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Global warming

The heat is on fish, fishers and fisheries

Fisheries will be severely impacted by global warming. Millions of livelihoods will be threatened and food supplies will be affected. Climate change is a global issue that requires global action. This issue of BBN initiates a series of articles on global warming and its impact on fisheries in the region.

Global Warming

The heat is on fish, fishers and fisheries

Global warming is no longer a prophecy, it's happening. Its impact on fisheries, which is already under pressure, can be severe. The world's leaders, policy-makers and scientists need to think coolly on one of the hottest issues of today, and follow up with action – fast!

Is the globe really warming? Indeed, yes! The skeptics have been silenced**.** Signals, facts and trends offer irrefutable evidence of an ominous phenomenon. NASA scientists say that of the 20 hottest years on record, 19 occurred in the 1980s or later. 2005 was one of the hottest years in more than a century.

The earth has a fever, said Mr Al Gore, in his lecture while accepting the Nobel peace award for his work on global warming (jointly with Dr R K Pachauri, who heads the UN Inter-governmental Panel on Climate Change).

Disasters have been striking everywhere – droughts, heat waves, storms, floods, fires, massive glacial melts. Scientists have been predicting this for some time – that man will have to pay for decimating forests and plundering the world's resources; for pumping greenhouse gases into the atmosphere, trapping the heat that flows in from the sun and raising global temperatures.

But carbon dioxide is colourless, odourless, tasteless, as Mr Gore pointed out. Climate change has been impacting our land and marine ecosystems for decades, but we didn't see the effects. Now we see it everywhere, and with regularity. Mr Gore also quoted an apocalyptic line from poet Robert Frost: "Some say the world will end in fire; some say in ice … Either will suffice."

Basics of global warming

Global warming is a term that describes the gradual increase in the earth's temperature. Coal-burning power plants, car exhausts, factory smokestacks, and other waste vents of the human environment give off about 23 billion tonnes of carbon dioxide and other 'greenhouse gases' into the Earth's atmosphere each year. The atmospheric concentration of CO_2 has increased by 31 percent above pre-industrial levels since 1750. This is far higher than at any time during the last 420 000 years, the period for which reliable data has been extracted from ice cores. Temperatures are expected to rise 1.4-5.8°C more by the end of the century.

It is the 'greenhouse effect' caused by human-generated CO_2, particularly during the last 50 years that has accentuated global warming.

This has caused sea levels to rise. Possible outcomes: floods, coastal erosion, impact on agriculture and fisheries (and thereby on food security), species extinction, spread of vector-borne diseases, loss of biodiversity.

Climate change and fisheries

What is the impact of global warming ***specifically*** on fisheries? There has been an assortment of studies and papers from many places, but a sustained and passionate campaign has been pursued by the World Wide Fund for Nature (WWF), and ***Bay of Bengal News*** has no hesitation in quoting and citing from WWF reports and investigations.

First, about resources, fish production and fish behaviour. WWF says the world's oceans, lakes and rivers harbour at least 27 000 known species. Fish are a cornerstone of global biodiversity. 132 million metric tonnes of fish are captured or raised each year, and more than 75 percent of this catch is eaten directly by people.

Worldwide, marine and freshwater fisheries generate over US$130 billion annually, employ at least 200 million people, and feed billions of people who rely on fish as their primary source of protein.

But the global warming of rivers and lakes threatens fish stocks already under pressure from overfishing, pollution and habitat loss, WWF says. "The decline in fish catch could devastate human populations, particularly in poorer countries that rely on fish for protein."

WWF says that fish are more sensitive to temperature than many animals because they cannot maintain a constant body temperature like humans. Higher temperatures reduce oxygen levels of fish, stunt growth, reduce food supplies. They can force fish to seek cooler waters which are alien to them. WWF estimates that 76 percent of the world's fisheries are already fished to their limit. Even slight changes in temperature can force economically important species to move their feeding and breeding grounds, hurting local, small-scale fishing activity most.

Fish, fisheries and global warming – Some other reports, some other phenomena from the Bay of Bengal region

Several global studies name India as one of those particularly vulnerable to global warming. In fact, a 1995 study by the Tata Energy Research Institute and the Ministry of Environment and Forests said that one meter sea level rise could displace 7.1 million people – including all coastal fishing communities. Yet, climate change does not seem to be a priority research area in India.

Scientific studies show that some of the commercially viable marine fish species in India are adapting to climate change. A study conducted by the Central Marine Fisheries Research Institute, Kochi reveals that highly popular oil sardines have moved to new geographical zones because of sea warming. Essentially a tropical species, oil sardines have moved from the south to the north-west and north-east coasts of India.

Other commercially important species have come up with equally interesting strategies for survival. Species like the Indian mackerel have gone down to different depths, and have been caught by bottom trawlers.

Take species like threadfin beam, off the coast of Chennai. Peak spawning months are now the colder months. And off the Mangalore coast on the southwest, the colder months are the season of abundance for copepods.

What's the inference? Adaptable species may be able to adjust to the challenge of temperature rise by modifying their behaviour. But the more vulnerable groups such as corals are in peril. Extensive coral bleaching was reported from the Gulf of Mannar, the Andaman and Lakshadweep seas when the sea temperature was 31^0 C or more in 1988 and 2002. The intensity of bleaching was proportional to the temperature.

False trevally (*Lactarius lactarius*) is an economically and culturally important fish in India, says WWF. It ranks as one of the most preferred, high-quality fish in the Gulf of Mannar region. But increased water temperatures and decreased rain because of global warming have led to a drastic decline of the fishery over the last few years.

What will be the distribution and migration patterns of oceanic tuna as the global seas warm up? The sex

of sea turtles is critically determined by the soil temperature at which the embryo develops. Prevailing temperatures above 28^0 C produces only females. Is the massive intrusion of puffer fish and medusae into the Indian coastal waters in recent years a fallout of climate change?

In Sri Lanka, the National Aquatic Resources Research and Development Agency (NARA) says that most sensitive habitats in the country are in different degrees of degradation owing to a combination of human activity and climatic change. Resulting problems (some already manifest, some predicted): resource decline, enhanced erosion, ecosystem changes such as conversion of brackish water into hypersaline water, damage to historical, religious and cultural sites, loss of beaches and tourism revenue, closing of river mouths, greater pollution (see detailed report on pp. 18-23).

Global warming can aggravate and accentuate problems caused by overfishing, such as loss of biodiversity. This should be a worry for countries who are not adjusting their fleet capacity according to the harvestable potential in their marine waters.

Conclusion

WWF seeks to limit global warming of average global temperature to below 2°C (3.6°F) over pre-industrial levels. That's the threshold at which climate change impacts would become unmanageable for nature and people.

Industrialized countries must cut their CO_2 emissions as obliged under the Kyoto Protocol. They must all agree to much more serious emission reductions in the next period, after 2012. To stay well below the 2°C danger threshold they must reduce their emissions by 60-80 percent.

"Rapidly industrializing countries too need to lower their emissions while meeting their development goals by 'leapfrogging' into clean and efficient technologies."

Mr Al Gore propagates a carbon tax. "We need to put a price on carbon – with a CO_2 tax that is then rebated back to the people, progressively in ways that shift the burden of taxation from employment to pollution. This is by far the most effective and simplest way to accelerate solutions to this crisis."

The single largest source of man-made CO_2 is electricity generation, accounting for 37 percent of worldwide CO_2 emissions. The first step to move to a clean energy future is to clean up the power sector, says WWF. It urges the coal-burning power sector to cut climate pollution and aim at a major switch to clean power.

"Comprehensive strategies to build resistance and resilience to climate change impacts need to be developed – for threatened communities as well as for nature reserves."

"Unless governments slow the rate and extent of climate change we're all going to feel like fish out of water," says Stephan Singer, Head of WWF's European Climate and Energy Policy Unit.

The WWF calls for responsible fisheries management and networks of Marine Protected Areas to combat both overfishing and global warming,

"The world needs an alliance," Mr Al Gore said in his Nobel acceptance speech. And Dr R K Pachauri made a similar plea in his Nobel lecture. He referred to the ideal of ***Vasudeva kutumbakam*** ('The world is one family'.)

Al Gore said "We, the human species, are confronting a planetary emergency. But there is hopeful news as well: we have the ability to solve this crisis and avoid the worst – though not all – of its consequences, if we act boldly, decisively and quickly."

– Y S Yadava

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

What Safety Hazards Do You Need to Look for on your Commercial Fishing Vessel?

Alan Davis*

This paper describes a detailed safety inspection programme that is employed aboard several large vessels in Alaskan waters. The inspection process focuses on prevention of injuries to workers both above and below decks. The programme identifies risk factors concerning possible injuries to fish processor workers. It tries to find ways to eliminate or mitigate these factors.

Fish processor workers are exposed to many hazards. These include:

- deck hazards such as tools, oxyacetylene use and welding fume exposure, chemicals, worn gear and safety equipment;
- factory hazards and risk factors for musculo-skeletal disorders, including unguarded points, chemicals, personal protection equipment, lifting issues, ergonomics;
- freezer hazards, including unguarded points, clothing, lifting issues, ergonomics;
- offloading hazards, including cargo gear, unguarded points, overhead hazards, safety rails or lines and lack of use of hard hats;
- cargo gear and handling hazards, including inadequate inspection records, crane certifications, crane wires, control labels, worn lifting gear; exposure to hazardous chemicals; and
- safety risks in living quarters, including inadequate use of smoke detectors, cigarette burns, overloaded circuits and exposed wiring.

The programme uses a methodical and detailed safety inspection process to minimize risk factors.

What Safety Hazards do you need to look for on your Commercial Fishing Vessel?

Before safety policies can be written, before safety training can be designed, and before risks can be identified, current conditions and issues must be measured or assessed. Employees must recognize that the management is committed to improving safety. The best way to accomplish this is to perform safety inspections and make OBVIOUS improvements based on the safety inspections. This challenge is magnified in commercial fishing, where generations of 'We have ALWAYS done it this way' have built up.

When I was first asked to explain my safety inspection process, I must admit to being a little stumped. Like many safety professionals, much of what I look for is in my head, not on a checklist. I try to imagine if someone could be injured or made ill by the conditions I am observing. Some professionals refer to this as 'Safety Eyes'. Our challenge now is to open your 'Safety Eyes'.

Inspection equipment

Video or digital camera: Frequently when I'm doing an inspection, even on a vessel I am familiar with, I see hazards but it's hard to describe their location. With a video camera, I can tape the hazard and then show it to the vessel management. The tape also serves as a springboard for problem-solving discussion.

Micro Cassette Recorder: Tape Measures and Voltage Detectors can be very useful at times…and usually are most needed when they are not with you.

Inspection Issues: Machine Guarding is a huge issue in commercial fishing, but is frequently not seen as the biggest

* *This article is edited and abridged from a paper presented at the Third International Conference on Fishing Industry Safety and Health (IFISH-3) held in Mahabalipuram from February 1 through 6, 2006. For the full version of the paper, write to BOBP-IGO. The author is Safety & Compliance Manager, American Seafoods Company, 2025 First Ave. Suite 900, Seattle, WA 98121, 206-256-2677.*

hazard. This is interesting since everyone in the commercial fishing industry knows someone who has lost a finger or an arm in a piece of processing equipment.

In 1996, I interviewed a Baader Technician in Dutch Harbor who had lost four fingers of his right hand including the thumb. His response was "That's Fishing". Fortunately the industry has come a long way since then.

A review of OSHA regulations gives room for interpretation.

OSHA 1910.212(a)(5) : Exposure of blades. When the periphery of the blades of a fan is less than seven feet above the floor or working level, the blades shall be guarded. Now does that mean if a fan or a belt is eight feet off of the floor, it is safe? NO! Plenty of people in today's work force can reach that high. And people are always climbing a ladder or other structure to reach something they need to work on…so GUARD IT.

There isn't room here to describe every situation on a commercial fishing vessel that requires guarding. So a few general conditions:

Blades: The modern factory processor has LOTS of whirling rotating blades. Guard them AND make sure that machines cannot be activated during servicing.

Belts: Both drive belts and product feed belts need to be covered or designed in such a way that crew cannot get caught in them.

Conveyor Belts: Conveyors of all types are used to move product from one place to another. Guidelines for guarding them can be vague, but be aware that transitions can suck people and product in and do extensive damage.

Shafts: Rotating shafts need to be guarded in order to prevent clothing or hair from getting wrapped around them, even if the shaft is open ended.

Fall Protection: Fall Protection issues are one of the greatest risks in commercial fishing. Open hatches,

elevated surfaces, and open decks all pose significant hazards. OSHA regulations require that anyone exposed to a possible fall of 4 feet or more be protected, either by railings or by a fall arrest system.

A study in ***Climbing*** magazine many years ago gave the following statistics; a fall of four feet means 20 percent chance of a broken bone; a fall of 10 feet means 80 percent chance of a broken bone AND a 20 percent chance of a spinal injury. Fall 20 feet, and they are not sure if it is the broken bones or the spinal injury that killed you.

Railings: Railings are the best form of protection around deck openings. Railings can be made of rope or chain, but in all cases railing must be capable of withstanding a load of at least 200 pounds, applied in any direction at any point on the top rail. (200 lbs is a bit light considering the size of some crew members).

Slips and fall: Perhaps the most common injury in commercial fishing is caused by slipping or tripping and falling onto the walking surface. Are your decks slippery? Does your house floor get the right

kind of wax? Is your crew wearing the correct footwear? Do your showers have anti slip mats inside them and outside of them? Are your stair treads too short for a human foot or are they worn smooth?

Chemicals: There are numerous chemicals used in the commercial fishing industry and since storage space is at a premium, many chemicals are in concentrated form.

MSDS: Material Safety Data Sheets (MSDS) are required by US law to be provided by every chemical manufacturer. Every employer is required to maintain up to date MSDS for every chemical they have in their facility. MSDS contain information like Chemical Content, Health Hazards, Environmental Hazards, Physical Hazards, Permissible Exposure Limits, Safety and Personal Protection Equipment Requirements, Emergency Contact Numbers, and First Aid Measures.

Labelling: Labelling is a key requirement for all chemicals being used on a vessel. All chemical containers, including those used only for a short duration, should be clearly labeled with the name of the chemical, the hazards associated with the chemical, and the personal protective equipment that should be used when working with the chemical.

Storage: Storage space is always at a premium on ocean-going vessels. Chemical storage is a constant problem. Great care must be utilized to make sure that incompatible chemicals are not stored together. There are many chemicals that should not be exposed to water or flame. A few common mistakes:

- **Acids or Caustics and Oils** – Mix these and you may get a fire.
- **Acids and Caustics** – Combined improperly, they can react and produce intense heat or an explosion.
- **Chlorinated products and Ammonia Products** – A common Galley or House issue, this combination can produce a cloud of chlorine gas.

Personal Protection Equipment: Personal Protection Equipment (PPE) encompasses a wide range of products that represent the last line of defense in preventing illness and injury. When conducting an inspection make sure to observe crew members closely. Are they using the proper PPE? Are they using it properly?

Steel Toed Boots: Steel Toed Boots are often overlooked or disregarded but can be of great value in preventing work disabling injuries. In the factory, there are motors and tools that when dropped can easily break toes. In the freezer, a 20 kg box of frozen fish hits with the impact of a hammer when dropped.

