SESSION SIX:
SOCIAL FACTORS CONTRIBUTING TO WORK-RELATED INJURIES TO COMMERCIAL FISHERMEN

Vessel off the UK coast *(Photo courtesy of Cliff Brand)*

FATIGUE AND THE COMMERCIAL FISHING INDUSTRY: AN INTERNATIONAL PERSPECTIVE

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Background

Commercial fishing is considered to be one of the world's most dangerous occupations. From a global perspective the International Labour Organisation (ILO) in Geneva estimates that approximately 24,000 deaths and 24 million nonfatal injuries occur worldwide each year at sea (NIOSH 2000). In Australian waters, the work-related death rate in the commercial fishing industry is 89 deaths per 100,000 workers. This figure is 16 times higher than the all-industry rate for Australia of 5.5 deaths per 100,000 workers per year (Batchelor and Bugeja 2003). However, self-employed workers were not included in the analysis, suggesting that the number may be even higher. The UN Food and Agriculture Organisation (FAO) estimated the fatality rate in the fishing industry in Australia to be 143 per 100,000 (Australian Transport Safety Bureau 2001). In the United States of America, the fatality rate for commercial fishermen in 1998 was 151 per 100,000. The most recent analysis done in New Zealand examined fatalities between 1985-2000 and showed that the commercial fishing fatality rate was 167 per 100,000 (FISH Group 2003). Therefore, in relatively affluent and advanced countries such as Australia, New Zealand, and the USA, commercial fishing remains a highly dangerous occupation.

Great effort has been spent determining the causes and contributing factors to commercial fishing fatalities around the world. Issues such as environment, design and construction of equipment, and safety awareness are being addressed at various levels within the industry. However, another area where improvements can potentially be made is human factors. Human error has been attributed to 50% of all commercial vessel casualties and 70% to 80% of

all marine accidents. Such errors include improper procedures, inexperience, poor judgment, carelessness, and navigational error. Contributing factors have been cited as stress, boredom, and fatigue (National Research Council 1991). Recently the ILO identified fatigue as a specific priority area to aid in the promotion of safety and health for those working within the fishing industry. Issues surrounding fatigue include long hours of work, few hours of sleep, physical and mental demands of the job, working at night, etc. A hazard occupational data sheet has been developed to address the issue of fatigue (Wagner 2000). Furthermore, the UN agency charged with the task of coordinating international maritime transport, the International Maritime Organisation (IMO), has introduced two conventions addressing fatigue. They are the Standards of Certification and Training of Watchkeepers, 1978 (as amended in 1995), and the International Safety Management Code (ISM Code).

What is fatigue?

Functionally, fatigue arises as a result of inadequate restorative sleep. Work-related fatigue is largely a consequence of hours of work that reduce the opportunity for recovery sleep and is generally worse when work hours are long or are undertaken at night. The human biological timing system is programmed for sleep during the dark hours and for activity during the daylight hours. For those individuals working outside the traditional hours of 0900 to 1700, Monday to Friday, achieving an adequate amount of sleep is difficult because of the time at which sleep opportunities occur. Research into shiftworkers' sleep, using both subjective measures (sleep diaries and questionnaires) and objective measures (activity monitors and sleep recording equipment), indicates that shiftworkers get significantly less sleep depending on the time of the particular shift (Siebenaler and McGovern 1991; Smith-Coggins, Rosekind et al. 1994; Smith-Coggins, Rosekind et al. 1997). In studies comparing sleep loss with alcohol intoxication, it was found that after 17 hours of wakefulness, performance decreased to a level equivalent to a blood alcohol concentration (BAC) of 0.05% (the driving legal limit in Australia and in many places around the world) and after 24 hours, performance decreased to a BAC of 0.1% (twice the legal limit) (Dawson and Reid 1997; Lamond and Dawson 1999).

