as BRD, TED, square mesh panels etc in their nets. NETFISH has also developed leaflets and posters, depicting the importance of avoiding by-catch and discards, which are being distributed among the fisher folks during the training programmes. An animation film and a documentary film on conservation of marine resources have also been produced by NETFISH and shown to fishermen to reach the matter deep in their mind.

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FOCUS AREAS

Conservation of mangrove for sustainable biodiversity

Deepu A. V., Afsal V. V. and Joice V. Thomas.
NETFISH (A SOCIETY OF MPEDA) VALLARPADAM, KOCHI

Mangroves are salt tolerant shrubs and trees that grow in salt water environment of tropical and subtropical intertidal regions. It harbours large number of animal and plant species and are extremely sensitive ecosystem, survive cohesively.

In India, Mangrove covers an area of 4445 km2 found along the east and west coasts, such as Gulf of Kutch, Gulf of Mannar, Pitchavaram in Tamilnadu, Godavari, Krishna basins in AP, Bhitarkanika in Orissa, and Sundarbans in West Bengal. Sundarbans in West Bengal is considered as one of the largest mangrove forest in the world which hosts a variety of organisms from tiger to turtle. Mangroves can also be seen in the Andaman & Nicobar islands.

Mangrove ecosystems are sustainable biodiversified systems. Once established, the well developed root system of mangroves impede water flow and thereby enhances the deposition of sediment that enrich the area and provides a habitat for many faunal species especially to oysters and crabs as well as acting as the nursery ground for many marine organisms. Mangrove protects the shore from erosion, surge storms (especially during hurricanes), and tsunamy. Their massive root system is highly efficient for breaking up the wave energy and slow down the pace of tidal water. It has been found several times that the wave energy is typically low in the areas where mangroves grow. Mangrove also supports ecosystems, adopt low oxygen, limit salt intakes and water loss and also increase survival of generations..

Need for Conservation

The value of mangroves has gone unrecognized for many years and the forests are disappearing in many parts of the world. Mangrove systems require intensive care to save threatened areas. So far conservation and management efforts lag behind the destruction; there is still much to learn about proper management and sustainable harvesting of mangrove forests. The following steps are required to conserve mangrove ecosystem and its sustainability.

- Growing manghrove saplings all along the coastline to increase the nursery grounds for the marine organisms.
- Formulation of Government regulation for the protection of mangrove area with community opinion mobilization.
- Helping the conservation agencies involved in mangrove protection to continuously assess the area of mangrove and to check the destruction.
- Moibilise communities on the need to develop parks and reserve areas to protect Mangrove vegetation.
- Proper legislation to stop all types of unsustainable exploitation of mangrove ecosystems.
- Implement co-management schemes for mangrove protection through people's participation.

Role of NETFISH on Mangrove conservation.

NETFISH conducts different types of awareness programmes all along the maritime states of India to make the fisher folk aware of the different issues related to the conservation of mangrove resources. Documentary films, leaflets, street plays and animation films were developed by NETFISH for educating fishermen more efficiently .

As a result of these training programmes, efforts were taken to plant mangroves in areas where mass destruction had taken place with due participation of local communities. In Gujarat, 8000 mangrove saplings were planted in 3 hectare area at Junagadh district by the member NGO Paryavaraniya Vikas Kendra with the active support of local fishermen communities. Major species such as Avicenia marina and Rhizophora racemosa were planted in this endeavour. Efforts like this from the side of fishermen community are highly appreciable to conserve our valuable mangrove resource.

NETFISH official overseeing the planting of Mangroves at Junaghad (Gujarat)

Biosecurity: Its application in shrimp farming

Biosecurity, or "hazard reduction through environmental manipulation" is often defined as practices that reduce the number of pathogens that enter a facility. Biosecurity, the concept of protecting culture animals from contamination by diseases and of preventing the spread of diseases across boundaries, has become increasingly important due to intensification of aquaculture production systems. The shrimp farming sector requires a biosecure production system to prevent the spread of infectious disease among farms to avoid pathological risks. Biosecurity measures in shrimp farming can be seen as a two-pronged approach: excluding pathogens and eliminating pathogens when they are present. There are three types of precautionary measures to defend the disease outbreaks. They are Physical measures, Chemical measures and biological measures. Physical measures are introduced by physical barriers to prevent the intrusion of disease carrying vectors. Chemical measures are chlorination and ozonisation of water and biological measures include the use of specific Pathogen-Free (SPF) shrimp. A second line of defence for the field is to use Specific Pathogen-Resistant shrimp which in addition to being disease-free are resistant to specific diseases.