Safety Glasses & Safety Goggles: Safety Glasses should be used in tasks that involve airborne objects and substances presenting a hazard to a crew member's eyes. Commercial fishing has lots of these hazards but has not embraced the idea of safety eyewear. Fish scales, dirt, salt water, fish fins, cleaning chemicals, etc all represent eye hazards in factories. Deckhands have all of these hazards plus metal from punches, wire snags, and snapping lines. Engineers and technicians are working around moving machinery, chemicals, grinding metal, etc.

The argument against safety glasses has always been that they get dirty. This argument is pretty weak when you consider the fact that almost every crew has at least one person that wears prescription glasses. They are able to wear their prescription glasses because they clean them regularly, so everyone else should be able to clean their safety glasses. It should also be noted that all the "dirt" that gets stuck on safety glasses is dirt that was headed toward someone's eyes.

Safety goggles should be worn whenever there is grinding or chemical operations that could result in a splash. Under these conditions, safety glasses do not offer adequate protection. Safety Goggles should be INDIRECTLY ventilated. Many goggles designed for woodworking are directly vented and chemicals might be able to splash through the vents.

Sea Story

A Galley Assistant in the Bering Sea was having trouble cleaning a spot on the galley deck. He went down to the factory and brought a caustic cleaner called 'Super Red' in a paper cup. When the Galley Assistant returned to the galley he was distracted by another problem and sat the paper cup on a table. A thirsty crewman dashing through the galley snatched up the cup and thinking it was 'red punch', swallowed the whole cup in a single gulp. The chemical destroyed his esophagus. According to the story, he had to have a new esophagus made from a piece of his intestine.

Fact or fiction… the story above illustrates the need to use proper containers and labeling... even when it is 'only going to be for a minute'.

Respirators: are used to filter out substances that can cause harm if breathed into the lungs. Some substances found on fishing vessels that should be addressed are: Caustic and Acid Vapors, Welding Fumes, Dusts from grinding, Cutting Fiberglass, Additives, and Refrigerant Gases.

Respirator Clearance Exams: Everyone who wears a respirator is required to have a respirator clearance exam by a medical provider. Is there a medical reason why a person using a respirator should be prohibited from using it? The exam will determine the answer.

Disposable "Dust Masks": There are a variety of "Dust Masks" or nuisance level masks available from a variety of manufacturers, avoid them. If someone needs to wear a "Dust Mask" to feel better, then they should step up the something that can legally be called a respirator.

Full-Face Respirators: Full Face Respirators offer a higher protection factor plus eye protection from vapors and gases. Full Face respirators are also available with welding face shields and many are adaptable for use as airline respirators.

Self Contained Breathing Apparatus (SCBAs): SCBAs are used in situations where the user has to take his or her own air supply into the situation with them. SCBAs have a full-face mask, a regulator and a compressed air bottle. The most widespread use of SCBAs is in fire response and it is important to note that there are MANY SCBAs out there that are not approved for use in fire response.

Deck Hazards

Without a doubt, the deck of a commercial fishing boat is a dangerous place, but the risks can be managed and reduced.

Deck Gear: Wire Rope (cable), Lines, Shackles, Hammerlocks, Winches, Flat Links, Hooks and other gear sustain a tremendous amount of strain during fishing operations. Buy good-quality material. Thoroughly test any new gear before putting it into use.

Flotation: Flotation should be worn on open decks at all times and should definitely be worn during fishing operations. Warm weather or cold, there are enough varieties of flotation devices available to eliminate excuses. The majority of the fatalities in the 2002 Alaskan Fisheries were man-overboard situations – the men concerned WERE NOT wearing flotation devices.

Welding and Cutting Guidelines

Transporting, Moving and Storing Compressed Gas Cylinders:

- Keep valve protection caps in place when not being used. Do not use oil to lubricate caps or valves.
- When cylinders are hoisted, use a pallet or a bottle cage. Do not hoist with a choker sling.
- Move cylinders by tilting and rolling them on their bottom edges. Prevent cylinders from being dropped, struck, or from striking each other.
- Do not use valve protection caps for lifting cylinders.
- Do not pry or hammer on cylinder valve protection caps to loosen them when frozen. Use warm, but not boiling water to thaw the caps loose.
- **Store oxygen cylinders away from acetylene cylinders.** A non-combustible wall at least 5 feet high should be used to separate cylinders.
- Acetylene cylinders shall be kept in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried. **At no time should an acetylene cylinder be stored or moved upside down!**
- Storage rooms for cylinders containing flammable gases shall be well ventilated. Do not place or store cylinders in a location where they would be subject to open flame, hot metal, or other sources of artificial heat. Do not place cylinders containing oxygen or acetylene or other fuel gas in confined spaces.

Wear personal protective equipment. Wear welding gloves, helmet, leather apron, welding chaps, leather shoes, welding goggles, and other personal protective equipment to help prevent weld burns and injury. Do not wear clothing made of synthetic fibers while welding.

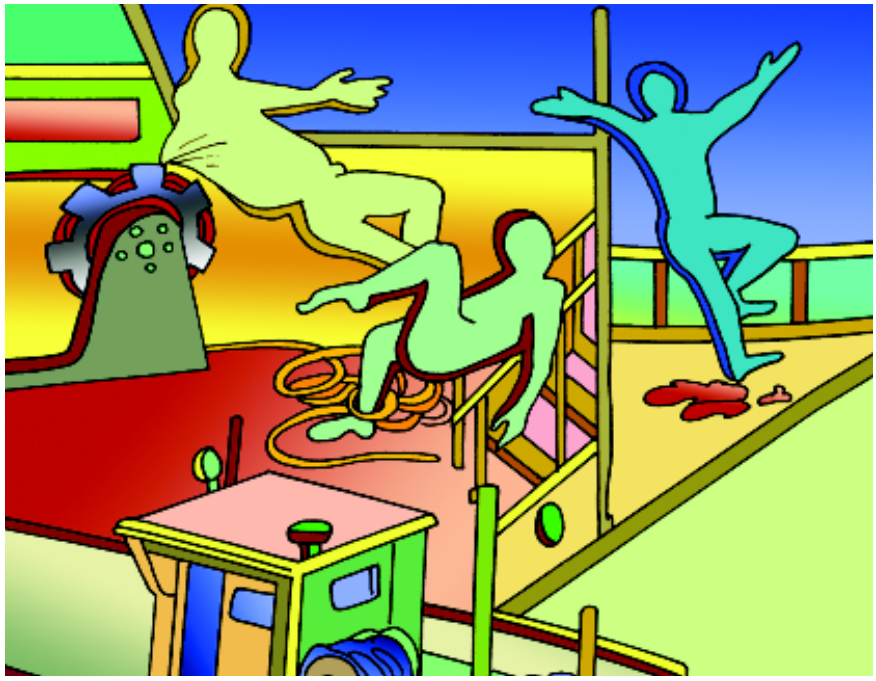
Torches: Clogged torch tip openings should be cleaned with suitable cleaning wires, drills or other devices designed for that purpose. Do not use defective torches. Inspect torches at the beginning of each shift. Light torches with friction lighters or other approved devices, and not with matches or from other hot work.

Welding cables and connectors: All arc welding and cutting cables must be completely insulated and flexible, capable of handling the maximum current requirements of the work in progress.

Factory hazards and risk factors: Musculo-skeletal disorders; ergonomics; lifting issues including unguarded points; chemicals; personal protection equipment; freezer hazards, including unguarded points; clothing.

Off loading hazards, including cargo gear, overhead hazards, safety rails or lines and lack of use of hard hats; cargo gear and handling hazards, including inadequate inspections records, crane certifications, crane wires, control labels, and worn lifting gear.

Safety risks in living quarters: Smoke detectors, cigarette burns, overloaded circuits and exposed wiring, floor surfaces.



Promoting Skilled Manpower for the Fishing Industry: The Contribution of CIFNET

The Central Institute of Fisheries Nautical and Engineering Training, perhaps better known as CIFNET, was set up in Cochin (now Kochi) in 1963 under the Ministry of Agriculture. Its main objective was to develop manpower for ocean-going fishing vessels, on the basis of recommendations made by a government committee on fisheries education. The committee had assessed manpower requirements in fisheries and suggested measures to meet these requirements.

The Institute was initially named Central Institute of Fisheries Operatives. One unit of CIFNET was set up in Chennai in 1968, another in Visakhapatnam in 1981. The Institute was subsequently renamed as Central Institute of Fisheries Nautical and Engineering Training. Courses to train candidates for manning fishing vessels under the Merchant Shipping Act, 1958, are conducted by the Institute regularly in the three centres.

The Institute has a total sanctioned staff strength of 298 at its Cochin headquarters and the two units at Chennai and Visakhapatnam. The other facilities at the three units are as follows:

The Institute is equipped with library facilities, laboratories, an engineering workshop, fishing gear fabrication hall, trainees' hostels, information and publication sections, etc. The Institute's faculty includes doctorates/ post-graduates in engineering, fishing technologists, computer application specialists, masters in nautical science with rich theoretical and practical experience with merchant and naval ships.

Mr G Hassan Manikfan, 57, Director of CIFNET, holds a degree in zoology, a diploma in fisheries science from the CIFE and a diploma in business administration. In his 31-year career with the Ministry of Agriculture, he has served two fisheries organizations – CIFNET and the Integrated Fisheries Project (IFP), Cochin – as well as the Union Territory of Lakshadweep.

Beginning his career as fishing instructor with CIFNET in 1977, Mr Manikfan moved on to the IFP which he served in different capacities – as Assistant Director, as Deputy Director for Experimental Fishing and as Director. He took charge of CIFNET in February 2002; during the first four years of this period, he also held additional charge as Director of IFP. Between 1993 and 1998, he was Director of Fisheries of Lakshadweep.

At IFP, Mr Manikfan helped draw up long-term and short-term strategies for development. Significant contributions were made by IFP during his period to improve marine products development, impart training to the industry in fish processing, and carry out fabrication and repair of fishing gear. He helped reorganise the IFP by transferring various staff to CIFNET and the Fishery Survey of India. At Lakshadweep, Mr Manikfan was responsible as Director of Fisheries for planning and implementation of projects, purchase operations, and coordination between fisheries and other departments.

As Director of CIFNET, Mr Manikfan plans and implements training programmes, formulates policies, liaises with the fishing industry, with various governments and international bodies. He manages fishing vessel operations and organises manpower development for deep-sea fishing vessels. He has helped introduce new courses, conducted a study on the efficacy of LPG as a fuel for outboard motors used by fishermen, and established an engine room simulator for students.

Objectives of CIFNET

- To create trained manpower for the operation of ocean-going fishing vessels. To run infrastructural establishments with technical teachers for manning fishermen training centres attached to maritime states and Union Territories (UTs).
- To conduct studies on fishing craft, gear and equipment. To provide extensive training for advancement in fishing technology aimed at enhancing fishermen's productivity and increasing marine fish production.
- To help developing nations in the South-east Asian, Middle-east

Facilities with CIFNET

Facilities	Headquarters Kochi	Chennai	Visakhapatnam
Total land area (acres)	4.35	1.41	1.035
Building area (sq.mt)	5 730	2 903	3 300
Training Vessels	M V Prashikshani; 34 meter LOA; training in trawling and longlining	MV Skipper; 28.3 meter LOA; training in trawling	M V Skipper III; 28.3 meter LOA; training in trawling

The Technical Divisions of CIFNET and their activities

Technical Division	Activities
Nautical Division	Seamanship & navigation, marine meteorology, chart work, etc.
Fishing Gear Division	Fishing gear material and design, fabrication of fishing techniques, fishery biology section, deck equipment, etc.
Marine Engineering Division	Marine engineering, electrical engineering, electronics & computer applications, hydraulics, refrigeration, etc.
Boatbuilding Division	Fishing, boatbuilding technology, materials, design, construction, installation of engines and accessories, etc.
Maintenance Division	Maintenance and repair of fishing vessels, equipment and machinery, etc.
Training Division	Programming and conduct of various training courses, post-institutional training, examinations, employment guidance, etc.

and African regions to create technical manpower for development of marine fisheries.

- To provide consultancy services in all matters with special reference to technical manpower requirements.

Vision of CIFNET

To impart quality training in order to upgrade skills, prevent obsolescence, and develop a constructive attitude with a focus on competitiveness to meet the changes and challenges of contemporary needs in both fishing and the merchant marine.

Recent achievements of CIFNET

- Introduction of a 4-year Bachelor of Fisheries Science (Nautical Science) degree course approved and affiliated by Cochin University of Science and Technology, Kochi.

CIFNET Headquarters at Kochi, Kerala

- Introduction of 2-year trade courses for Vessel Navigator and Marine Fitter approved by the Director-General of Employment and Training (DGET), Ministry of Labour, New Delhi, affiliated to National Council of Vocational Training (NCVT).
- CIFNET has conducted a study on the efficacy of LPG as fuel on outboard motors used by fishermen in fishing vessels. The project was successfully completed and a report was submitted to the Ministry of Agriculture in 2007.
- Establishment of Engine Room Simulator for the benefit of students of various engineering colleges undergoing short-term training programmes at CIFNET, and students of the Marine Fitter Course at CIFNET.

Contributions of CIFNET

A. On the training front:

Fishing industry: The Institute conducts a Mate Fishing Vessel Course, an Engine Driver Fishing Vessel Course, a Vessel Navigator Course and a Marine Fitter Course for operative personnel for fishing vessels. The Institute provides post-institutional training to help candidates acquire sea services for the competency examinations conducted by Mercantile Marine Department (MMD) – they are eligible for a remission of the sea service requirements prescribed in the Merchant Shipping Act, 1958.

Foreign nationals: The Institute trains foreign nationals, mainly from Africa and Asia, under various bilateral schemes. 124 candidates from Nigeria, Zambia, Tanzania, Ghana, PDR Yemen, Myanmar, Laos, Sri Lanka, Bangladesh, Maldives and Philippines, etc. have been trained so far.

Inter-institutional activities for marine fisheries development: CIFNET is associated with various Central and State Government organizations, the Indian Coast Guard, universities, colleges and the fishing industry. It imparts technical

knowledge on marine fisheries development to their representatives.

Training for officials of Government organizations and financial institutions: The Institute regularly conducts trainers' training programmes for officials of the Marine Products Export Development Authority (MPEDA) on marine electronics & equipment, capture fisheries, hygienic handling of catch onboard fishing vessels, etc. The Institute provides refresher courses for in-service certified hands of fishing vessels from institutes like the Fishery Survey of India (FSI), Central Institute of Fisheries Technology (CIFT), etc. These courses update knowledge on nautical science and electronic equipment and prepare candidates appearing for higher-level competency examinations conducted by the MMD.

The Central Institute of Coastal Engineering for Fishery (CICEF) regularly deputes its officials for the training courses on 'Operation of outboard engines and navigation' and 'Nautical and engineering technology'. The institute has also conducted customized courses for officials of financial institutions like NABARD on 'Fish preservation and processing' to acquaint them with the subject.

The Institute is connected with the National Institute of Ocean Technology, National Institute of Oceanography and Department of Ocean Development by way of designing and fabricating suitable fishing gear for experimental operation onboard the research vessels belonging to these organisations.

Training courses for State Directorate of Fisheries and UTs of Lakshadweep: CIFNET has been conducting various short-term training programmes for candidates sponsored by the Fisheries Departments of States and UTs. These include 'Operation of patrol boats'(Orissa), 'Introduction of intermediate craft for pelagic trawling' (Andhra Pradesh) and 'Marine electronics & equipment' (Maharashtra, Orissa, and Goa). The Institute has conducted courses for candidates sponsored by the Lakshadweep Administration and the Lakshadweep Development Corporation. These include 'Shore mechanic's course', 'Junior signal man course' and 'Course on practical trawling operations'.