Fatigue has been identified as a major root cause of human error in a number of extremely high-profile disasters. The Chernobyl nuclear meltdown disaster occurred at approximately 0120 (International Atomic Energy Agency

1986) and the Three-Mile Island meltdown at 0400 (Office of Inspection and Enforcement 1979). Both incidents resulted from human error. Workers did not respond correctly to either unexpected or unusual mechanical or control room failure, despite the circumstances being controllable. Furthermore, key management personnel achieved a minimal amount of sleep as a result of their previous work hours prior to the 1986 explosion of the space shuttle Challenger (Presidential Commission on the Space Shuttle Challenger Accident 1986). The Exxon Valdez grounding in Prince William Sound occurred because a crewman who was scheduled to be off shift at the time failed to recognise and act on a signal to turn the ship (National Transportation Safety Board 1990). Each of these accidents was largely contributed to by human fatigue. Such high-profile incidents have resulted in a greater awareness about the association of fatigue and human performance, particularly with reference to health and safety.

Reports indicate that fishermen routinely work 24 to 96 hours or more with little or no sleep (Committee on Fishing Vessel Safety 1991). Hence, it is not surprising that fatigue is a major problem within the industry. Fatigue has been shown to be responsible for at least 2% of human-related collisions such as that between the *Handymariner* (a bulk cargo vessel) and the *Lipari* (a fishing vessel) off the Western Australia coast on the 18 January 2001 and 4% of groundings (Australian Transport Safety Bureau 2001). Furthermore, six groundings per year in UK waters such as that of the cargo ship *Jambo* are believed to be fatigue-related (Marine Accident Investigation Branch 2003).

In the past, traditional approaches to managing fatigue in the workplace have focused on prescriptive measures (e.g., regulating hours, breaks, and time off duty). However, much of the research investigating fatigue in the workplace has found that from an operational perspective, these measures can be functionally problematic and restrictive and in some cases can actually make the problem worse. These prescriptive regulations are not based on the scientific understanding of fatigue. A more recent approach adopted in Australia and elsewhere is to move away from this traditional view toward one where organisations focus on performance-based outcomes in managing fatigue. For example, the Western Australian and Northern Territory governments regulate their commercial trucking industry in this fashion. Furthermore, the railways in the UK utilize a similar technique known as the "safety case," which provides flexibility and requires an auditable system to be in place. This outcomes approach recognizes the needs of different organisations

and companies in different environments with different operational requirements and exposures. Hence, the emphasis is on reducing fatigue-related risk rather than solely focusing on hours of work. This shift has allowed managers to use the flexibility of the health and safety environment instead of bureaucratic rule-based systems to minimise and mitigate work-related fatigue without compromising economic productivity.

The human element in safety is the responsibility not only of the employer but also of the individual. The fishing industry and those tasked with the responsibility of improving safety standards face a somewhat unique challenge among industries. The ILO (1999) states that—

> Many fishermen have a different perception of danger [than] shoreside workers. Social and cultural attitudes, beliefs and values play an important role in the perception of, and response to, danger. The denial of danger, independence, fatalism, the belief that safety is a problem that primarily requires a technological solution, are common themes among fishermen. Efforts to improve safety should begin with trying to understand the fishing culture and to involve the fishers in the development and enforcement of safety regulations.

Thus, an international project aims to investigate the role, effect, and consequences of fatigue and long hours of work on the health and safety of those working within the commercial fishing industry in Australian and international waters. Initial work for this project has commenced in determining team membership, background information on the industry, and possible methodologies to be used. It is envisaged that the lead-in time for this international work would be no less than 12 months from August 2003. This lead-in time will be spent viewing simulators, planning scenarios, and most importantly, developing collaborative relationships with a variety of industry stakeholders such that the research is targeted and focused.

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FAMILY PREPAREDNESS PREVENTS ACCIDENTS AT SEA

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Worrying about family and home problems while fishing can cause stress and inattentiveness to one's work and surroundings, jeopardizing the safety of a fishing crew. Concern for those at home is no longer brought on only by such crises resulting from bills that need to be paid, cars breaking down, or a leaking roof. What can be done to decrease the added mental burden brought on by the worry of intended attacks or a major natural disaster affecting the family back home?