Providing better environmental and biological conditions to the infected population will increase its ability to resist diseases. Effective physical measures are increasing aeration, controlling temperature, improving the feeding regime, removing sludge and organic matter and treating wastewater to improve the environmental conditions and chemical measures are controlling of PH and salinity, reducing of ammonia and nitrite and avoiding use of antibiotics and drugs and biological measure is containing a mix of bacterial species to establish beneficial microbial communities under culture conditions. The last one is called probiotic mode of operation.

Specific Pathogen-Free (SPF) shrimp

The principal disease vector appeared to be the disease carrying shrimp seed, both wild and hatchery-reared. Bringing disease carrying shrimp into farms is an invitation to disaster and therefore SPF shrimp production is a must. However, once the SPF stocks leave the breeding centre, eventhough they are free from pathogens to the best of our ability and understanding, it faces the threat of open environment.

Water Exchange

Using of raw or untreated water is responsible for continued disease problems when ponds are stocked with high-health shrimp seed. Therefore, filling and exchange of water needs to be disinfected.

Management practices

Management practices that may be implemented to reduce the risk of introduction of pathogens include:

- Wash hands with anti-bacterial soap upon entering the facility or keep hand dip at the entrance of each and every section, so it will help us to reduce the pathogenic load to transfer it from one section to another.
- Disinfect footwear before entering the facility otherwise foot dips should be prefered mixed with bleaching powder/chlorine with appropriate level to avoid the contamination
- Access to culture area and reservoir pond should be restricted to a minimum number of well trained individuals.
- Reduce the number of visitors to a minimum and/or only people working on the farm should be allowed into the facility
- Check tray should be cleaned after use.
- Disinfect wheels of delivery vehicles when they come onto the facility and when they leave. Establish a visitor parking area on the periphery of the facility grounds.
- Culling dead and weak shrimp is a very important strategy that can reduce the spread of pathogens from shrimp to shrimp.
- Bird fencing and crab fencing should be checked daily, if any errors that should be corrected in time to protect the crop. Bird fencing is necessary, because birds negatively affect shrimp production by transmitting or transporting diseases, weed seeds, and parasites from pond to pond or from one facility to another. Crab fencing is also necessary, because as we know they are voracious feeder once they enter into pond they will voraciously feed on the PL or the shrimps present in pond and its consequences will be low-yield, low survival and heavy economic loss.

Conclusion

Biosecurity can be applied to shrimp aquaculture production systems through a variety of management strategies. In addition, there are a variety of risk assessments that can be used in shrimp farming. The key elements of biosecurity can be summarized as reliable sources of stock, adequate diagnostic and detection methods for excludable diseases, disinfection and pathogen eradication methods, best management practices, and practical and acceptable legislation. Nevertheless, it is almost impossible to determine the economic benefits of a biosecurity program if there is no disease outbreak, and aquaculture producers may be reluctant to adopt biosecurity measures that appear to be an additional cost. A disease outbreak in one area, however, in addition to its economic consequences in that area, may cause unintended consequences in other parts of the world.

Source: Sachin O. Khairnar, Kiranmali, Pankaj Kapse, Abhay Deshmukh and Bhavesh Solanki

Resource Sustainability through Responsible Fishing Practices

(Deepu A. V., Afsal V. V. and Joice V. Thomas, NETFISH)

Introduction

We may find several definitions for responsible fishing but what it essentially means?. In its greater sense it means fishing with responsibility to nature, future generations and biota. Responsible fishing and sustainable fishing are the two sides of one coin. In recent years, rapid developments in the harvest & post-harvest technology with the introduction of powerful and highly efficient fish harvesting systems and fish detection methods as well as the uncontrolled expansion in fleet size fuelled by ever increasing market demand for fish has resulted in over fishing, decline of many commercially important fish resources and degradation of marine ecosystems. This scenario points to the need of scientific management of the fishery resources ensuring sustainability of the fish stocks for future generations. Responsible fishing would ensure the long-term sustainability of the resources, minimize negative environmental impacts and protect biodiversity. The International Conference on Responsible Fishing, held in 1992 at Cancun, Mexico highlighted the need for an International Code of Conduct for Responsible Fisheries. Subsequent efforts in this direction have resulted in the adoption of Code of Conduct for Responsible Fisheries, by FAO Conference in October, 1995.