Training of Coast Guard officers: The Institute has been imparting training in fisheries technology to officers of the Indian Coast Guard since 1984 to acquaint them with fishing activities. The Assistant Commandants undergo this training for a week.

Training courses for college and university students: CIFNET's expertise, training facilities and infrastructure are offered to college and university students. Short-term sandwich training programmes are arranged in subjects like fishing gear, fisheries technology, marine engines, marine refrigeration, marine electrical technology, marine electro technology, marine electronic equipment & power supplies. Students from various vocational institutions, graduate and post graduate students in science and fisheries, and students of engineering colleges, benefit from these specially designed programmes.

Extension activities for the traditional fisheries sector: The Institute makes its expertise available to meet any specific demand for updating / upgradation of new fishing technology. Some of the training programmes organized by CIFNET for traditional fishermen to enhance their fishery activities and uplift their socio-economic status are 'Operation and maintenance of outboard motors', 'Hygienic handling of catch onboard', 'Safety of life at Sea', etc.

B. Contribution to the fishing industry

Location of tuna grounds in the Indian EEZ: Tuna longline fishery was introduced in the early 1980s, and was established after the initial

Foreign Candidates Trained at CIFNET (as on 31.12.2007)

Country	Scheme	Number Trained
Nigeria	FAO Fellowship	15
Philippines	FAO Fellowship TCS Colombo Plan	2 2
Fiji	TCS Colombo Plan	4
Zambia	SCAAP	8
Ghana	FAO Fellowship SCAAP	2 5
Laos	ESCAP	2
Burma	FAO Fellowship TCS Colombo Plan	12 1
PDR Yemen	FAO Fellowship Bilateral	3 15
Tanzania	CFTC	4
Maldives	CFTC ITEC	5 4
Bangladesh	CFTC TCS Colombo Plan	16 1
Kiribati	CFTC	1
Namibia	CFTC	10
Sri Lanka	CFTC ITEC TCS Colombo Plan	10 1 1

SCAAP - Special Commonwealth African Assistance Plan; ESCAP -Economic & Social Commission for Asia and Pacific; CFTC -Commonwealth Fund for Technical Co-operation; ITEC -Indian Technical & Economic Co-operation; TCS - Technical Co-operation Scheme

breakthrough around 1986-87. CIFNET undertook a new exploratory tuna longlining programme jointly with the FSI. The training-cum-survey conducted by the institute's training vessel MV Prashikshani during the 1980s helped in locating potential tuna grounds in the Indian EEZ. The institute has also trained personnel required for this sophisticated fishing method.

Selective shrimp trawl fishing: CIFNET in association with the Institute of Marine Research, Bergen, Norway, was identified for the conduct of Selective Shrimp Trawl Fishing operations. The Institute's 28 meter trawler MV Skipper III in the North-eastern coast, carried out the experiment during 1995-96.

Ferro-cement boat construction: CIFNET and FAO conducted a technical co-operation programme on the introduction of ferro-cement as an alternative construction material for fishing vessels. Six such vessels were constructed under this programme by CIFNET. They were later handed over to various fisheries corporations for further operations.

Energy conservation programme: A programme for energy conservation in the Indian fishing fleet was specially undertaken by CIFNET in 1988 under a bilateral agreement signed between India and Norway, Technical tests were carried out on these vessels for hydrodynamic properties and characteristics of propulsion machinery. The findings showed good fuel-saving potential in the Indian fishing fleet through economic operational measures.

LPG project of CIFNET: Considering the importance of alternate fuel, the Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture decided to take up a feasibility study on the efficacy of LPG for use on Outboard Motors (OBMs) operated in traditional fisheries. The Department identified CIFNET as the agency to undertake this study. CIFNET took up this project study in November 2006, on a 9.9 HP OBM and a 25 HP OBM respectively at two different centers. The result of the study has been submitted to the Department.

CIFNET Director addressing the trainees

Trainees acquiring practical skills in the Institute's laboratory

Major constraints

CIFNET's facilities are meant to cater to the training requirements of two regular 24-month courses – Mate Fishing Vessel and Engine Driver Fishing Vessel. A number of faculty have been proposed and sanctioned to handle classes for these courses. Many posts have been abolished or surrendered because of various reasons as well as government policy decisions. Now, the staff strength has been reduced drastically because of government curbs on filling up posts earmarked for direct recruitment.

Considering the demand for technically qualified hands in fisheries, the institute has commenced a four-year degree course recognized and affiliated by the Cochin University of Science & Technology during 2005. The certificate courses of 18-month duration have also been upgraded to 24-month courses and approved by DGET, Ministry of Labour, New Delhi and affiliated by NCVT.

Earlier, the total strength of the candidates in regular courses at the three centres was 200. Now the strength has gone up to 272. In addition to these courses, the Institute is conducting short-term training courses for fisheries organizations/ universities/ professional college students/ fishermen, etc. More than 1 000 people are trained every year in the short-term courses. The workload and training efforts have gone up considerably during recent years. The Institute could not add facilities

or faculties proportionately to the increase in the training activities. No new posts have been sanctioned for starting the degree course; on the other hand, the staff strength got reduced during the last four years because of general government policy.

Three training vessels presently available with the institute are more than 27 years old and have already outlived useful life. The machinery and equipment onboard these vessels are very old; frequent breakdowns have occurred in all three vessels. It is essential to procure new training vessels complete with equipment to impart practical training to the candidates undergoing regular courses at CIFNET. The practical training onboard fishing vessels is compulsory.

More training institutes have been established in the private sector for developing manpower for merchant shipping. Their training courses lead to CDC (Continuous Discharge Certificate), the document required for employment in merchant ships. These courses attract many candidates because of the job opportunities they provide in shipping. It is necessary for CIFNET to diversify the courses to suit the requirement of modern days.

Lack of proper hostel facilities to accommodate all the candidates undergoing regular courses affects the welfare of students undergoing regular courses. It is therefore necessary to overcome the shortcomings in the area to make the training programmes more efficient and quality-based.

CIFNET has long experience in developing technical manpower for the fishing industry. It has also designed and conducted short-term and long-term courses for fisheries organizations/ universities/ banks/ professional colleges/ fishermen, etc. The Institute has also organized field training programmes for fishermen in fishing villages. The Institute can design the programmes according to the requirement of target groups and sponsoring agencies. More training programmes can be taken up by CIFNET, provided facilities and faculty are upgraded.

Job potential for CIFNET trainees

Candidates who successfully complete the 24-month Mate Fishing Vessel Course at CIFNET can appear for the Mate Fishing Vessel Competency Certificate Examination after acquiring 24 months of sea service working onboard fishing vessels. Candidates who obtain such Competency Certificates can appear for a Skipper Gr. II Competency Certificate – they will need 18 months of sea service after the Mate Certificate Examination or 30 months of sea service towards eligibility for Skipper Gr. I examination.

Similarly, candidates who successfully complete Engine Driver Fishing Vessel Course at CIFNET have to follow it up with 6 months workshop service and 9 months sea service towards eligibility for Engine Driver (FV) Competency Certificate Examination and further 21 months sea service for Engineer (FV) Examination.

As per available information, most CIFNET-trained candidates secure suitable jobs on their own. The Institute is proud that most large fishing vessels in the country are managed/ manned by CIFNET-trained and certificated personnel. Some CIFNET-trained personnel have also obtained jobs in fisheries and allied sectors in African and Middle-east countries.

Future development activities

- Upgradation of the present NCVT trade courses to 3-year diploma courses;
- Acquisition of modern training vessels;
- Construction of a laboratory complex at CIFNET, Kochi;
- Setting up of new IC engines, pneumatic and refrigeration laboratories;
- Setting up a new bio-chemistry and processing laboratory;
- Setting up a working model of a marine power transmission system – CIFNET Visakhapatnam;
- Establishing an experimental hatchery unit – CIFNET Kochi;
- Construction of a new hostel complex – CIFNET Kochi;
- Construction of a swimming pool at CIFNET Kochi; and
- Upgradation of the Simulator Centre by adding GMDSS, navigation and fishing simulation software.

CIFNET Trainees onboard fishing vessel

Financing Fisheries Management in India

Yugraj Singh Yadava

At the expert consultation on low-cost fisheries management strategies held in Georgetown, Guyana in September 2007, a paper was presented on the financing of fisheries management in India. Here is a condensed version of the paper.

In the mid-1980s, India undertook a series of reforms to minimize state interference in business and liberalize the economy. The New Economic Policy of 1991 marked a clear shift from pro-planning to a pro-market growth model based on the principles of liberalization, privatization and globalization of the economy.

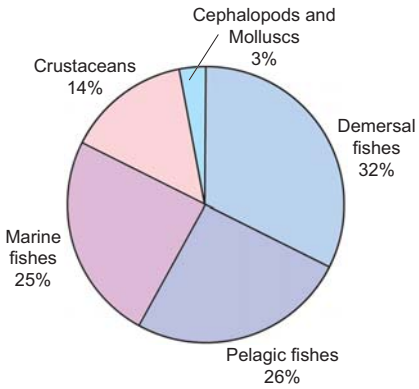
India is now the third largest economy in the world in terms of purchasing power parity (PPP) and the second fastest growing major economy in the world (a GDP growth rate of 9.4 percent for the fiscal year 2006–2007).

Despite industrial development, agriculture is a major economic player. It contributes about 20 percent of the Gross Domestic Product (GDP) and employs about 60 percent of the labour force in the country. (Industry contributes about 26 percent of the GDP and employs about 12 percent of the labour force.). Fisheries is also a major foreign exchange earner, through export of marine products.

Trends in fish production and catch composition

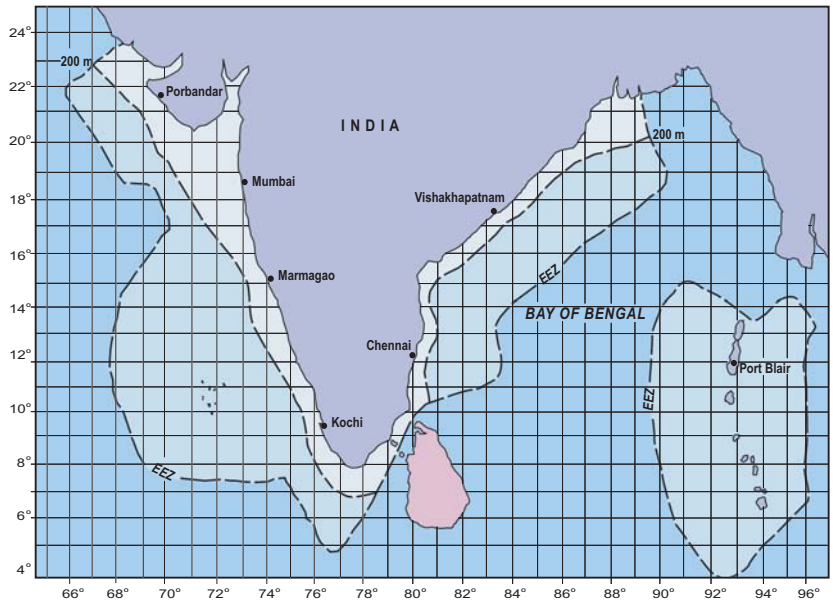
Fish production in India touched the record of 6.57 million tonnes in 2005-06. Marine fisheries contributed 2.82 million tonnes, inland fisheries 3.75 million metric tonnes.

India's marine waters harbour 1 707 species of fish, of which over hundred species are commercially harvested. There have been considerable variations in catch through the period 1950-2005. More species are being harvested, catch composition has changed, some



species have declined. Broadly speaking, during the 1950s and 1960s, Indian oil sardines, natantian decapods, mackerels and Bombay duck constituted the majority (more than one-third) of the landings. But since 1970s, the share of Bombay duck has declined steadily, so have the shares of other dominant species such as clupeids and hair tails. On the other hand, a phenomenal rise

Exclusive Economic Zone of India



occurred in the landings of prawns, shrimps and other marine crustaceans.

Marine fisheries resources

The country has a long coastline of 8 118 kms and an equally large area under estuaries, backwaters and lagoons, etc. The continental shelf area amounts to 5 30 000 sq. kms of which 71 percent area is available in the Arabian Sea (west coast) and the remaining 29 percent in the Bay of Bengal (east coast). After declaration of the Exclusive Economic Zone (EEZ) in 1977, the area available to India is estimated at 2.02 million sq. km, comprising 0.86 million sq. km on the west coast, 0.56 million sq. km on the east coast and 0.60 million sq. km. around the Andaman and Nicobar Islands.

The fish production potential in India as per current estimates is 8.40 million tonnes per annum. Potential yields from inland fisheries and marine fisheries are estimated at 4.50 million tonnes per annum and 3.92 million tonnes per annum respectively. India presently exploits 83 percent of potential yield in inland fisheries and 72 percent of potential in marine fisheries.

Fishing fleet

The marine fishing fleet comprises about 2 80 491 fishing craft of which 2 25 862 are of traditional types (including about 44 578 motorized traditional craft). The mechanized fishing fleet comprises 29 241 trawlers, 983 purse seines, 14 183 gill-netters, 8 862 *dol*-netters and 1 020 other type of boats. As seen by the number of traditional craft and small-mechanized vessels, the major fishing activities are still concentrated in the areas within 0 to 70-80 meter depth zone. As compared to the west coast, concentration of traditional craft (including motorized) is more on the east coast (about 57 % of the total). In the case of mechanized vessels, the trend is reverse. The scale of mechanization is also reflected in the total fish landings of the two coasts.

At the national level, the mechanized sector contributes about 67 percent of the landing. In 1969 it was a mere 20 percent. Motorized sector contributes about 25 percent and the balance 8 to 10 percent is contributed by the traditional crafts. With the advent of mechanization, use of traditional harvesting gear like bag net, cast net, small meshed gill net has declined and more efficient gear like purse seines have became popular.

Allocation of funds to fisheries management

Fisheries management in India is mainly concerned with increasing production both in capture and culture fisheries, R&D support to increase production in a sustainable manner, human resource development, improving the operational efficiency of various schemes, and capacity-building in fisheries.

Until the Seventh Five-Year Plan (1985-1990), the Government was mainly concerned with increasing

Fishing craft operating in the coastal States and Union Territories

Sl. No.	State/ Union Territory	Traditional crafts	Motorized traditional crafts	Mechanized boats	Total
1	Andhra Pradesh	53 853	4 164	8 642	66 659
2	Goa	1 094	1 100	1092	3 286
3	Gujarat	9 222	5 391	11 372	25 985
4	Karnataka	19 292	3 452	2 866	25 610
5	Kerala	28 456	17 362	4 206	50 024
6	Maharashtra	10 256	286	8 899	19 441
7	Orissa	10 993	2 640	1 276	15 854
8	Tamil Nadu	33 945	8 592	9 896	52 433
9	West Bengal	4 850	270	3 362	8 482
10	Andaman & Nicobar Islands	1 180	160	230	1 570
11	Daman and Diu	252	350	805	1 407
12	Lakshadweep	594	306	478	1 378
13	Pondicherry	7 297	505	560	8 362
	Total	**181 284**	**44 578**	**53 684**	**280 491**

Total includes 810 FRP Catamarans and 135 Beach Landing Crafts

Source: Handbook of Fisheries Statistics-2004, Government of India.

fish production and promoting capitalization of the fishing fleet. It was only during the Eighth Five-Year Plan (1992- 1997) that fisheries management figured in the Plan budget.