Preparedness is the first line of defense against accidents when fishing and should hold the same importance for crises at home. Everyone should be prepared for at least 72 hours of no assistance from emergency responders. An earthquake, for example, may result in bridges being down, phones inoperative, and broken water mains. If there is no electricity, gas cannot be pumped for cars; grocery stores cannot operate their computers to sell food; heat may not work; and there may be no way to cook food. In some disasters, entire homes may be lost. If there is infrastructure collapse and no chance of getting help for several days, each family will be on its own for support and care. Would your family know what to do if you were not there to help?

Start now to prepare for the event that you hope never happens. Because those who are fishing will want to contact their loved ones as soon as possible, an out-of-area contact will be the first item. During a disaster, each member of the family can call the selected out-of-area person with information to pass along to each other. That will allow everyone to know the whereabouts and condition of each other.

Collect essential items and place them in a transportable kit: battery-powered radio, water, nonperishable ready-to-eat food, flashlights, extra batteries, medicines, first-aid supplies, a change of clothes and shoes, blankets or sleeping bags, and games or books. Have toilet tissue, wet cleaning wipes, and additional water to be used for hygiene. Can openers and eating utensils are needed. Don't forget the special baby items and pet's food, carrier, and leash. Individual preferences and needs should be considered and included. Plastic bags of various sizes are good for

many purposes: small ones keep organized medicines, contact lenses, and hearing aid batteries. Large garbage bags can serve as a windbreaker, rain coat, or even as additional warmth over a sleeping bag. Large plastic bags can hold contaminated material and waste for later disposal or burial. When preparing an emergency kit, you should make it light enough to carry in case the roads are impassable to vehicles and the home must be abandoned. A backpack for each person would distribute the weight and provide participation and understanding of the preparation for all family members.

Every family should be prepared to evacuate at a moment's notice. Reasons to evacuate could include a fast-approaching forest fire, a hostage stand-off, accident or derailment of a train transporting dangerous materials, flash flood, and a home that is otherwise damaged and too dangerous to occupy. When the emergency supplies are already collected, the family members can leave with enough provisions for the first days. They are prepared to have the basics as they wait out the catastrophe.

In addition to preparing for evacuation, a family should also prepare to "shelter in place." A chemical spill (accidental or intentional), for example, may lead to an emergency announcement to stay in until the chemicals dissipate. A shelter-in-place kit includes materials to seal one room from outside air–close off heat or cooling vents, duct tape plastic sheeting around windows, place a towel at bottom of doors, duct tape around doors, tape over electric wall outlets. Keep the radio on (battery power available) and flashlight handy in case electricity is lost. If an announcement is made to evacuate, the family must leave immediately with their emergency supplies and go only on the route designated by the emergency responders.

After a disaster, emergency responders and relief workers will be on the scene, but they cannot reach everyone immediately. If the family is isolated or confined due to natural disaster, infrastructure collapse, or because emergency responders are overwhelmed, they must be prepared to cope with emergencies until help arrives. When the family is apart for periods of time and disasters occur, there may be less stress if emergency preparations are ready and everyone has a plan in place to respond. Make a kit, make a plan, and stay informed. Safety at home is necessary to have safety at sea.

Additional information is found on these Web sites:
http://www.fema.gov/areyouready/
http://www.redcross.org/services/disaster/beprepared/hsas.html
http://www.ready.gov
http://training.fema.gov/EMIWeb/CERT/certfog.asp

A DESCRIPTION OF LIFE STYLE FACTORS AFFECTING CREWS WORKING ON DISTANT WATER TRAWLERS

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Background

Commercial fishing and offshore fish processing are high-risk work. The risk of accidents and sickness in the offshore fishing industry is up to ten times higher than "land-based" high-risk occupations. Fishermen's work differs greatly from "normal" working life on land. Fishermen find themselves, often for months on end, in a limited space aboard their ships without the possibility of going ashore. They are exposed to unstable workplaces with constant noise and vibration. In circumpolar areas, workers are exposed to nearly continual light or darkness throughout their shifts, depending on their vessel's location and the season of the year.