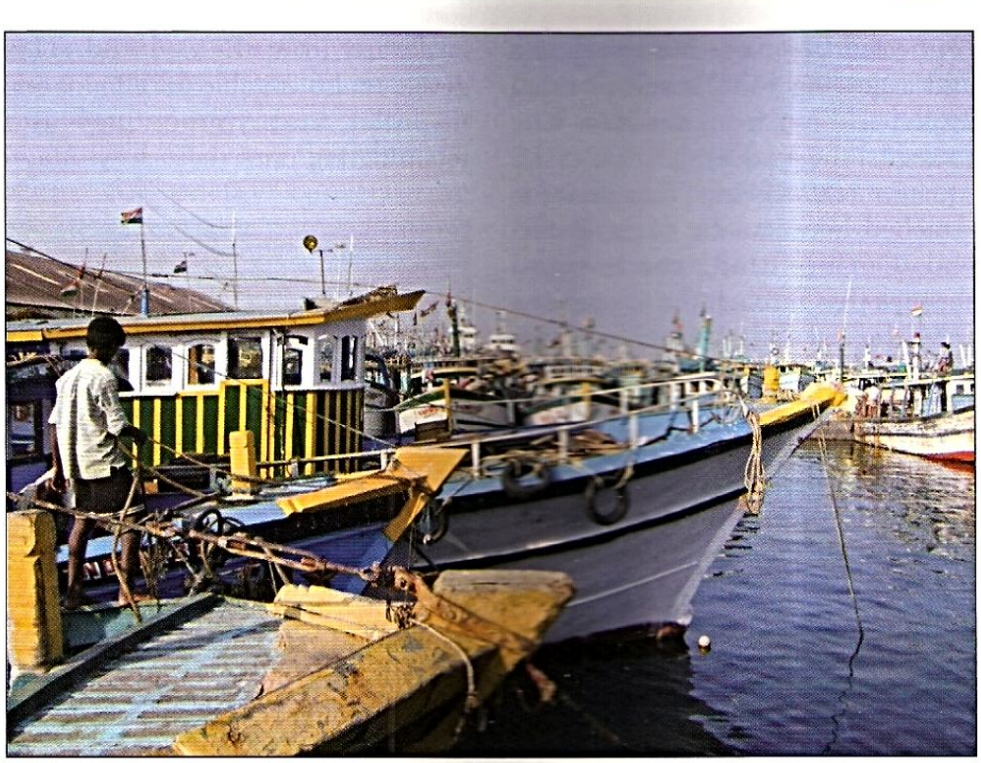
In India, fisheries sector contributes 1.2% of the GDP of the country. Fisheries Survey of India has already surveyed the demersal resources in all the coastal sectors and found that the stocks are under advanced levels of exploitation (www.fsi.gov.in). India has an Exclusive Economic Zone (EEZ) of 2.02 million sq. km. The harvestable potential of marine fishery resource in the EEZ has been estimated at about 3.9 million tonnes. An estimation of the depth-wise potential (Table 1) shows that about 58% of the resources are available in 0-50 m depth zone , 35% in 50-200 m depth zone and 7% in depths beyond 200m. The marine fishing fleet of India comprises of about 2.26 lakh traditional crafts (including about 44,578 motorized traditional crafts) and 53,684 mechanized boats.

Potential fisheries resources and level of exploitation in Indian EEZ

Depth range (m)	0-50 m	50-200 m	Beyond 200 m	Total (in million tonnes)
Demersal	1.28	0.625	0.028	1.933
Neretic Pelagic	1.00	0.742	-	1.742
Oceanic Pelagic	-	-	0.246	0.246
Total (%)	2.28 (58%)	1.367 (35%)	0.274 (7%)	3.921 (100%)
Present level of exploitation	2.08 (91%)	0.820 (60%)	0.020 (7%)	2.920 (75%)
Available for exploitation	0.20	0.547	0.272	1.001

(Source: Ministry of Agriculture, Govt. of India)

The pattern of marine fish landings in India during the last fifty years clearly reveals that the contribution by the artisanal sector to the total production was significant up to the sixties. As a result of the popularization and consequent expansion of mechanised fishing during the subsequent periods along with motorisation of artisanal craft, the contribution by the artisanal sector declined considerably. At present, the contribution by the mechanised and motorised sectors accounts for 87% of the total catch whereas the share from artisanal sector is only 13% (www.nio.org). Today's fishing technology is highly elaborate. Fishing lines can reach as much as 120 km, equipped with thousands of hooks. Some trawlers reach 170 metres in length and can take on board the volume equivalent of 12 jumbo jets and drift-nets can exceed 60 km in length. Fishing vessels cover large distances at high speed from coastal zone to high seas. They fish at great depth, stay at sea for several days, while fish are often prepared for the markets on board. Bottom trawling involves powerful boats dragging heavy metal weighed nets across the ocean floor to catch the maximum possible amount of bottom-dwelling life. Navigation apparatuses, such as Global Positioning System (GPS) and radar