Management measures being considered include a ban on fishing during the monsoon, standardization of mesh sizes in different categories of fishing gear and conservation of aquatic bio-diversity in accordance with the FAO Code of Conduct for Responsible Fisheries.

Expenditure on fisheries management can be classified into expenditure on various components of management (research, capacity building and human resource development, etc) and allocation of funds to the States/ Union Territories.

Both the Central and State Governments finance fisheries. Plan outlays for fisheries have gone up from Rs 19 600 million (1951-56) to Rs 19 688 150 million (2002-07).

State Government funding is mainly for fisher welfare. Some schemes are funded entirely by State Governments; and for some centrally sponsored schemes, State Governments provide 50 percent of the outlay.

Non-government funding for fisheries management activities

Non-government sources of funds for fisheries in India are mainly external – various regional and inter-governmental organizations, and the UN system (agencies such as the FAO, UNDP, IMO, World Bank).

Institutional finance: the National Bank for Agriculture and Rural Development (NABARD) refinances bank credit for fisheries. Deep-sea fishing and aquaculture have been funded by institutions such as the Industrial Finance Corporation of India, the Industrial Development Bank of India, the Shipping Credit and Investment Company of India, State Finance Corporations and the National Co-operative Development Corporation.

Credit support from financial institutes is available for almost all fisheries activities and for infrastructure creation. But middlemen, merchants and occasional moneylenders continue to play an important role. Liberalization of banking may mean more public finance for fisheries.

Costs of fisheries management

Costs related to MCS and conflict management are said to have increased, although no specific data are available. The government believes that the money directed at MCS is inadequate. The mechanism of cost-sharing for fisheries management is minimal. License fees are levied in the mechanized sector, but fees are low, so are penalties for offences. These sources of revenue are insignificant in relation to the cost of resource management.

Fishermen cooperative societies are exempted from income tax. Two possible explanations are that farmers are exempted from income tax; and that the cost of tax collection in a highly disaggregated sector like fisheries is too high in relation to the possible revenue.

Seafood exporters were exempted from income tax until recently. Now they are charged a fee of 0.3 percent of the FOB value of seafood exports (the fee was 0.5 percent earlier).

Packing fish in ice at Vizag Fishing Harbour, Andhra Pradesh, India

The collected tax is used to finance the MPEDA, and currently stands at about US$ 4 million per annum.

At present, the governments of various coastal States/ UTs license only mechanized fishing vessels. The system of licensing must be extended to motorized and non-motorized craft as well. Licensing will enable an inventory of all categories of fishing vessels. New vessels should be permitted only to replace vessels of equal size and capacity. The priority of licensing should shift from revenue-earning to regulating the number and type of fishing vessels. Licensing will also enable better implementation of sea safety norms in small-scale fishing vessels.

The ability-to-pay mechanism

In theory, an ability-to-pay mechanism is possible in marine fisheries. But politics and the politics of fisher unions are hurdles. A majority of the fishers are small-scale and poor. Non- payment of rent is common, and there is no mechanism in place to penalize defaulters. Result: very little rent accrues from the users of landing and berthing facilities. Because of political compulsions, it is becoming difficult for management bodies to rationalize the fee and fund better maintenance and upkeep of infrastructure facilities such as fishing harbours and fish landing centres.

The role of private players in fisheries management is limited. The Tenth Five-Year Plan document emphasises the importance of private/ public partnership to strengthen the infrastructure, diversify fisheries and aquaculture, and enhance fish production and productivity. Greater investment is also needed to strengthen research and training, post-harvest and marketing structures. More Minor Fishing Harbours and Fish Landing Centres need to be set up.

The private money lender can be a significant player in fisheries management, though he finds no place in management policy. The private moneylender acts as a cushion for fishers and fish farmers during lean periods. Since timely institutional credit is not available, fishers depend mostly on private moneylenders – who serve as inputs suppliers in aquaculture and as wholesale buyers in capture fishery.

In conclusion, the plus points of management in India lie in the modernization of fisheries, particularly aquaculture, in increased fish production (both from inland and capture fisheries and aquaculture), and in greater export earnings. Technology is being made use of for fisheries management; and transaction costs have been going up for conflict resolution, MCS and safety at sea, especially in relation to small-scale fishers.

But there are questions over the sustainability of both capture and culture fisheries in India. Marine capture fisheries confronts the issues of open access and overfishing. Small-scale fishers have still to be pulled out of the poverty trap. Livelihoods are being threatened in many fishing communities along the coastline. The management is largely top-down, although a participatory approach to management is often discussed.

The challenge of today lies in optimal utilisation of resources and in strategies like co-management which can increase the role of fishers and other stakeholders in day-to-day management of fisheries.

Climate Change Impact on Coastal Resources in Sri Lanka*

Sea warming and sea level rise may impact strongly on coastal fisheries and agriculture in Sri Lanka, aggravating the poverty of coastal communities. Sri Lanka cannot prevent climate change, but can adopt mitigation/ preparedness strategies. This study, carried out by the National Aquatic Resources Research and Development Agency (NARA) discusses how climate change will impact on coastal resources. It also identifies several activities to overcome the impact of climate change on fisheries and agriculture – such as culture of seaweed, oyster farming, crab fattening, artificial production of marine ornamental fish, value addition to agriculture and fisheries products, and use of fish aggregating devices.

The coastline of Sri Lanka is about 1 760 km long, the third longest in South Asia. A total of 4.6 million people (about one quarter of the population), lives along the coast. Sri Lanka's coastline exhibits considerable geographic diversity; bays, long sandy beaches, lagoons, dunes, bar built lagoons and estuaries.

It supports a unique ecosystem and serves as base for sensitive habitats such as mangroves, coral reef beds and seaweed beds. The coastal zone is extremely sensitive to changes in climate. It is prone to disasters but also acts as a buffer zone against disaster. Fishery is the major livelihood in the coastal zone. Agriculture is important as well.

Coastal fisheries accounts for almost three quarters of the total fisheries production in Sri Lanka. The fishery sector contributed about 1.2 percent of the GDP in 2006 and continues to be an important source of foreign exchange. In 2006, fishery export amounted to 138 million US $. Prawns, mainly from culture (80%) accounted for 14 percent of the export value from fisheries products. The ornamental fish industry based on coral reefs is rapidly expanding since the early 1990s. The coastal zone supports infrastructure for coastal and offshore fisheries, tourism, recreation, and navigation.

Sea level rise has intensified coastal erosion, siltation of estuaries,

* *This article is based on a report provided by Dr K Arulanathan, Head, Oeanography, National Aquatic Resources Research and Development Agency, Crow Island, Colombo-15, Sri Lanka. Dr Arulanathan can be contacted at arul@nara.ac.lk*

saltwater intrusion into rivers and salination of coastal plains. Increased siltation and reduced fresh water discharge into the coastal zone have enhanced sedimentation on the coastal zone. Anthropogenic activities – such as overexploitation of resources, emission of green house gases, deforestation, ad hoc irrigation, land use changes, sand mining – accelerate the slow processes of climatic change.

A Coastal Zone Management Plan was introduced in Sri Lanka in 1997 to integrate development activities and protect the coastal environment and resources. The Plan has focused primarily on the vulnerability of the coast to erosion. But vulnerability to climate change has not received adequate attention.

Climate system and its components

Climate is an outcome of the exchange of heat and mass between various components of nature. Climate evolves in time under the influence of its own internal dynamics; also by interaction among various components of nature and their physical, chemical and biological properties. The natural components are – atmosphere, hydrosphere (ocean), cryosphere (ice sheets), lithosphere (land) and biosphere. The system is also influenced by external forces such as volcanic eruptions, solar variations, composition change of the atmosphere, land-use change.

Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. In general, 'climate change' is attributable to human activities altering the atmospheric composition, and 'climate variability' attributable to natural causes.

Natural processes and their impacts on climate

Climate change can be classified into 'forcings' and 'feedbacks'. A climate forcing is an energy imbalance imposed on the climate system by natural processes (such as changes in solar energy output, volcanic emissions) and anthropogenic effect (such as emissions of greenhouse gases, aerosols, and their precursors). A climate feedback is an internal climate process that amplifies or dampens the climate response to an initial forcing.

Various hypotheses have been formulated for long-term climate change. But no generally accepted explanation fits all observed characteristics. Some of the hypotheses are:

- Change in Earth's orbit, thus variations in solar radiation (20, 40 & 100 kyr);
- Isostatic readjustments;
- Transition between steady states;
- Non-linear transfer from 20 & 40 kyr;
- Slow CO_2 feedback; and
- Inter-planetary dust.

Over the last 400 000 years the Earth's climate has been unstable, with very significant temperature changes. These changes suggest that climate may be quite sensitive to internal or external climate forcings and feedbacks. But during the last 10 000 years, temperatures have been less varying. Based on the incomplete evidence available, it is unlikely that global mean temperatures have varied by more than 1°C in a century during this period. Records indicate a strong correlation between carbon dioxide content in the atmosphere and temperature.

Geological data indicates that global average sea level may have risen at an average rate of about 0.5 mm/ yr over the last 6 000 years. At an average rate of 0.1 to 0.2 mm/ yr over the last 3 000 years, global warming will lead to a sea level rise of 110 to 880 mm.

Anthropogenic impacts on the climate

Human activities add to nature's influences on climate. Human impacts on the climate system include increasing concentrations of atmospheric greenhouse gases (*e.g.,* carbon dioxide, chlorofluorocarbons and their substitutes, methane, nitrous oxide, etc), air pollution, increasing concentrations of airborne particles, and land alteration.

Since the beginning of the industrial revolution, atmospheric concentrations of carbon dioxide have increased nearly 30 percent, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15 percent. These increases have enhanced the heat-trapping capability of the earth's atmosphere.

While some gases, such as carbon dioxide and methane in the upper atmosphere, create the greenhouse effect associated with global warming, other pollutants, such as sulfur dioxide and nitrogen oxides in the lower atmosphere cool the earth's surface by reflecting sunlight.

Coastal bio-physical features and resources

Sri Lanka's coastal region comprises 74 administrative divisions. They contain about:

- 23 percent of the islands 65 610 km^2 land area, 25 percent of the population, including 65 percent of the total urban population, 70 percent of the tourist hotels, 62 percent of the industrial units and 285 sq. km of lands gazetted as municipal and urban lands;
- Habitats that are vital for ecological functions, maintaining biodiversity and economic activities, especially the coastal and marine fishery; and
- A large number of high priority archeological, historical, religious and cultural sites, as well as scenic and recreational sites.

The coastal fishery accounts for about 68 percent of the coastal and marine fishery, which together provides 88 percent of the total fish production in Sri Lanka. Agricultural lands comprise around

17 percent of the coastal zone, while home gardens comprise about 20 percent.

Fisheries and aquaculture: The Sri Lankan fishery is dominated by coastal fishing. Coastal fisheries are broadly defined as fishing activities taking place in the area of the continental shelf or the fisheries conducted within a day (24 hrs). However, in general, fishing activities within the area of the sea extending up to 40 km from the coast are considered as the coastal fishery. At present, coastal fisheries accounts for 48 percent of the total fish production (with about 121 360 metric tonnes) while offshore and inland and aquaculture contribute 38 and 14 percent respectively.

More than 1 337 fishing villages are scattered along the coastline of Sri Lanka and some 128 400 households live in these villages. The fisheries directly employ over 143 150 fishermen. It is estimated that around 15 percent of the marine landings are from reef fisheries.

The coastal zone is heavily used for fish landings. Sri Lanka has some 752 minor fish landing sites scattered along the coast besides 10 main fishery harbours and 19 anchorages. The total marine fishing family population amounts to 626 940. It is estimated that more than a million people from the coastal community depend on fisheries for their livelihood. The fisheries sector contributes more than SLR 14 440 million foreign exchange through export of marine and aquaculture products.

Mineral resources: Coastal areas contain several types of quaternary deposits among which are sands, sandstone, quartz, gravels, red earth and inland coral deposits. Among the important minerals in coastal areas are heavy mineral sands (Kokilai to Pulmodi, Kuderamali, Trincomalee, Beruwala and Hambantota), Silica sand (Madampe-Nattandia, Vallipuram), salt (Puttalam, Mannar, Elephant Pass and Hambantota). Miocene limestone (Puttalam, Mullithevu,

Jaffna Peninsula), iron ore (Ratgama), and moonstones (Ambalangoda), peat (Muthurajawela). Possible resources include placer deposits, petroleum, gas and shale. As of 1997, US $ 330 million worth of heavy mineral placer deposits were identified on the shallow waters off Beruwala.

Sensitive habitats: Several species of marine mammals and sea turtles and also large numbers of wader birds frequent the coastal lagoons of Sri Lanka. Nearly 50 seabird species have been recorded on the west coast of the Island.

Mangroves cover the near-shore areas of many coastal water bodies. They stabilize the shoreline; their stems and roots trap fine sand and soil particles, forming an erosion-resistant layer. By inhibiting wave damage they provide the coast with buffer against the sea's forces and control runoff, thereby reducing siltation in estuaries and sea grass beds. Mangroves are a major source of food and nutrients to estuarine, lagoons and near shore coastal waters and provide a nursery for the early stages of commercially important crustaceans and fish. Mangroves are widely harvested for subsistence but also for commercial purposes.

Coral and sandstone reefs are common along the coast of Sri Lanka. Coral reefs dissipate wave energy and thus enhance coastal stability by containing erosion. Sandstone reef habitats dissipate wave energy and thus enhance coastal stability by containing erosion and provide habitats for variety of flora and fauna. The most extensive coral reefs in Sri Lanka are the patchy coral reefs in the northwestern coastal and offshore waters, occurring within the Gulf of Mannar, west of the Kalpitya peninsula and on the western and eastern coastal areas.

***Seagrass*:** beds comprise a highly productive habitat that supports many commercially important organisms. They serve as breeding and feeding grounds of marine organisms, and are the main habitat of the endangered dugong. Prominent seagrass beds are found in Gulf of Mannar, Palk Bay and Palk Strait and in several basin estuaries and lagoons. Seagrass beds bind sediment and stabilize the coast against erosion.

Quantifying changes on climatic variables in Sri Lanka

The forecasts for global sea level rise in this century vary considerably, but the Inter-governmental Panel on Climate Change (IPCC) has provided a central estimate of 0.2 m and 0.5 m rise by the years 2050 and 2100 respectively. By 2100 a general shoreline retreat of 25 m is expected, corresponding to an average retreat of 0.25 m per year. However, coastal erosion is controlled by winds, waves, surges, geomorphology and geology. In critical areas coastal erosion rate may vary from 1-13 m/year.

The surface temperature record, as compiled by Jones *et al*., 1997 offers the most convincing evidence of sea surface warming. The global temperature record from 1870 falls into four periods. The first (1870-1910), when urban development and heating standards were modest, shows no definite trend. The second, from 1910 to 1945 showed a temperature increase of about 0.5°C. The third, from 1946 to 1975, showed a fall of about 0.15°C. This

period coincides with the expansion of the aviation industry, with removal of many weather stations to airports, and an expansion of the system to rural areas. The period after 1976 – characterized by rapid expansion of human population, motor traffic and economic wealth – shows a rise of about 0.5°C.