Commercial fishermen work, eat, and sleep on board their vessels. There are no free days or weekends, and if there were, crew would have to enjoy them at their workplace. There are limited possibilities for exercise by crew, both because of too little free time and too little space, and because (taking into consideration the circumstances) motivation is not particularly high. Social interaction can be forced; you have to live together with your colleagues, whether you like them or not. Crew members are faced with physically, psychologically, and socially straining, continuous shift work, which often carries with it elevated risks for injury.

Another factor that can have a negative effect on health is the food eaten by the crew. If mealtimes are one of the few highlights in an otherwise busy and monotonous day, they may become compensation for the stresses experienced by the crew. "Good food" is easily equated with too much, often unhealthy, food containing high amounts of animal fat. Some crew members indulge in excessive use of stimulants such as coffee and tobacco, both of which carry consequences to health. Commercial fishing also entails loneli-

ness and deprivation, as there are no opportunities for physical contact with families and participation in the social and cultural life at home.

For crew members, coming home can easily comprise a mixture of emotions, both good and bad. Without doubt, commercial fishers are happy to be with their families and friends again and to take part in daily life. But their biological clocks must be readjusted to a normal daily rhythm after months of shift work, and this can be hard for many who have become used to the ship's constant movements, vibrations, and noise as well as always hearing the ship's movements, even in sleep. Many crew members end up with sleep problems.

Being home again also means a big upheaval for family life. Spouses must adjust to each other's presence and learn how to share responsibilities and tasks, such as bringing up children, economy, maintenance of property, etc. Many crew members choose to stay at home for one trip if there is a large family event ahead, such as a wedding, birthday, confirmation, etc. But this choice has a cost in lower annual income.

The Faroese fishing fleet contains ships of various sizes and functions. The way in which they work, in which distant waters they fish, and the length of the fishing trips varies greatly. Some of the fleet fish close to the Faroes and land fish about every 14 days. The crew on these ships must, if the fishing is good, work for several days without sleep. However, the subjects of the study described in this paper all work aboard long-distance trawlers, where one fishing trip can last from 2 to 4 months, traveling far from the Faroes, without any port calls. In 2000, there were five such trawlers working from the Faroes, producing salt fish and fillets. The hypothesis of the study described here was that Faroese fishermen aboard long-distance trawlers would be subject to a number of lifestyle factors that could have implications for their health status.

Methods

To more fully understand factors associated with the health of crew members on long-distance trawlers, we selected a random sample of 35 crew, working aboard all five Faroese long-distance trawlers, whom we asked to participate in a survey. The project's investigator developed a questionnaire aimed at examining the lifestyle factors experienced by crew members of a Faroese long-distance trawler. The questionairre contained items about exercise, food intake, cigarette and caffeine consumption, leisure time activi-

ties, and attitudes toward work. All written communications concerning this project were in Faroese.

The format of the questionnaire was designed to identify the presence of life style factors that I hypothesized would have negative impacts on fishermen's health. I obtained the permission of the ship's manager and captain to start the project before I sent the questionnaire out. An informative letter was sent to the captain and the crew. As part of a review process, the Faroese Fishermen's, the Engineers', and the Master Mariners and Navigator's unions were also informed in writing. The Faroese Science Ethics Board was informed about the project.

Before the questionnaire was sent out, a letter with information on what the project was about was sent on board each of the five trawlers. The questionnaire was sent by fax with information about when the answers should be returned. Of the 35 men who were asked to answer the questionnaire, 29 chose to take part. The age of respondents was fairly young: 3.5% were under 25, 21% were between 25 and 29, 48% were between 35 and 44, and 27.5% were 45 years or older.