Trawl boats in a fishing harbour

allow boats to constantly reconsider the best fishing spot, with very high precision. Fresh fish is a highly perishable product and its consumption was traditionally limited to coastal areas. With modern transport and food preservation technologies, one can offer fresh fish during all seasons, anywhere in the world. As the demand and price of fish increases with the advancements in the fishing technologies and the resource is limited, fishermen turned into many unsustainable and unscientific fishing practices to catch more fish.

Responsible Fishing Practices

Various steps to be taken to ensure responsible fishing practices in our waters following the code of conduct for responsible fishing introduced by FAO (1995). Some of them are discussed below.

Selective fishing gears

For sustainability of resources and to improve selectivity, changes ranging from changes to the mesh characteristics in the cod end, to the insertion of escape zones or other selective devices in the net are being paid attention by researchers. In past, selectivity research was almost solely focused on commercial species. Recently however, the release of non-commercial fish species has become an issue of major concern.

Size selectivity in gear using netting for retention of catch can be achieved by controlling mesh sizes and mesh shapes (square mesh panels) optimized for the target species or size groups.

In traps such as pots and creels, the size and shape of the entrance and mesh size or bar space, and in long lines appropriate hook sizes are utilized to control size selectivity. Species selectivity in mobile gears such as trawls can be achieved using separator panels or rigid grids, by making use of behavioral differences in species in the fishing area.

Gill nets

The use of gill nets is a very selective and low energy fishing method and the use of this gear should be encouraged. The framing lines of gill nets should be made of natural fibres, to help/ restrict 'ghost-fishing'. Fishermen and fisheries cooperatives should make it a point to interact closely with R&D organizations to get the necessary scientific information on target species to make the gear optimally effective. Considering the low disturbance that gill nets and trammel nets cause to the bottom fauna and the ecosystem as a whole, these gears should be encouraged as a conservation measure. The use of gill nets is a practical method for the development of coastal fisheries as it is simple, has a relatively small outlay but with a high performance (Anon 1984). Gill nets utilize only 0.15-0.18 kg of fuel per hour as compared to trawling, which uses 0.8 kg of fuel per hour (Gulbrandsen 1986).

Long Lines

Long line gear is highly targeted specific, non-destructive and can be operated with low power engines. Sails can be used for propulsion to reduce fuel consumption and environmental pollution. With some modification to their traditional fishing, skilled fishers can use this method. It can also be operated in combination with a gill net, making it more cost effective.

Attachement of escapement devices to nets

Bycatch Reduction Devices (BRDs) are devices that have been developed to exclude the non targeted species and reduce the non-targeted species and other unwanted catch in shrimp trawling. While the BRD is a broad term used to describe to eliminate or reduce the bycatch, the Turtle Excluder Device (TED) is a specialized form of BRD designed to exclude specially the sea turtles, which is a protected species. These devices have been developed taking into consideration the different behavioral pattern of shrimp and fish inside the net. While the fish are active and capable of swimming

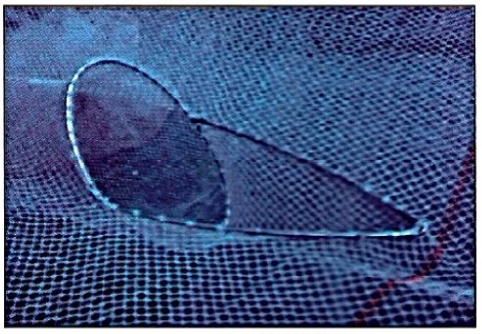
against the water flow inside the net and stimulated to escape at anytime if required facilities are provided, the shrimp is unable to swim against the water flow and are carried away with the flow of the water up to the cod end. These differences of behavior form the basic principles in designing the selective devices so as to allow the fish and turtle to escape and to maintain the shrimp catch in the cod end. Square Mesh Windows can also be attached in trawl nets as a very simple way of by-catch reduction device. It consists of a piece of webbing of appropriate dimension made of square mesh. This webbing piece is attached as windows at the upper part of the net and cod end. The mesh size of the square mesh is determined according to the size and species of fish to be eliminated. The principle involved in this device is that unlike diamond mesh, lumen of the square mesh remains open during fishing facilitating the escapement of fish through the opening. Studies carried out with square mesh panel window indicates the effectiveness of square mesh in eliminating the by-catch particularly juveniles and young ones of the fish.