Meteorology

In general, cyclones are generated in the Bay of Bengal during October and November. The mean annual occurrence of cyclones is 0.2, indicating a return frequency of cyclones every five years. Globally, climate change has shown increasing frequency and intensity during the last three decades; however, the trend in Sri Lanka is opposite.

It is believed that human-induced climate change, rather than naturally occurring ocean cycles, may be responsible for the recent global increases in frequency and strength of hurricanes. During the period from 1901 to 1995, 13 cyclones hit the Sri Lankan coasts.

Climate-induced environmental changes

Earth is a warm, wet planet. History provides clear evidence that a warm wet world is optimal for organisms. Ability to cope with the changing climate, habitat and resource is essential for the survival of species. Mobile and adaptable species are the most likely survivors.

Sea level rise induced by climate change and inflow of surface runoff and river inflow may change the physio-chemical characteristics of coastal waters, generating an adverse impact on the coastal fishery and aquaculture. It can cause inundation of low-lying areas, shoreline retreat, saltwater intrusion into coastal water bodies and rivers and sandbar formation at the mouths of water bodies and rivers. The major issues/ problems can be listed as following;

- Enhanced erosion;
- Salination/ salt water intrusion into low lying coastal plains;
- Ecosystem changes (*e.g.* conversion of brackish water into hypersaline water);
- Closing of river mouth – reduced water exchange, accumulation of pollution;
- Tourism – loss of beaches;
- Destruction of sensitive habitats; and
- Destruction/ damage to archeological/ historical, religious and cultural sites.

Biological environment

Seawater rise associated with climatic change means less food, offspring and oxygen for fish populations in addition to changes in rainfall patterns, currents and sea levels. Hotter temperatures are expected to stunt the growth of some fish, resulting in fewer offspring. Normally, fish metabolism speeds up as temperature rises, and insufficient food supplies could slow their growth and reproduction rates. Sudden fish kills have been observed in some enclosed water bodies such as Berai Lake in Colombo during unusually hot days.

Sensitive habitats are fragile, thus vulnerable to climatic changes. Most of the sensitive habitats in Sri Lanka are in different degrees of degradation owing to climatic changes and anthropogenic effects, resulting in decline of resources.

Impact of climate changes on coastal communities

The biological and socio-economic implications of salination and saltwater intrusion on marine and coastal ecosystems caused by sea level rise are extensive. These include reduced biological diversity and productivity, declining land values and reduced revenues from tourism, fisheries and other development activities. Saltwater intrusion into groundwater means less freshwater, including water for drinking, in coastal areas.

Sand mining on the coast increases coastal erosion. River sand mining leads to erosion of river banks and deepening of river beds. The latter leads to intrusion of salt water into rivers, endangering water supply schemes.

Coastal erosion results in loss of beach and landscape quality, damage to private houses, public buildings, hotels and infrastructure. Sea level rises could lead to difficulties for shore-based communities: for example, many major cities such as Galle, Matara and Hambantota already need storm-surge defenses, and would need more if sea level rise accelerates.

Presently, coastal erosion is managed by installing coast protection structures, using setback

Coastal erosion, associated with sea level rise, exerts a profound impact on the beach seine fishery, which contributes about 5 percent of the total fish production, and requires fairly large tracts of beach area for net-hauling and drying.

lines, avoiding development on erosion-prone coasts, and enforcing regulatory mechanisms. The recommendations in this regard are:

- Stop sand mining on beaches and rivers;
- Stop coral mining;
- Promote vegetation and mangrove culture; and
- Promote offshore sand mining.

Fisheries and fishing communities

The impact of temperature rise on fish populations is not adequately known because of lack of long- term research monitoring on the subject. But with coastal fishery resources under pressure because of overfishing, climate changes will likely aggravate the situation to the stage of no recovery.

Larger-scale sea fisheries production is not under immediate threat due to climatic changes. The fisheries most sensitive to climate change are among those most affected by human interventions – such as those in dams, wetlands, coastal areas, manipulated habitats and areas affected by population growth.

Coastal agriculture and farming community

Traditionally, agriculture has been the mainstay of the Sri Lankan economy. It has also provided about 35 percent of the employment and 21 percent of the national output. Almost 72 percent of the population engages directly or indirectly in agricultural activities.

Climate changes predicted as a result of increases in greenhouse gases are likely to impact farming systems. The changes are sea level rise, higher tropical surface temperatures, increased tropical cyclone frequency and severity, and changes in cloud cover and precipitation.

Rising sea levels inundate coastal farmlands, enhance salt-water intrusion, make coastlines retreat and force shifts to more salt-tolerant activities like shrimp farming. Changes in precipitation reduce returns on existing water resources, reduce plant propagation and aggravate plant disease patterns.

The possible impacts of climate change on farming systems include:

Changes in weather pattern*:* The IPCC has stated that the global average surface temperature has increased since 1861. In Sri Lanka the data analyzed for more than 100 years from 14 meteorological stations across Sri Lanka recorded a temperature increase of 0.01°C - 0.036 °C y^{-1} during the last 30 years.

During the same period, rainfall had decreased by 10 to 35 mm across Sri Lanka, except on the northwest coast, where the rainfall had increased by 9 to 17 mm. Precipitation, evaporation and transpiration patterns are not stable or predictable. Flood control, drainage, and irrigation infrastructure have to evolve with change. As sea level rises, low-lying coastal plains, particularly Jaffna Peninsula, are prone to inundation, saline groundwater intrusion and drainage congestion.

Sri Lanka was devastated by the December 2004 tsunami along 1 200 km (68%) of its 1 770 km costal belt. At some places, marauding seawaters intruded 2-3 kilometers inland, damaging most seawater-sensitive crops – not only farm fields, but also thousands of small home gardens where the rural folk grow vegetables and fruit trees. Irrigation and drainage canals within 200 m of the coastline were severely damaged.

Proposed actions and recommendations

Coastal planning should take into account the impacts of climate change – especially sea level rise, higher temperatures, prolonged droughts, severe rainfall, cyclones and storm surges. Integrated coastal zone management is essential for coastal zone planning, management, monitoring and evaluation. It requires close coordination with government agencies and communities. Needed action:

Mariculture/ aquaculture

- Expand aquaculture to increase and stabilize seafood supplies, help stabilize employment, and carefully augment wild stocks (Batticaloa, Kalpitya, Chilaw). Introduce aquaculture, mariculture and fish farming. Potential areas for mariculture are Gulf of Mannar, Koddiyar Bay in Trincomalee, Jaffna and Hambantota.
- Promote culture of seaweed, clams, spiny lobsters. sea cucumber, oysters, bivalves, Cobia (*Rachycentron canadum*), Pompano (*Trachinotus blochii*), Giant trevally (*Caranx ignobilis*), Rabbit fish (*Siganus janus*) – Kalpitya, Rekawa, Batticaloa, Trincomalee.
- Encourage Graciliaria (seagrass) and Eucheumia farming in the open sea and in abandoned shrimp ponds – Dutch Bay, Muttur, Kinnya.
- Promote oyster farming and crab fattening activities – Rumassala, Trincomalee Bay,
- Introduce artificial production of marine ornamental fish in selected coastal districts — Negombo, Beruwala, Chilaw, Bentota, Weligama.

Infrastructure

- Develop resources and facilities for culture fisheries development activities, verification studies, testing feeds. Set up a computerized information system linking major markets, exporters and producers.

Technology transfer

- Transfer technologies for culture of fisheries and seaweeds to communities.
- Introduce fish aggregating devices.
- Set up pilot projects for the culture of Asian seabass, grouper in cages, mud crabs and molten crabs in concrete tanks, mollusks culture in cages and oyster farming.

Socio-economics

- Develop production strategies for culture fisheries.
- Improve market access for marine products including suitable methods of processing and value addition.

- Strengthen the trader-export value chain.
- Promote family/ small-scale farmer approach.
- Strengthen fishery cooperative societies, and increase the participation of women in their activities.
- Increase fish production through the development of small-scale community based production units.
- Promote entrepreneurship development and provide access to technology, technical expertise, information systems, credit and extension services.

Public awareness

- Improve public awareness about fish handling to reduce fish spoilage and improve the quality of fish. This will make possible higher prices for fishers and better living standards.
- Promote awareness on sophisticated methods of fish processing including dry processing and vacuum- packing, through training and better processing facilities.
- Promote habitat conservation.

Management

- Strengthen community participation in the management of coastal habitats.
- Strengthen research on management systems and aquatic systems, leading to innovation.
- In coastal areas, integrate the management of fisheries with other uses of coastal zones.
- Monitor health problems (*e.g.* algal blooms, cholera) that could be aggravated by climate change and harm fish stocks and consumers.

Research Requirements

- Evaluate the potential impact of sea level rise and beach erosion on infrastructures, harbours, anchorages and beach landings.
- Identify erosion trends and formulate appropriate mitigation measures.
- Identify untapped potential for mariculture and aquaculture.
- Carry out biological studies on culture species.
- Identify constraints to increasing volumes and prices of seaweed.

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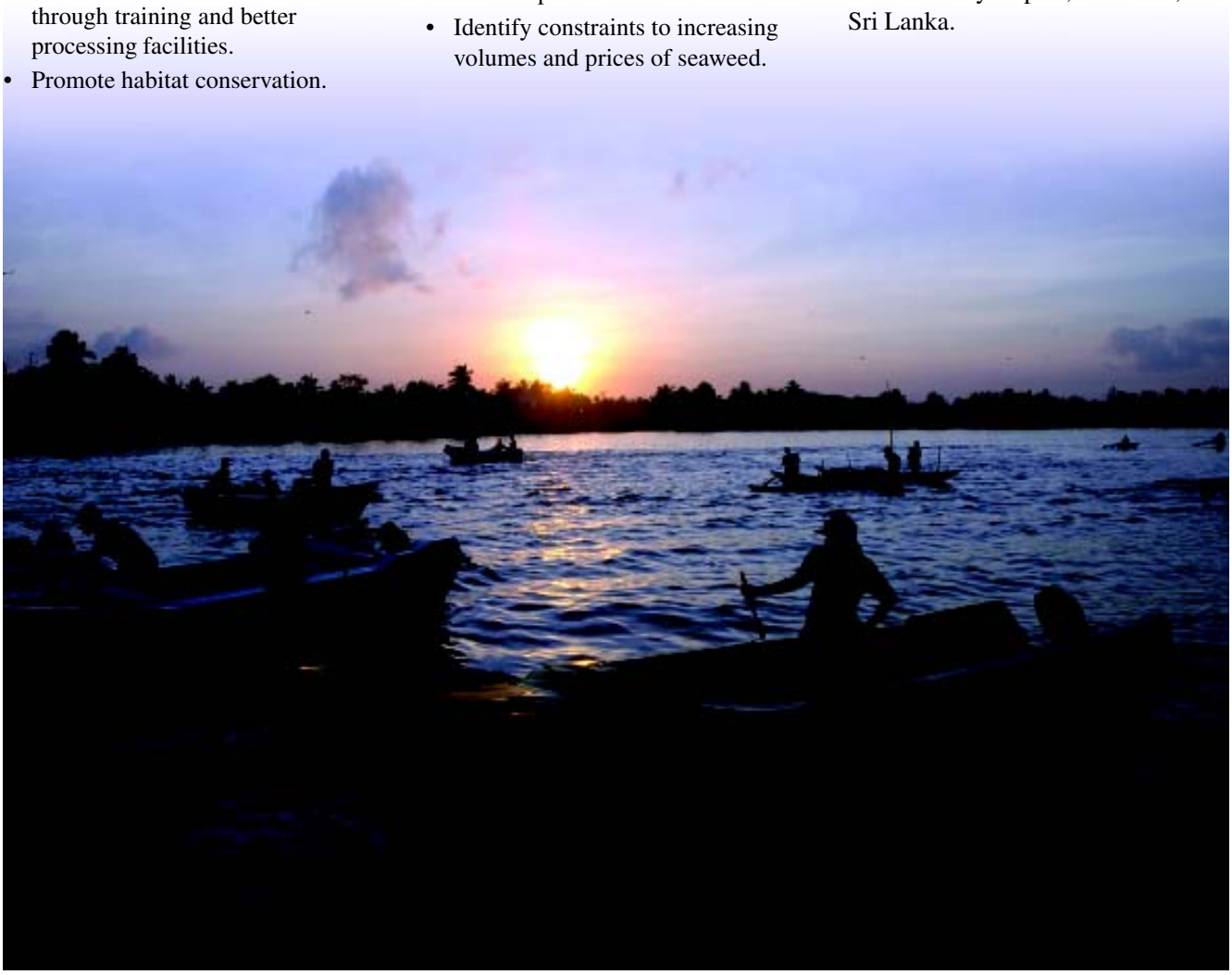

Fishing Harbours and Fish Markets of Japan – A treat to the eyes

Photo Essay by Y S Yadava

A visit to fishing harbours and fish markets in Japan is an exciting experience. Cleanliness and orderliness is amazing and awesome. Facilities are simple but highly mechanized and modern. No compromises are made in the hygienic handling of fish and fish products until they reach the consumers. They set international benchmarks in sanitation and hygiene.

This photo feature, second in the series of articles on Japanese post-harvest infrastructure, provides glimpses into the fishing harbours and fish markets in Hokkaido province of Japan. The first article featured the Metropolitan Central Wholesale Market of Tokyo at Tsukiji (*Bay of Bengal News, Vol IV, No 9, September 2006, pp 21-24*).

The journey to various places of fisheries importance in Hokkaido province was undertaken in September 2007 as a part of the Training Project for Promotion of Community-based Fishery Resource Management by Coastal small-scale Fishers. The International Cooperative Fisheries Organization of the International Cooperative Alliance is implementing the project. BOBP-IGO is one of the partners.

The province of Hokkaido, an important fishing area of Japan, is surrounded by three waters; the Pacific Ocean, the Sea of Japan, and the Okhotsk Sea. It has a 3 045 km coastline which makes up 9 percent of Japan's coastline. There are very productive fishing grounds east of Hokkaido, where a branch of the current from the northward-flowing Kuroshio warm current and the southward-flowing Oyashio cold currents meet. There are also wide continental shelves and seamounts.

Hokkaido houses 14 per cent of Japan's fishers and accounts for a full quarter of the country's

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Fishing port of Notsuke FCA, which is important for the landings of chum salmon Oncorhynchus keta *or Shirozake in Japanese (1-4) .*

HACCP is widely integrated into all the processes – from harvesting to post-harvesting activities (5).

Hakodate is one of Japan's major fishing ports. A wide variety of fishes are traded in the auction hall of the fishing port (6-7).

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total fish catch. The fisheries sector in Hokkaido is a major economic sector of the prefecture, constituting about 15 per cent of the total primary industries production of Hokkaido. In 2005, the total fisheries production including aquaculture from Hokkaido was 1.4 million tonnes, which constituted 24.8 percent of Japan's total national production (5.67 million tonnes). The main fisheries are scallop, salmon, Alaskan Pollack, Atka mackerel and kelp. Hokkaido accounts for almost the entire national production of these species.

The coastline of Hokkaido province is dotted with fishing harbours and fish landing centres. These infrastructure facilities are mostly managed by the Fisheries Cooperative Associations (FCAs) and are highly organized. They offer excellent landing and berthing jetties, auction halls, ice for preservation of fish and other forward and backward linkages for harvest and post-harvest activities.