Results

Exercise

Survey questions asked about respondents' exercise patterns while aboard long-distance trawlers. Only one respondent stated that he exercised regularly, working out about 120 minutes a week. The same person had a normal body mass index (BMI). The vast majority of respondents, 28 out of the 29, did not exercise regularly.

Food intake

We asked respondents to provide data on weight and height. Research investigators later converted this data into age-adjusted BMIs for each respondent. Based on analysis of respondents' data for weight and height, our study found that about 57% had BMIs that were higher than normal weight ranges.

Cigarette and/or caffeine intake

Respondents were asked if they smoked, and if so, how many cigarettes a day. All respondents were asked if they shared a room with a smoker. If so,

this study presumed such respondents to be passive smokers. Another survey item asked respondents to provide information on the number of cups of coffee each one consumed during the day.

Our survey found that there were fewer smokers on board long-distance trawlers and that nonsmokers comprised the majority of respondents. There were 48.3% smokers and 51.7% nonsmokers. Of the smokers, 71% smoked 20 or more cigarettes a day. Our findings were compared with those of an extensive annual questionnaire of all 9th grades in the Faroes carried out since 1989 by the Department of Occupational and Public Health in collaboration with the Faroese School Health Nurses. In this survey, respondents stated that 42% of their fathers smoked. If this statistic is reflective of Faroese men as a whole, it appears that fishermen on Faroese trawlers smoke more than Faroese men on average. This is interesting, when considered against the production tasks that take place aboard long-distance trawlers, where smoking bans are in place at production lines and where working hours limit cigarette consumption.

Coffee consumption among respondents varied, from none to up to 10 mugs per watch.

Shift work

Respondents were asked which watches they worked, how often the watches were broken, and whether they judged their work to be monotonous or not. We asked respondents to tell us the number of days they worked in the past year. The two watches were evenly represented in the answers received: 15 worked on the master's watch, 13 on the mate's watch, 1 chose not to answer this question.

The question on how often the watch was broken up during the week was incorrectly formulated in the questionnaire, and a third of the answers received were marked with a question mark. Therefore, it is not possible to say how often broken watches occurred.

The majority of respondents (23) did find that their work was monotonous, five said no, and one did not respond. Working hours aboard trawlers varied considerably among the respondents.

Isolation

Respondents were asked to identify an acceptable period of time for duty aboard long-distance trawlers and whether they wanted to continue to work as commercial fishermen. We also asked respondents to describe the ways in which they passed the time during long voyages. Feedback from respondents about optimal length of time aboard long-distance trawlers indicated that any period above 4 months would be considered "too long." Most respondents (21, or 72.4%) felt that 2 months was an acceptable length for an individual voyage.

Of the 29 respondents who replied to the survey question asking about career choices, 25 wanted to remain at sea and only four were planning to stop (86.2% and 13.7% respectively). This may be because Faroese commercial fishermen like this lifestyle and the freedom and excitement involved in commercial fishing. But it may also be a matter of the limited earning possibilities in other occupations. While fishermen's earnings can be high, the number of hours that they work must also be compared against land-based occupations.

Respondents' leisure time pursuits, in order of selection, were TV, reading, different types of games, other, and exercise. The types of television programs watched varied, with movies frequently shown. When trawlers receive mail deliveries from other ships, there were also video recordings of news from home.

Conclusions

The results of this study indicate that my hypothesis that trawler crews experience a number of negative life style factors is well founded.

1. The vast majority of respondents did not exercise.
2. Most of the respondents were over normal weight limits, as documented by BMIs.
3. It appears that there are more smokers among the respondents then would be expected.
4. The number of hours worked per year by respondents is far greater than those worked in land-based occupation.
5. The difficulties associated with the lifestyles of commercial fishermen aboard long-distance trawlers may contribute to early retirement from

this occupation, as evidenced by the age distribution of the respondents, which was skewed to younger ages.