Radial Escapement Device

Radial Escapement Device (RED) consisted of two spherical rings connected by square mesh webbing and a guiding panel made of small mesh webbing from the first ring towards the cod end, inside the square mesh webbing. This device is attached between the net and cod end. During fishing the fish and shrimps pass through the funnel and enter the cod end. While the shrimp remain in the cod end, the fish swim backward and reach the space between the two rings and try to escape through the mesh opening. Here also by regulating the mesh size in the square mesh webbing between the rings, the juveniles and undersize fish could be eliminated retaining the bigger fish in the cod end. This device has been successfully used by commercial shrimp trawlers in many countries abroad and found to be effective in reducing the fin fish by-catch.

Fish Eye

This is a device facilitating the escapement of under sized fish from the cod end of the trawl nets. It consists of an oval shaped structure with approximately 10.0 cm height and 30.0 cm width with supporting frames made of stainless steel rods. This is attached at the top of the cod end so as to provide the escape opening. This opening facilitates the escapement of fish which try to swim backward from the cod end. This device is also suitable for eliminating juveniles and young ones and retaining big ones.



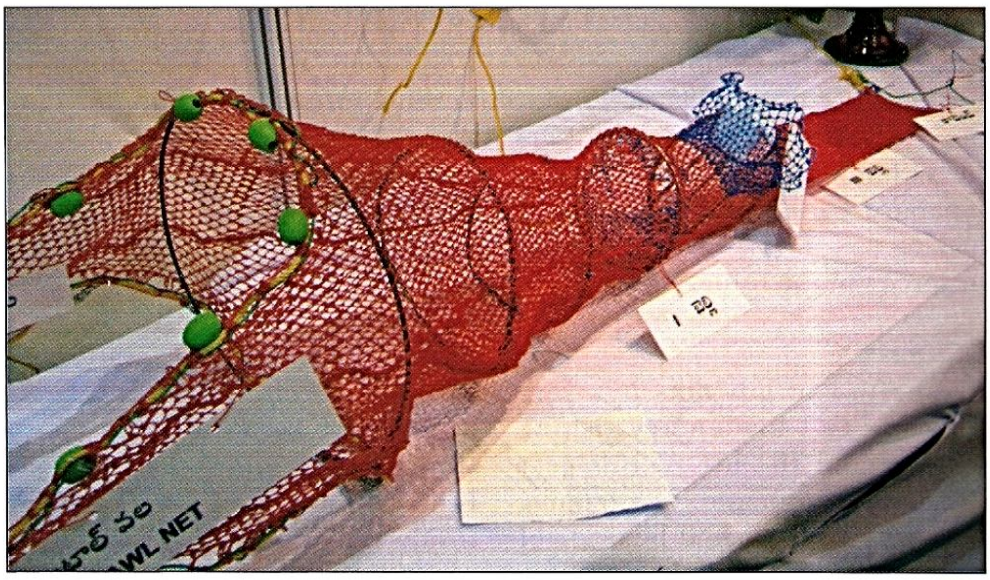
Fisheye integrated to trawl net

Environment-friendly fishing gears

Depending on their impact on the environment, some fishing gears or practices are more destructive than the other. Practices of using explosives and poisoning which are generally banned belong to the worst category. Passive fishing gears such as gillnets and traps though having less impact on the physical environment have the potential for causing unaccounted fishing mortality through ghost fishing by lost and discarded fishing gears. Dragged gears as trawls, particularly when they are heavily rigged, could cause severe damage to benthic fauna and flora, which occupy the bottom substratum and contribute to the productivity of the region. Efforts have been made to lessen the impact of bottom trawl on the substratum, where possible by rigging them to operate a small distance above the sea bottom as in semi-pelagic trawl. Lines and large uncovered pound nets (set nets) are among the fishing gears which have minimal impact on the environment.