The FCAs carry out several professional, business and community functions. They take active part in welfare programmes for fishers, such as financial service and health management. They also help out with communications and disaster and crime prevention. FCAs often serve as core centers for the regions.

Japanese are connoisseurs of fish and fish markets play an important role in meeting this dietary requirement. Fish markets abound with varieties of fin and shell fish species and products procured from different parts of Japan and from abroad. They run a riot of colours, tempting the customers. I visited two markets in Hokkaido province – the fish market in Hakodate city and the '*Nijo Ichiba*' (South 2nd Street Market) market in Sapporo city.

The *Nijo Ichiba* is more than 100 years old and was once also ravaged by fire. Today, the retail shops in *Nijo Ichiba* have established a cooperative and the fish market for general consumers and tourists. Many tourists come to visit the market since they can buy almost all kinds of fish and fishery products produced in Hokkaido. *Nijo Ichiba* attracts people not only from within the country but also from neighbouring countries such as Taiwan, Korea, Russia and China, etc.

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Women in fishing communities play multiple roles. They often take part in fishing, sort the fish by species and size after landing and prepare the fish for shipping by loading ice in the fish box (1-3).

Fishery products account for 40 percent of the animal protein intake (20 percent of the total protein intake) of Japanese people (4-6).

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Sri Lanka Workshop Makes Recommendations on Safety at Sea

Several ideas and recommendations emerged from a National Workshop on Safety at Sea for Small-scale Fisheries, held in Negombo, Sri Lanka on 11-12 October 2007. It was organised jointly by the FAO (Food and Agriculture Organization of the United Nations) and the BOBP-IGO, and drew an audience of 44 – from government agencies, fisheries co-operative societies and boatyards. Mr G Piyasena, Secretary, Ministry of Fisheries and Aquatic Resources (MFAR), Government of Sri Lanka chaired the workshop.

After an inaugural session and a technical session, three groups of workshop participants huddled in conclave to discuss three subject areas: (i) Knowledge gaps on safety awareness in fisher communities; (ii) Knowledge gaps on safety at sea initiatives in national agencies; and (iii) Knowledge gaps on safety aspects in fisheries. They adopted three "action points" for implementing a Safety at Sea Project in Sri Lanka:

- All pilot-scale activities will be carried out at Beruwala, a major fishing centre south of Colombo.
- A committee comprising nominees from national fishery agencies, district fishery bodies, fisheries co-operative societies, local leaders of influence, and women from the fisher community, will be formed to oversee the pilot activities.
- A baseline survey will be conducted to assess present knowledge and awareness of safety at sea aspects. The MFAR and the Department of Fisheries and Aquatic Resources (DFAR) will conduct the survey on the basis of a questionnaire prepared by BOBP-IGO for each category of stakeholders. This will serve as a benchmark for monitoring the effectiveness of the awareness campaign.

Mr G Piyasena, Secretary, MFAR speaking at the inaugural session

Inaugural Session

At the inaugural session held earlier, FAO Representative Pote Chumsiri welcomed workshop participants. He said the FAO's close links with the Ministry of Fisheries and Aquatic Resources had been strengthened after the 26 December 2004 tsunami. Both agencies had worked together as a team to restore the livelihoods of fishers and strengthen the industry to 'build back better'.

Mr Piyasena said safety at sea is often neglected in developing countries, particularly in small-scale fisheries, because of inadequate awareness of safety issues, lack of safety guidelines for fishing crafts and methods, poor distress response strategies and infrastructure, and inadequate rules and regulations to address the needs of small-scale fishermen. The FAO's global safety at sea project would address these issues.

Mr R Ravikumar, FAO Regional Coordinator for the South Asia component of the Project on Safety at Sea for Small-scale Fisheries in Developing Countries, said this component would be implemented in cooperation with the BOBP-IGO. Besides, an IMO-FAO Project would focus on Guidelines for the Design, Construction and Equipment of Small Fishing Vessels. Both projects would be funded by the Swedish International Development Agency - Sida.

Mr Ravikumar said the Project would focus on (i) awareness-building to promote a safety at sea culture within the fishing community and other stakeholders; (ii) education and training of trainers, extension workers and fisherfolk to understand sea safety requirements; (iii) introduction of FAO/ IMO/ ILO draft guidelines for design and construction and equipment of small FRP fishing boats; (iv) supporting the elaboration of proposals for implementing safety regulations as part of fishery management measures; (v) review of accidents-

at-sea reporting systems and design of an appropriate reporting and analysis procedure for implementation by appropriate authorities; (vi) promoting gender and HIV/AIDS awareness-raising campaigns in connection with safety-at-sea awareness campaigns; and (vii) promoting adequate representation of women and youth in safety-at-sea work ethics.

Mr Neomal Perera, Deputy Minister of Fisheries and Aquatic Resources, said (in a paper read out by Mr L S Fernando, Chairman, National Institute of Fisheries and Nautical Engineering), that statistics proved that fishing is one of the most dangerous occupations in the world. But existing regulations covered only large vessels and exempted vessels under 24 meters. In most countries, safety education and training are carried out on a voluntary basis, and are not obligatory. It is now argued, he said, that safety at sea should be integrated into the general management of fisheries. He hoped that the new FAO project would move forward initiatives already taken to improve sea safety for small-scale fishermen in Sri Lanka.

In his inaugural address, Mr Felix Perera, Minister of Fisheries and Aquatic Resources (in a paper read out by Mr D R Jayasinghe, Chairman, Cey-Nor Foundation) thanked the FAO for its contributions to fisheries development in Sri Lanka. He recalled that FAO played the leading role in securing over US $23 million for tsunami rehabilitation in fisheries in Sri Lanka. All FAO tsunami-rehabilitation projects had been implemented in close collaboration with his Ministry and its agencies. He thanked the FAO, also the Government and the people of Sweden for helping improve the sea safety of small-scale fishers in developing countries.

Dr Y S Yadava, Director, BOBP-IGO proposed a vote of thanks.

Technical Session

Four presentations were made in the technical session. Mr H S G Fernando, Director-General (Development), MFAR, discussed the 'Current status of safety-at-sea initiatives in fisheries'. He said fishing boats in Sri Lanka had increased in number by 35 percent after the tsunami. The highest increase was in motorized traditional craft (175 %), followed by multiday boats (66 %) and FRP outboard boats (54 %). But the number of day boats had fallen by 23 percent.

Providing an overview of fishing-related accidents at sea, Mr Fernando said that the number of accidents had fallen from an average of 32 per year during the period 1994 - 2001, to 10-20 per year during the period 2002 -2006. He said the major causes of

accidents at sea were drifting, collision and capsizing and sinking. Inferior quality of engines and bad installation, poor operation and maintenance, lack of practical knowledge on trouble -shooting, non-availability or non-operation of navigational lights, loss of stability, crew fatigue and operation in the rough sea were some of the major reasons for the accidents in Sri Lanka.

He said effective approaches to safety at sea should rely on three lines of defense – prevention (the most reliable and cost-effective method); survival and self-rescue; and Search and Rescue (SAR), the most costly approach.

He said legislation is necessary on vessel standards and specifications, vessel design and construction, safety training, etc. Community training programmes for promoting safety at sea, community participation and insurance schemes for fisher communities were essential.

Emphasizing the need to make safety at sea an integral part of fisheries management, Mr Fernando said the Government of Sri Lanka had taken initiatives to draft the Fishing Boat (design, construction and equipment) Regulations and the Fisheries and Aquatic Resources (Amendment) Bill. The recently established 'Vessel Survey Unit' of DFAR should be strengthened. Safety training courses for skippers of multi-day boats and awareness programmes to inculcate a safety culture among fishing communities were two other suggestions he made.

Commander Kalana Jinadasa of the Sri Lanka Navy presented an 'Overview of Search and Rescue Operations and recommendations'. He said the 1979 SAR Convention was designed to provide a global system for responding to emergencies, while the GMDSS was established to provide it with efficient communication support. Both the GMDSS and SAR are crucial to maritime safety and are designed to ensure that any emergency at sea will result in a distress call.

The Convention outlines operating procedures to be followed in the event of emergencies or alerts and during SAR operations. The Convention has divided the world's oceans into 13 areas for search and rescue purposes. Parties to the Convention are required to ensure that arrangements are made for adequate SAR services in their coastal waters. The Government of Sri Lanka is yet to ratify the Convention.

Commander Jinadasa said that SAR is a costly operation. Search by air is the most effective method, but it can be prohibitively costly. One of the cost-effective ways to implement SAR is to form local safety-at-sea organisations. They can be set up nationally and help to conduct awareness campaigns, safety courses, fund-raising and lobbying. They can also provide volunteers to take part in SAR when the need arises.

A presentation on 'Overview of Standards and Procedures followed in Design Construction and Equipping of Fishing Vessels in Sri Lanka' was made by Mr G J D W Dayananda, Marine Engineer, DFAR. He said that fishing vessels in Sri Lanka are built in more than a hundred boatyards scattered in the coastal areas of the country. Every boatyard ought to be registered with the DFAR after fulfilling stipulated conditions relating to infrastructure facilities, compliance with industrial safety regulations, environmental clearance, etc. It should exercise quality control procedures – such as regularizing temperature and humidity, maintaining workshop machinery and tools to suit construction.

Mr Dayananda said that DFAR is enforcing standards but in a legislative void. The void was exploited by boatbuilders after the tsunami. They set up a number of boatyards and constructed inferior boats. Since regulations had now been drafted with FAO help, enforcement would be much easier. The DFAR needed capacity-building and further strengthening to meet the changing requirements of the boatbuilding sector.

Mr Shanta Bhandara, Director, MFAR, made a presentation on **'**Strategy for building awareness within the fisher community for developing a sea safety culture'. He said that Sri Lanka has 2 637 marine fishing villages and some 200 000 fishers (including inland fishers). If trade/ service/ input suppliers and those who depend on their livelihoods for fishing are added, the total number would go up to about 2 400 000. Thirty six national and international NGOs are active in fisheries in the country.

He stressed the importance of fisheries co-operative societies – which function as a community organization: to carry out fisheries development schemes, promote thrift in the fishing community, implement credit schemes, mediate conflicts among fisherfolk, help implement management plans and serve as community mobilizers.

Mr Bhandara urged formal training for field officers (training of trainers), and for fishermen as well, on safety at sea. The training needs should focus on IMO guidelines, on the FAO manual relating to safety of fishermen, and on DFAR regulations relating to safety of fishing vessels. The awareness programmes should be conducted at fisheries harbours, anchorages and fish landing sites and also at the general meetings of fisheries societies. Extension methods would include short documentary films, posters, notices, radio programmes, cartoons and leaflets. Stickers could be put up on fishing boats.

Mr Piyasena hailed the success of the workshop and thanked the BOBP-IGO for organizing it.

Ideas Abound at Sea Safety Workshop in Chennai

Forty three persons took part in the National Workshop on Safety at Sea for Small-scale Fisheries, held in Chennai on 3 - 4 December 2007. They represented the Ministry of Agriculture; the Coast Guard; the coastal States of Andhra Pradesh, Orissa and Tamil Nadu and the Union Territory of Puducherry; fisheries education institutions; fisheries associations; fishing boat manufacturers; NGOs; the National Institute of Occupational Safety and Health (NIOSH) of the United States; the Food and Agriculture Organization of the United Nations (FAO) and the BOBP-IGO.

Mr Ajay Bhattacharya, Joint Secretary, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, chaired the workshop.

Welcoming participants, Dr Y S Yadava, Director of BOBP-IGO, said the workshop took forward two earlier initiatives – the Chennai Declaration on Safety at Sea for Small-Scale Fishers (October 2001) and the Third International Fishing Industry Safety and Health Conference (February 2006).

Mr Per Danielsson, Fishery Industry Officer (Safety at Sea), Fishing Technology Service, FAO Rome, briefly explained the objectives of the South Asian component of the Global Project on 'Safety at Sea for Small-Scale Fisheries'. He said the project aims at improving the livelihoods of small-scale fishing communities by reducing the number of accidents at sea. It will implement a whole gamut of safety-related activities, such as awareness-building to promote a safety-at-sea culture in fishing communities; education and training to understand sea safety requirements; guidelines for design and construction of small FRP fishing vessels; appropriate reporting systems for accidents at sea; and adequate representation for women and youth in promoting safety-at-sea work ethics.

Mr Bhattacharya said the Government of India is implementing an insurance scheme that provides some relief to a fisher family in the event of death or permanent disability to the earning member. Tamil Nadu utilizes a substantial part of the assistance provided under the scheme, he said. He suggested that accidents statistics should be analyzed so that it could be ascertained why more accidents are reported from Tamil Nadu than from any other coastal state.

Mr Bhattacharya said that sea safety continued to pose problems despite a few measures – construction of 30 patrol boats during the mid-1990s, and the setting up of a Coastal Security Wing in Tamil Nadu under the control of an Additional Director General of Police, and an active Indian Coast Guard. He promised full government support to the project, and said the government would carry its lessons to other states.

Mr R Ravikumar, FAO Regional Project Coordinator- South Asia for the Safety at Sea Project, made a presentation on 'A Holistic Approach to a Safety-at-Sea Programme'. He said that neglect of safety at sea resulted from inadequate awareness of its importance; lack of safety guidelines for fishing craft and methods; poor distress response strategies and infrastructure; and inadequate rules and regulations in small-scale fisheries.

He said the regional project would be complemented by an IMO-FAO project relating to Recommended Guidelines for the Design, Construction and Equipment of Small Fishing Vessels.

Mr Ravikumar said that training and awareness campaigns for fishers must address a number of issues such as (i) understanding the service limitations of fishing vessels and occupational hazards; (ii) use of life-saving appliances and communication devices; (iii) survival at sea; (iv) hull and engine maintenance; (v) pre-voyage and post-voyage checks; (vi) awareness of national and international rules & regulations; (vii) weather warning mechanisms; (viii) distress response

Mr Per Danielsson, Fishery Industry Officer, FAO speaking at the inaugural session

protocol; (ix) reporting of accidents; (x) life and vessel insurance; and (xi) community role in developing a sea safety culture and community health programmes.

He also said that skippers of boats that are equipped with GPS and VHF must be well-versed in using such equipment. All fishers need to be trained in rescue at sea. Boatbuilders must be made to understand the need for technical guidelines for fishing vessel construction and must be trained to adopt good boatbuilding practices.

Mr Ravikumar said that the Merchant Shipping Act, which came into being in 1958 largely focusses on fishing vessels above 24 meters. Smaller fishing vessels are presently not being attended to. Consequently, they do not conform to any particular standard.

It is imperative that a set of technical guidelines for fishing vessel design, construction and equipment should be made available, Mr Ravikumar said. He also said that safety at sea must be integrated into the general management of fisheries in all coastal states.

Discussing the project's approach, he said the first step would be to assess knowledge gaps among all stakeholders – the fisher community, government agencies and the service sector – besides assessing mechanisms already in place that may need improvements. The next step is to design an awareness campaign and develop technical guidelines for fishing vessels and fishing operations.

Mr Arvind Kumar, Commissioner of Fisheries, Andhra Pradesh, made a presentation on 'Safety at Sea Aspects of Small-Scale Fishermen of Andhra Pradesh'. He said that according to a 2005 census conducted by the Central Marine Fisheries Research Institute (CMFRI), the State's marine fisher population is approximately 0.51 million, including an active population of 0.138 million fishers spread over 498 coastal villages.