There are many ways to promote healthy work environments for commercial fishermen aboard long-distance trawlers. The findings of this study can be likened to a "buffet" of recommendations for a future worksite health and safety plan for this industry.

Prioritizing is important in order to obtain improvements. The first priority, and one that could definitely improve conditions, would be to limit the length of any one voyage on board long-distance trawlers to 2 months. The majority of the crew wishes this, and without doubt this is also the wish of the individuals' families. We are pleased to note that the Faroese Fishermen's Union has called for a 2-month limit, as well.

A second priority should be made to promote both healthy diets and exercise. Ships' managers and cooks should receive professional help from nutritional experts. It should be possible to provision a ship so that products with high animal fat content are limited. Educational programs for crew, with information and guidance on diet and exercise, could stimulate the motivation for crew members to make more nutritional food choices and to implement exercise programs.

We hope that the findings from this project contribute to the improvement of the work environment for trawler crews. There clearly is room for improvements to promote healthier life styles for workers aboard long-distance trawlers. We look forward to additional research projects with this population, and expect that, with legislative support, many changes can be made to enhance the lifestyle experienced aboard these vessels.

The Occupational Medical Department of the Faroese Hospital Service subsidized this study.

Appendix: Changes in lifestyle factors of Faroese fishermen

Fishing has been the main industry of the Faroes for hundreds of years. However, vessel design and amenities for crew members have changed dramatically. Numerous differences exist between the old fishing boat, where work was carried out on open decks in all types of weather and where the crew slept crowded together in small cabins in which they made food, dried clothes, talked, and smoked to the super-modern factory trawlers of today, where working conditions have improved, the crew lives in one- or two-man cabins, the galley and the recreation rooms have everything a crew member could wish for, and living conditions include washing machines and tumbler dryers, and, on some ships, a sauna and exercise room.

Life for the Faroese fisherman has generally been typified by hard physical work, long work days, little sleep, and at times monotony, bad diet, loneliness, and deprivation. There have always been considerable risks of attrition, sickness, disablement, and shipwreck. As the main part of Faroese industry is and has been fishing, the choice of this occupation may be the result of social and/or familial pressure, but it must also be pointed out that the Faroese have always been, and still are, an extremely seaworthy people. Many times they have been pioneers testing out new techniques in commercial fishing, for example, as crew and skippers when shrimp fishing with trawls began in Greenland. To clearly delineate the changes in working conditions, we conducted interviews with two participants. The first is a retired commercial fisherman who worked on board Faroese commercial fishing vessels in the 1950s and 1960s; the second is a young man who is currently working as a commercial fisherman.

Interview with a former fisherman

"We worked 12 hours at a time, 6 hours free time. The free time included two meal times, we never slept more than a good 5 hours.

"For a short time we tried a watch system called the Seawatch. Some of our colleagues who had sailed with cargo boats wanted to try this. We were divided into two teams. Team A had the dogwatch, from 2400 hours to 0400 hours. Team B had the watch called the Seawatch, from 0400 hours to 1200 hours, then team A was on watch again from 1200 to 2400 hours. This watch system was good for the crew. The drawback of this was that both teams ate almost at the same time, so if the fishing was good, there was

no work on the deck at that time. Therefore we could not keep this watch system. The watch system we know now with 6 hours on and 6 hours off began around 1956.

"We had newly slaughtered meat, both sheep and beef at the beginning of a fishing trip, which could have been 4 to 6 months long. When this was eaten up we had salted meat with pea soup and then tinned beef, corned beef. We also had bacon. We ate a lot of fish as well as birds.

"Salted whale meat and blubber were also a part of the provisions bought by the ship's managers, from men who were good at catching whales and, according to how big the whale catch was, were able in this way to earn money. We got potatoes but they were often of doubtful quality and often didn't stretch the whole trip. We did not have any other fresh vegetables, only dried peas and herbs. We only had raisins, prunes and the occasional dried apples for fruit. Bread and cakes were baked on board. We only got milk when we could buy dried milk. Cream was the tinned cream called Molly. Some of us had dried sheep's meat from home. Some ship's managers bought dried sheep's meat for the crew.