Energy conservation in harvesting

Passive fishing gear and practices such as gillnets and entangling nets, lines and traps are less energy intensive than active dragged fishing



Model of the bycatch reduction device

gears. Among the fishing gears, trawling utilizes maximum energy in terms of energy spent per unit quantity of catch and offers greater scope for energy conservation practices. Purse seining comparatively spends much less energy per unit quantity of catch landed, because of the large volumes of catch per operation. It may involve such practices as selection and promotion of low energy fishing techniques where possible; adoption of energy conservation practices and devices in energy-intensive fishing systems where they are adopted due to exigencies of the local situation; adoption of advanced technologies such as remote sensing, acoustic fish detection, global positioning systems which will bring down search time for fish and facilitate accurate location of the fishing ground; and adoption of measures for development and improvement of coastal fishing grounds, so that fishing can take place in the near shore waters rather than distant waters.

Enhancement of resources

Fishery resources need to be conserved and enhanced by adopting management regimes appropriate for the area such as restriction and control over the fishing units, area and seasonal closures, gear interventions, protection of nursery grounds and promotion of selective fishing gear and practices. With improvement in the resources, energy spent per unit quantity of catch and time spends on searching decrease.

Protection and development of nursery grounds by installation of Artificial reefs or Fish Aggregation/ agrregating Devices (FADs) and sea weed bed development and enhancement of primary production by installing artificial upwelling flow generating structures could promote marine fishery resources along the coast. Artificial reefs are under sea structures constructed of materials such as concrete or in some cases steel to function as fish aggregating facilities and thus improve fishing potential of the area.

Restoration of the coastal fishing grounds from the effects of environmental degradation due to pollution, eutrophication, red tide, etc. by sludge removal and bottom quality improvement by dredging and by improving water exchange by guide wall construction, could result in enhancement of resources in the near shore waters, enhancing fishing opportunity, spending less fuel and search time for production.

Effective implementation of MFRAs

The Marine Fisheries regulation Act should be properly enforced to get the complete benefit of the act. Awareness campaigns and extension activities should get proper support from Government by implementing necessary laws. A concerted effort from Government, NGOs, extension agencies, local governing bodies and stakeholders is required for the sustainable management of fish resources.

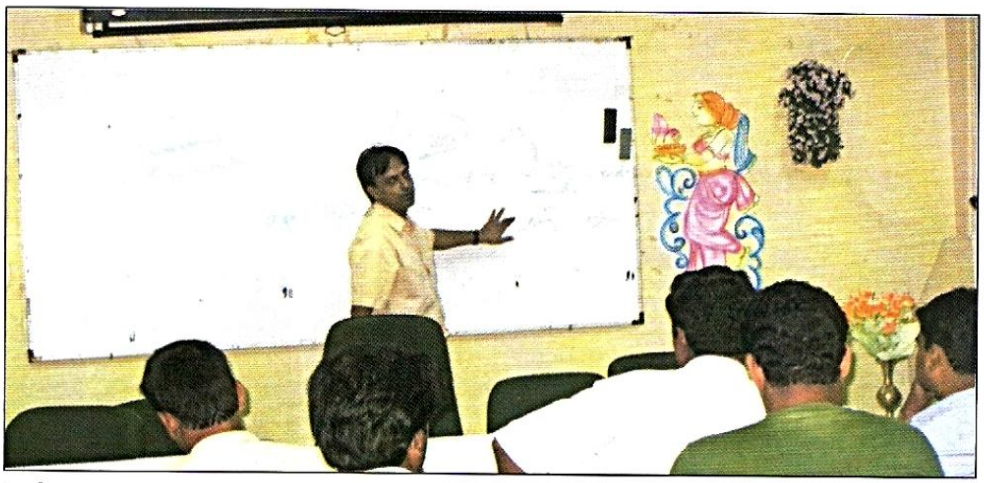
Conclusion

The rich marine resources are getting depleted on account of excessive fishing pressures in many parts of the world. Though many measures and steps have been taken /formulated to reduce the fishing pressues, the proper implementation of them has not been achieved so far. A concerted attempt is needed by all players of the various sectors such as fisheries, environment, Agriculture, etc to achieve the resource sustainability.

MPEDA Organizes Advanced Training Programme for Ornamental Fish Sector in Kolkata

MPEDA has organized an advance training programme on 'Breeding technology and management of exportable variety of ornamental fishes' at CIFE, Kolkata centre during 30-31st May 2011. The programme was inaugurated by Dr B. K. Mahapatra , Officer -in - Charge of CIFE, Kolkatta Center. The faculty included Dr. P. K. Roy, Scientist, CIFE, Kolkata, Mr. Indranil Banerjee, Mr. Indranil Ghosh, and Mr. R. Chakraborty.

All the trainees attended the



Training session in progress