The marine fishing fleet comprises 2 541 mechanized, 14 112 motorized and 24 386 traditional boats. Increase in effort, particularly by the mechanized fishing fleet, had reduced catches in recent years.

Mr Kumar referred to the FAO-TCP project on Sea Safety Development implemented during 1997-1999, following the November 1996 killer cyclone of Andhra Pradesh. Under this project, radio transmission towers were set up at two locations; 100 VHF sets, 100 FRP life floats, and engines were supplied for search-and-rescue (SAR) operations; fisheries staff were given training; the capacity of the Department of Fisheries (DoF) was strengthened; Storm Safety Action Groups (SSAGs) were set up in the 30 most vulnerable villages, and equipped with a transistor radio, bicycle, first aid kit, mega phone, rain coats, gum boots, torch lights, etc. Contingency plans were prepared for these villages.

Mr Kumar said that after the success of the pilot project, the government extended its activities to other districts of the State. As a result, 12 shore stations were established, more SSAGs were formed, and training was provided at the State Institute of Fisheries Technology, Kakinada. The reduction of fishing-related deaths at sea in succeeding years reflected the project's success.

Mr Kumar said that mechanisms like registration, certification and inspection, carried out for larger fishing vessels, do not exist for small country crafts. Communication and navigation equipment on small-scale fishing vessels are inadequate. Construction standards are poor too.

Mr Kumar stressed the need for accurate weather bulletins that reached fishers on time; development of safe landing and berthing places along the State's coastline; a registry of fishing boats and crew. SAR effort is often jeopardized by delays in receipt of information about missing fishers, he said. In the absence of vital information, it's difficult for the Coast Guard to focus its SAR operations.

He said that to integrate safety at sea with the larger issue of fisheries management, a holistic approach would be required, encompassing the socio-economic uplift of poor small-scale fishers.

Mr Shambhu Kallolikar, Commissioner of Fisheries, Tamil Nadu spoke on 'Safety at Sea Aspects of Small-scale Fisheries of Tamil Nadu'. He said Tamil Nadu has 13 coastal districts. Its 1 076 km coastline is unique because of three distinct zones: the Coromandel Coast, the Palk Bay and the Gulf of Mannar. The total marine fishermen population of Tamil Nadu is 0.81 million. Against an estimated marine fisheries potential of 0.72 million tonnes, the fish production in the State is 0.392 million tonnes. The fishing boats are varied; they include wooden and FRP catamarans and vallams, and mechanized fishing boats.

Mr Kallolikar said that mechanized boats in Tamil Nadu had been registered and licensed for fishing nearly a decade ago. To assess the exact strength of the fleet after the 26 December 2004 tsunami, a new re-registration process was taken up by the DoF. Following this exercise, the total number of fishing crafts of various categories registered in Tamil Nadu was estimated at 44 688, Mr Kallolikar said. Identity cards have also been issued to 2 18 566 fishers.

On accidents at sea involving fishers from Tamil Nadu, he said that during the period 2001-2006, 64 fishers died and 55 were reported missing. To improve safety at sea, a subsidy of 25 percent (up to a maximum of Rs 30 000 per vessel) was provided by the government for fixing VHF and GPS units in mechanized fishing vessels below 25 meters in length. The state government had provided 50 VHF sets and 10 GPS on a trial basis to mechanized fishing vessels. A proposal for providing seamless

communication to all fishing crafts is being considered. Rules have been formulated for the safety of deep sea vessels.

Mr Kallolikar detailed the training being imparted by the DoF on various aspects of safety at sea, navigation, operation and maintenance of engine, etc. He also mentioned the supply of life-saving appliances (life jackets, waterproof lanterns first-aid boxes, etc) to fishers under various programmes; the role of the DoF and other State agencies in disaster mitigation; and response and insurance coverage for fishers and fishing vessels.

Mr Hasan Manikfan, Director, Central Institute of Fisheries Nautical and Engineering Training (CIFNET), briefed the audience about the 'Role of CIFNET in Training of Seafaring Fishers'. Mr Manikfan said that CIFNET had a well-equipped nautical division, marine engineering division, and a craft and gear division, to train fishers.

He said that CIFNET conducts regular courses for those who man fishing vessels. These include a Mate Fishing Vessel Course and an Engine Driver Fishing Vessel Course, both upgraded now to 24 months from 18 months; and a four-year degree course in Bachelor of Fisheries Science (Nautical Science). The institute also conducts ancillary courses, statutory courses, refresher courses and short-term courses in different fisheries disciplines, plus a number of short-term programmes.

Mr Manikfan said that basic safety training should be provided to all fishing vessel personnel before being assigned to any fishing vessel. The training should be based on an analysis of the prevailing needs and conditions in each particular area. He proposed a simplified course for training small- boat fishers at the village level.

Mr Oyvind Gulbrandsen, FAO Consultant spoke about 'Status of Fishing Boats on the East Coast of India'. He said that communication is the key to sea safety. Nowadays even small-scale fishers carry mobile phones, GPS, etc. Bigger fishing vessels carry echo sounders & VHFs. "We know the limitation of mobiles, but it is better than nothing. Very few fishers had these 10 years ago", he said.

Mr Gulbrandsen pointed out that navigation lights were either missing or defective in 80 percent of fishing vessels. "Very few fishers use life jackets or life floats. The smaller crafts are our biggest challenge. The wooden catamaran may look primitive, but it cannot sink regardless of the danger. But the new FRP catamarans are defective and vulnerable to danger." He said that 25 years ago BOBP had introduced FRP boats (the IND-20) on the east coast. Today, they are scattered everywhere in Tamil Nadu. "Thousands of boats are being built by inexperienced people. FRP has come here to stay. But FRP is not a good material to take abrasions and many boats can be seen with cracks that need patches."

Mr Gulbrandsen was critical of the 'long-tail' system of propulsion in boats. "These are not suitable for the surf-beaten coast. Lots of deaths and injuries are taking place; some protection around the propeller is essential. The BOBP-liftable propulsion system – the bellow drive – is a much safer option," he said.

In a brief presentation, Dr George Conway, Director, Alaska Center of NIOSH, USA, recalled that mortality among fishers in Alaska was high because safety measures were lacking. But once the causes were examined and interventions made, the fatalities and accidents reduced significantly. Alaskan fisheries today are a good example of safety at sea. "It is worthwhile to examine whether the Alaskan experience can be exported to other parts of the world."

In a question-answer session that followed the technical presentations, Commandant B P Singh, Chief Staff Officer, Indian Coast Guard (Visakhapatnam Base), said that on the Andhra coast, 11 SAR operations were carried out during the previous 12 months (each operation lasting 72 hours) at a cost of approximately Rs 0.5 - 1.0 million. Twenty three fishermen had been rescued. He urged that boats should have a uniform system (design, colour, etc) for display of boat registration numbers. FM Radio can be a useful tool in the hands of fishers. "Since fishers are not the actual boat owners, their safety is compromised. The Coast Guard comes in late, often very late".

Participants raised the issue of insurance coverage for fishers, suggesting that it should be raised to a million rupees. Fishing vessels should be provided with life time insurance coverage.

After the technical sessions, participants formed three groups to discuss three topics: (i) knowledge gaps in fisher communities on safety awareness; (ii) knowledge gaps in national agencies on safety at sea initiatives; and (iii) knowledge gaps in the service industry on safety aspects for fisheries sector.

Mr Jagan Seshadri, Additional Director General of Police, Coastal Security Group, Tamil Nadu, chaired the discussions on group presentations.

Participants said cell phone companies should be persuaded to increase the seaward range of mobiles.

Mr Vijay Boda, President, RESTORE, urged a comprehensive and sustained examination of the health of fishers. It was suggested that health camps should be organized for fisher communities, and that a first aid clinic should be set up in each fishing harbor. Participants also emphasized the need to establish a formal mechanism to report accidents at sea, and to formulate an action plan to integrate safety at sea with fisheries management.

(Continued on page 42)

Marine Fisheries Academy, Chittagong

Oceans are repositories of wealth. They provide fish for food besides minerals, chemicals, oil, gas and energy resources.

To tap the resources of the Bay of Bengal, the Government of Bangladesh decided in December 1971, soon after its independence, to establish a professional training institute that would turn out skilled manpower.

Consequently, the Marine Fisheries Academy (MFA) came into being in Chittagong on 01 September 1973, with assistance from the former Soviet Union, as a project of the Bangladesh Fishery Development Corporation (BFDC). The only professional and national-scale training institution for fishery officers, the MFA provides skilled navigators, engineers and processing technologists for fishing fleets and fish processing industries.

The Academy's 10-acre campus sits on a beautiful landscape on the southern bank of the river Karnaphully, opposite to Sadarghat, Chittagong. It is about 10 km away from the Chittagong city center and about 350 km from Dhaka, the capital.

Since inception, the Academy has been training seafarers and fishers. It came under the direct administrative control of the Ministry of Fisheries and Livestock from 01 July 1993.

The MFA's facilities

The Academy has 17 officers and 46 staff and is headed by the Principal. It is equipped with an administrative-cum-training block, an academic block, marine workshops, a parade ground, and laboratories for physics, biochemistry, biology and information technology. It also has accommodation for cadets and officers, an inspection bungalow, plus a unique fish museum with some 375 types of fish species. This infrastructure is being expanded.

Mandate and vision of MFA

- To produce skilled manpower in the areas of navigation, engineering, food processing and preservation and thereby increase the harvest of fish, shrimp and other commercially viable sea animals; overcome the protein deficiency of the population; and earn foreign exchange through export of sea food.
- To organise human resources in the areas of navigation, gear technology, marine engineering, fish processing & quality control, so that they meet the growing demands of marine fishing in Bangladesh and elsewhere.
- To explore and harvest the country's marine resources and overcome protein deficiency.
- To assist friendly countries by helping train their cadets.
- To provide IT knowledge to the trainees.
- To increase the job opportunities of the cadets at home and abroad by enhancing their IT learning.
- To contribute to the national economy through trained human resources.
- To alleviate poverty, diversify exports, influence the policy environment.

Course & curriculum of MFA

The MFA is affiliated with the National University of Bangladesh. The university has designed the course and the curriculum for the academy's 3-year bachelor degree course. The academy at present has 144 cadets; 48 are recruited every year, of whom 20 are allotted the nautical branch, 20 others the marine engineering branch; eight take up marine fisheries.

Subjects for the nautical course: principles of navigation; ocean & practical navigation; terrestrial and coastal navigation; meteorology; general ship knowledge; engineering knowledge; electro-navigational aids; watch keeping; seamanship; signals; ship safety, environmental protection & personal care. In addition, general

Investiture ceremony at the Academy

English, physics and mathematics are taught to meet the requirements of the National University; physical training and parade training are conducted regularly.

The marine engineering course encompasses subjects like mechanics and hydrodynamics; thermodynamics and heat transfer; general engineering knowledge (general & motor); engineering drawing; marine engineering repair & mounting works; marine electro-technology; naval architecture and ship construction; ship safety, environmental protection & personal care. Besides, general English, physics & mathematics are taught to meet the university's academic requirements. Physical training and parade training are also compulsory.

The marine fisheries course includes elements of marine fisheries; coastal aquaculture; applied fisheries (fishing gear & resources management); fish processing engineering; quality control & HACCP management; seamanship; signals; ship safety, environmental protection & personal care. Besides, general English, general zoology and bio-chemistry are taught to meet the requirements of the National University. These cadets, like those of the other two courses, undergo physical and parade training.

All three courses are conducted together with practical work, industrial training and regular field work, as designed by the curriculum body set up by the National University. The course curriculum could be revised from time to time by the board.

Recent achievements of MFA

The course curriculum of the nautical and marine engineering branch has been so designed that cadets are fully equipped to serve both fishery and merchant vessels. Considering the pressing demand for marine officers all over the world, the cadets of MFA are this year being issued with the Continuous Discharge Certificate (CDC), which will facilitate jobs in merchant vessels as well.

Cadets in the Academy's laboratory

To keep pace with technological developments, MFA cadets will be trained in IT. A new IT laboratory with 25 PCs has been established.

The Government has authorized the MFA to train three foreign cadets along with local cadets. From the session starting in 2009, the MFA is expected to receive three overseas cadets from SAARC countries.

Foreign collaboration

To develop infrastructure (like a swimming pool, various simulators, a drill shed for use in wet weather) and to update the course and curricula, the Academy has been trying to obtain collaboration with JICA of Japan. It hasn't succeeded so far. The MFA is still looking for a collaborator.

The MFA and nation-building

In a nutshell: the MFA's output of skilled manpower strengthens the country's capabilities in navigation, marine engineering and fish processing and preservation. It increases production of fish, shrimp and other commercially viable seafoods, and strengthens food and nutritional security.

– Capt. M Makbul Hossain
(Principal, Marine Fisheries Academy)

Bay of Bengal News is a quarterly publication of the BOBP-IGO. Readers are invited to send their views and experiences on development of sustainable coastal fisheries in the countries surrounding the Bay. We also solicit scientific/ popular articles on subjects related to coastal fisheries management. The articles should not exceed 4-5 typed pages and preferably with good illustrations/ colour photographs. Scientific articles will be subject to peer review and edited before they are published.

– Editor

Negombo Revisited

Photo Essay by S Jayaraj

Nearly 27 years ago, the third issue of ***Bay of Bengal News*** (December 1981) carried a feature on "Negombo, yesterday, today and tomorrow" by journalist Neville de Silva. He said that despite the thriving fishing activity, government assistance and a booming tourist industry, "much remains to be done".

Negombo is synonymous with Sri Lankan fisheries. At one time, traditional fishing craft (such as teppams and orus) dominated Negombo. Today, you see greater variety. There are some 400 multi-day boats and 129 single-day boats, some 1 845 fibreglass boats with outboard engines, 2 024 non-motorized traditional crafts, and 34 beach seine boats. As many as 22 fishing methods have been identified. The fish produced includes lobster, tuna, prawn and a variety of small species. The productivity of the Negombo lagoon is high, there is a moderate shrimp and finfish fishery, tuna is captured, so are crabs and many food fish species. Some of the poorer fishermen collect ornamental fish too.

But Negombo's 65 000 strong fishing community (13 000 fishing families) is likely to say, like citizens everywhere, "much needs to be done." Management is the need of the hour. Community-based fisheries management would be ideal, considering that the fishers of Negombo are by and large aware and well-informed.

Fish are auctioned on the beaches, also sold in fish markets (Negombo has Sri Lanka's second largest fish market). Most of the fish vending is done by women. They don't go out to fish but are active in processing and marketing, and run their families as well.

Negombo is also known for tourism as much as for fisheries. Its beaches lure tourists into spending a day or two there – to observe the daily fish auctions, meet the colourful fishermen, go on fishing trips into the lagoon, take part in water sports or diving, or gaze at varieties of fish around coral reefs. Some stretches of the beach house hotels, the rest are busy with fishermen.

The pictures in this photo feature provide glimpses of Negombo's thriving fishing community.

"Fisher Safety – there's a long way to go" — *Roger Kullberg*

Roger Kullberg, 44, left his small island residence in an archipelago outside Gothenburg, Sweden, to join the FAO's Safety at Sea project for small-scale fishing vessels (South Asia) at BOBP-IGO as Fishery Officer in September 2007. The assignment is till December 2008.