"Boots and outer garments were as they should be, we also had good woollen clothes. However, gloves were a big problem. They were attacked by water fleas (Cyclops), which made them water absorbent, resulting in destroyed, raw hands. Our hands were often painful, because we had to continue working anyway.

"We got news from home when we went into a port to bunker, or from other ships from home. We occasionally received telegrams, which could be a difficult process. Not every home had a telephone then so the option to call home was limited.

"We took a book chest from the library with us; several of us read a lot. We also played cards and chess during off duty. Hobbies such as making small dolls' houses, cradles, model ships, etc. were very popular. Sunday should be a day of rest. We observed this by holding a service at the time when the least amount of work was done. Otherwise, work was carried out like any other day."

Interview with a young man currently working as a fisherman

"I have chosen this career because I have grown up with it and it is in my blood. Even though it is hard at times, it is exciting—how much we fish, what price we will get when the catch is sold, whether we fish more than other ships and so on. In addition you can earn a lot of money.

"When we begin a new trip the crew is divided into two watches that are called the master's watch and the mate's watch. There are no fixed rules about how we are divided, it depends upon splitting up experience and skill as good as possible. The master's watch works from 0600 to 1200 hours and from 1800 to 2400 hours. The mate's watch works from 1200 to 1800 hours and from 2400 to 0600 hours. This is how the whole trip is run; you do not change shifts. Sometimes when it is very busy, work is carried over so that one half of the watch works 3 hours more and the other half of the watch starts 3 hours earlier, so you only get 3 hours off duty.

"You quickly get into the watch rhythm, you soon get used to it. The problem is when you come home again and try to live a normal daily rhythm again. It can be difficult. The main meal times on board are the same as at home, lunch is eaten at 1200 hours and supper at 1800 hours.

"Working on board is not without danger- you should watch out all the time, as a serious accident could easily happen. Working on the trawl deck is dangerous—you should always be on the alert and aware of what you are doing. A main rule or law, you can say, is to look out for yourself and your safety, as no one else will do it for you.

"Rooms are intended for two people, although some times every man gets a room for himself. However the master, mate, chief engineer, cook and telegraphist always get their own rooms. We change bedding twice a month and we keep our rooms clean. We have a washing machine and tumbler dryer, and we wash our own clothes. We take turns in cleaning- we clean the passageway floors, and recreation room. There are common bathrooms on the passageway. I think on one of the newer ships they have a sauna and an exercise room.

"The mood on board can swing according to how the fishing is going and how long the time away from home. It also depends upon whether one hears good or bad news from home. Sometimes you can have an argument but it is

nearly always forgotten by the next watch. The food on board is good enough, you don't go short of anything. Some drink a lot of coffee, others not at all.

"Smoking varies; there are several who do not smoke. Smoking is forbidden on the production line and also there are some smoke-free areas on the ship, smoking is also forbidden in the recreation room. These prohibitions are strictly enforced.

"There is a service on Sunday, varying a little on who reads. Once we had a priest with us, then of course he read. We also sing a couple of psalms when we hold a service.

"We see some television, we also have video films from home. There is a book chest on board, some have their own books and papers with them. We also play cards and chess, also between different ships. We can buy work clothes on board at cost price.

"We receive mail on ships that have just been home, it may be once or twice a trip. So we get letters, papers and parcels, we also get Christmas gifts in this way sometimes."

SAFETY ISSUES IN ARTISANAL AND SMALL-SCALE COASTAL FISHERIES: A CASE STUDY FROM THE BAY OF BENGAL REGION

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The Bay of Bengal region

The Bay of Bengal, located in the monsoon belt, is bounded by eight countries: the Maldives, Sri Lanka, India, Bangladesh, Myanmar, Thailand, Malaysia, and Indonesia. About one-quarter of the world's population resides in the littoral countries of the Bay of Bengal, approximately 400 million of whom live in the bay's catchment area, many subsisting at or below the poverty level. An average of 65% of the region's urban population lives in large coastal cities, and migration toward the coastal regions is increasing.