Roger studied business administration at the University of Gothenburg, then fisheries management, biology and technology at the same university. He attended several courses on safety at sea, both on his own and through the Swedish Maritime Administration.

Roger has worked in the Bay of Bengal region earlier. Nearly 20 years ago, he did a three-month "Minor Field Study" on bycatch from shrimp trawlers operating in Andhra Pradesh. One recommendation from the study was to reduce bycatch by introducing more selective trawl gear. The study was carried out by BOBP in collaboration with the Swedish Board of Fisheries.

The cheerful, ever-smiling Roger talked to ***Bay of Bengal News*** about his previous jobs and the present one.

Q: I understand you came to BOBP from the Swedish Maritime Administration. What were your duties there?

A: I was a Vessel Traffic Systems Operator. My work related to port management and vessel traffic management. I supervised logistics and vessel crew, and coordinated pilot vessels and tugboats. Safety-at-sea activities on the west coast of Sweden were also part of my work.

Q: Can you elaborate on your safety-at-sea activities?

A: I worked in close co-operation with the Maritime Rescue Coordination Centre. I know about IMO regulations and guidelines such as SOLAS, MARPOL and STWC, as well as the Code of Safety for Fishermen and Fishing Vessels. I have long experience with both distress communication and regular VHF communication using IMO's standard marine communication phrases.

I have also helped develop our communication systems with fishing vessels and various clients. I'm familiar with vessel construction, design and stability.

When I was a fisherman in November 1995, the vessel I worked on sunk in the Baltic Sea. I was off that week. The crew of four managed to survive in the cold water because of immersion suits – without which they may have died. (Fishers are expected to carry these suits with them, but they are worn only in an emergency.)

At that time, safety courses for fishermen were not mandatory. But they became mandatory – at the urging of women from the fishing communities – after some more accidents occurred.

Equipment by itself doesn't ensure safety. You may have all the equipment in the world, but without awareness and training, you aren't safe.

Q: You have been a teacher as well. Where?

A: I prepared and conducted training, education and awareness programmes on fisheries among students. I also served as a part-time lecturer at a fisheries high school in Öckerö, Sweden. My main topics were fisheries technology, fisheries management and safety at sea.

Q: Please tell us about your experience as a fisherman.

A: Between 1988 and '99, I worked at various places in both industrial and small-scale fisheries – in

Roger Kullberg

Sweden, Norway, Denmark, Latvia, Scotland, Morocco in West Africa. I served as commander, first mate deck hand, engineer and fisherman. I engaged in trawling, purse-seining, longlining, netting, trapping and Danish seining. I worked in the Baltic Sea, the North Sea, the North Atlantic, the Atlantic outside West Africa and in the Bay of Bengal.

Q: What will your duties be in your present job in Chennai?

A: I am settling into my present job in the Bay of Bengal region. I made a field trip to Bangladesh in the second half of January and took part in workshops in Chittagong on safety at sea and on MCS (monitoring, control and surveillance). I visited Kuakata, where I met fishers affected by a severe cyclone in November. I also visited Barisal, Mahipur and Patuakhali. The fishers generally lead a tough life, they don't have either safety equipment or training. A pilot project on safety may be introduced in Cox's Bazaar, Bangladesh

My duties, in co-operation with the FAO project coordinator and the BOBP-IGO director, will be to develop and improve accident reporting and analysis systems, recommend better distress communication systems, conduct baseline surveys to review the design, construction and status of small fishing vessels in the region, help organize workshops, assist member-countries in improving fisheries management systems.

We need to make the fisherman's working environment safe and comfortable.

There's a long way to go!

Gulbrandsen Re-visits Fisheries Centres of South India

Oyvind Gulbrandsen was profiled by ***Bay of Bengal News*** 27 years ago – in the very first issue of BBN (January 1981). That article focused on Gulbrandsen's work as consultant in designing BOBP's beachcraft development programme, which was a major activity during the Programme's first decade.

That article described Gulbrandsen's early work for the FAO in designing boats in Western Samoa, and his travels all along India's east coast in March 1979 to study the small-scale fisheries scene as preparation for designing a beachcraft programme for small-scale fishers.

R Ravikumar, then BOBP's fishing craft specialist, said of Gulbrandsen: "I admire the meticulousness with which Oyvind studies the local ethos, the local environment and capability before starting a design. There is always a sound rationale for his decisions."

Fast forward to November 2007. Oyvind Gulbrandsen revisited Puri, Visakhapatnam, Kakinada, Cuddalore and Tuticorin in India. He also visited Negombo, Beruwala and Galle in Sri Lanka. His tour was to study the status of safety of fishing vessels, identify key problems, and collect baseline information for the IMO component of the ongoing FAO-SIDA safety at sea project, being executed under the BOBP-IGO umbrella.

He met scores of fishers, boatbuilders and officials with whom he had worked in the past for BOBP. Gulbrandsen will use his observations and findings to prepare technical guidelines for fishing vessels in India and Sri Lanka – an update of his very popular "Safety Guide for Fishing Boats" BOBP/MAG/16.

A traditional Andhra boat with an outboard motor fitted with long-tail propulsion unit

Tuticorin, Tamil Nadu fishers back from a good fishing trip

Mr Gulbrandsen inspecting a FRP boat in Chinna Neelangarai, Tamil Nadu

"It is always a joy to come here," said Gulbrandsen. "Fisherfolk in this part of the world are the most friendly and happy people that I have encountered anywhere." Gulbrandsen took masses of photographs of fishers and fishing boats with his compact Fuji 8 mega pixel digital camera to visually document his findings.

He spoke about what he saw and learned on his east coast tour at the National Workshop on Safety at Sea organised by BOBP-IGO in Chennai on 3-4 December, 2007.

"Imagine fishers battling strong waves and rough weather on a dark night. It's a tough life," Gulbrandsen observed. "We must make his life easier and safer, and of course prevent him from drowning."

"I was here last after the 1996 cyclone hit Andhra Pradesh and more than 500 fishers were killed. Since then, there have been some positive steps. A key word is communication. Even small-scale fishers carry mobile phones. These have their limitations but are better than nothing. They are useful when fishers have to be warned about approaching cyclones."

Gulbrandsen said he noticed that trawlers in Andhra Pradesh and Tamil Nadu have some equipment such as echosounders. But there were no navigation lights, very few life floats, not a single life jacket. "Formulating sea safety regulations is important, but there is no point if they are not implemented, Gulbrandsen noted. He added that the trawlers could do with a lot of improvements to engine installation and fittings."

Gulbrandsen was critical about the use of 'long-tail' propulsion units on boats operating from surf beaten beaches as they could cause fatal accidents to shore crew. "Long-tail engines have been used with thousands of boats provided by donors. In calm conditions these are good, but there is a problem during surf-crossing." Deaths have occurred because of fishers being hit by the propellers.

Gulbrandsen's main observation related to the large-scale introduction of FRP craft in Tamil Nadu after the December 2004 tsunami which devastated fishers, their boats and livelihoods.

Most of these craft had been financed by donors who wanted to do their bit for tsunami relief. But the construction quality of the craft was poor and the boats started leaking very soon. They had been made by inexperienced builders who knew little about FRP. "I wish donors who provided these boats assist fishers with the repairs." He added that concrete steps were needed to assist and train boatbuilders, and improve both their awareness of regulations and compliance with them.

"In a wooden plank you notice a problem immediately, not so with an FRP craft. FRP has come to stay, so it is vital to improve the skills of boatbuilders," Gulbrandsen said. "BOBP introduced the first FRP fishing boat to the east coast through the IND-20 beachlanding craft designed by R Ravikumar. It is still being used in Puri, and has a safe installation for surf-crossing, which could be demonstrated any time to those interested."

Referring to Sri Lanka, Gulbrandsen said he had visited the Island after the tsunami in connection with rehabilitation work. He didn't notice any major change there during his current trip.

Ideas Abound at Sea Safety Workshop in Chennai

(Continued from page 33)

On the basis of the group discussions, the workshop adopted the following three action points for implementation of the Safety at Sea Project in India:

- All pilot-scale activities will be carried out in a fishing harbor/ fish landing site – such as Chennai in Tamil Nadu, Visakhapatnam in Andhra Pradesh.
- A committee comprising nominees from national fishery agencies, district fishery bodies, fishery cooperative societies, local leaders of influence, and women from the fisher community will be formed to oversee the pilot activities.
- A baseline survey will be conducted to assess present knowledge and awareness of safety at sea. A consultant will conduct the survey on the basis of a questionnaire prepared by BOBP-IGO for each category of stakeholder. This will serve as a benchmark for monitoring the effectiveness of the awareness campaign.

During the workshop's concluding session, Mr Per Danielsson said that the poor quality FRP boats constructed during the post-tsunami period in Tamil Nadu should be repaired. Boats beyond repair should be recalled. Insurance for fishing boats should be linked to their construction standards.

Mr Seshadri said that liquor is a major problem in the fishing community, and compounds other social problems. The open-access nature of fisheries needs to be urgently addressed. There are too many boats; they must be regulated if fisheries is to be sustained.

Mr Seshadri further said that analyses of all fishing-related mortalities are a must – we must go into the cause before looking for the solution. He referred to the three E's of safety – engineering, education & enforcement. All three factors must be studied and addressed simultaneously to improve the safety and health of small-scale fishers.

He thanked the BOBP-IGO for organizing the workshop and all participants for smooth conduct of the workshop. Dr Y S Yadava proposed a vote of thanks.

Regional Workshop on Monitoring, Control and Surveillance – Chittagong, Bangladesh, January 2008

Effective MCS (monitoring, control and surveillance) is essential for sound policies to conserve and manage fisheries resources. Some of the main constraints to MCS in the Bay of Bengal region are lack of accurate statistics concerning small-scale fisheries; lack of a scientific information system; inadequate trained manpower; lack of awareness at the community level of the need for MCS; landing centres that are remote and inaccessible; lack of supporting legislation; and inadequate funding.

These are some issues that will be discussed at a Regional Workshop on Monitoring, Control and Surveillance to be held in Chittagong, Bangladesh, from 16 to 18 January, 2008. Representatives from Bangladesh, India, Maldives and Sri Lanka will attend. The workshop will review existing marine fisheries management programmes in member-countries, current licensing and registration procedures, and practices and fisheries legislation. It will assess the existing capacity for MCS, identify institutional requirements necessary within the Department of Fisheries in each country, prepare and outline procedures for a fisheries MCS programme. It will discuss the preparation of training and extension materials.

National Workshop on Safety at Sea in Chittagong, Bangladesh, January 2008

A National Workshop is to be organised during 21-22 January, 2008, in Dhaka, Bangladesh, in co-operation with the FAO and the Ministry of Fisheries and Livestock, Bangladesh. The workshop will explain the objectives and activities of the SIDA-funded FAO-executed

project "Safety at Sea" in co-operation with the BOBP-IGO. It will evolve a work plan in co-operation with stakeholders, identify a fishing centre for pilot activities, and the agencies and personnel who will form a committee to facilitate project activities.

Regional Consultation on Management Plan for Hilsa fisheries – Barrackpore, India, March 2008

The hilsa is an icon of Bengali cuisine; the hilsa fishery is also an important source of food, nutrition and livelihoods in the coastal, estuarine and inland areas of Bangladesh, India and Myanmar. But the hilsa is being depleted and stocks are declining. It is believed that both natural and anthropogenic impacts are responsible. Conservation and management of the hilsa fishery is a serious and urgent issue.

A Regional Consultation on preparation of a management plan for hilsa fisheries is to be held on 14 and 15 March, 2008 at Barrackpore (Kolkata), India, in co-operation with the Ministry of Agriculture, Government of India, and the Central Inland Fisheries Research Institute, Barrackpore. Representatives from Bangladesh, India and Myanmar will attend. The Consultation will review the current status of hilsa fisheries in the Bay of Bengal region as well as socio-economic data, set up a technical committee to prepare a comprehensive report, and outline management aspects essential for a management plan.

Regional Consultation on Preparation of Management Plans for Shark Fisheries – Beruwala, Sri Lanka, March 2008

Sharks have been a major fishery in India, Maldives and Sri Lanka for centuries. Sharks are commercially valuable; in fact every part of shark has economic utility. Forty seven species of shark occur in the seas in India, while three types of shark fishery are carried out in the Maldives – the reef shark fishery, oceanic shark fishery and the deep water gulper shark fishery. But the shark is under threat. Many species of shark are now in the IUCN (International Union for Conservation of Nature) red list.

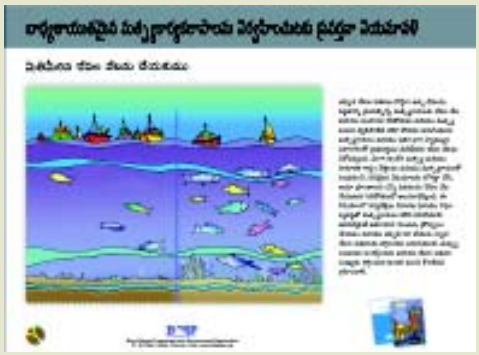
A Regional Consultation on Preparation of Management Plans for Shark Fisheries will be organized from 24 to 26 March 2008 in Beruwala, Sri Lanka, with representatives from India, Maldives and Sri Lanka. The Consultation will review existing data on shark fisheries in the region, review socio-economic data, outline important management aspects essential for formulating a management plan, and set up a technical committee to compile, collate and prepare a comprehensive report on shark fisheries of the region.

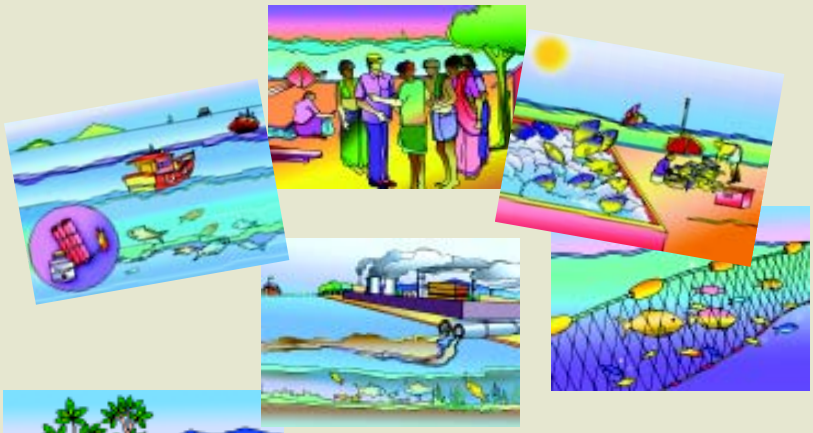
Popularizing CCRF through Posters

In 2006, the BOBP-IGO brought out a set of 12 posters depicting the messages of the Code of Conduct for Responsible Fisheries through attractive sketches and simple and catchy messages, such as Enhance fish stocks. Ban destructive fishing practices. Avoid overfishing. Keep fishing harbours clean. Encourage People's participation. Promote co-management. Ensure safety and health of fishers.

The original posters (in English) are immensely popular with the stakeholders in the member-countries. To ensure wider reach of these posters, the BOBP-IGO has translated the entire set of posters into Tamil (for use of Tamil speaking fishers in India and Sri Lanka), Telugu (for Telugu speaking fishers in India), Dhivehi for Maldivian fishers, Sinhalese for Sri Lanka and Bangla (for Bengali speaking fishers in India and Bangladesh).

These posters will be widely distributed in the member-countries.
If you need a set of posters, please write to info@bobpigo.org





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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