The Bay of Bengal, including the Andaman Sea and the Malacca Straits, covers an area of 2.83 million sq km. The total length of the coastline of the countries straddling the bay and its adjacent seas is about 200,000 km. The coastal and offshore waters of the region support numerous fisheries, which are of great socio-economic importance to the countries bordering the Bay of Bengal. Among the most important of these are the inshore small pelagics, demersal, and shrimp fisheries and the offshore fisheries for tuna. During the last decade, fish landings from the region has increased by over 60%, with the latest statistics indicating catches exceeding 3.7 million tonnes. More than 300 fish species are estimated to be of commercial value.

Small-scale fisheries in the Bay of Bengal are still largely traditional. Log rafts and wooden crafts are popular in coastal India, Bangladesh, and Sri

Lanka. Evolved over centuries, these artisanal, low-cost, environmentally friendly fishing crafts are next to perfect. Most of the fishery resources of the coastal waters in the bay are heavily exploited due to unregulated fishing activity and open access. This is further complicated by the growing population, poor national resource management strategies, and a general lack of knowledge and data on the functioning of the ecosystem as a whole.

The Bay of Bengal, unlike many other seas, is rough for most parts of the year. Cyclones are frequent and come without much warning, and the monsoon winds increase the perils of fishing at sea. The artisanal and small-scale fishing vessels are unequipped to meet the challenges of the offshore waters of the bay. With the resource getting scarce in the coastal waters, the fishermen are venturing deeper into the sea, risking their lives. Some get drifted and end up in an alien land. Some fail to return, leading to a long and tortuous vigil for the family. There are few who survive the ordeal and return. Most perish and leave a widow and children destitute. The misery for the family unfolds immediately. With little savings and practically no alternative means of livelihood support and income opportunities, the family is either forced to migrate to the urban areas to work as labourers or beg for a living. The debt of the moneylender also makes many families work as bonded labourers.

Fishing-related deaths are on the increase and are more likely the result of economic pressures and human factors, such as risk-taking, fatigue, stress, or simply attitudinal problems. A high risk for loss of life has been accepted as part of the fishing culture in the region. Typically, small-scale fishermen are not registered; they are self-employed, and they have no safety net at all. The spirit of bravado has become a defence mechanism for most fishers.

Excessive fishing, lack of vessel maintenance, recklessness, and the gradual erosion of traditional skills have all led to fishing becoming the most dangerous occupation in the world (Turner and Petursdottir 2002). Accidents take place mostly because of engine failure, navigational difficulties, rudder damage, fuel shortage, capsizing, down-flooding (holes in the deck, for example), fire, explosion, collision, overloading, lack of safety equipment, etc. Many lives that are lost at sea could be saved if simple safety and communication equipment were kept onboard. The reasons for this human tragedy are all well known: lack of sea safety measures in the artisanal and small-scale fishing crafts.

Fishermen and fishing vessels are largely excluded from the vast majority of the provisions of the international shipping conventions drawn up by bodies

like the International Maritime Organisation. Among commercial vessels and industrial fishing boats, a large work force and strong maritime unions bargain effectively for better safety and welfare measures. However, within the artisanal and small-scale fishing industry, workers are unorganised and at the mercy of the middlemen and the boat owners, who care little for their safety at sea. For those individuals or small groups of fishermen who own fishing vessels, the turnover and profits are so meagre that there is little left to use for safety and navigation equipment. The result: A risky adventure into the sea every day and thousand of lives lost every year.

Regulations governing boat construction, availability of on-board safety and navigation equipment, and timely warnings on rough weather are mostly lacking in the countries surrounding the bay or, if present, are not strictly enforced. Therefore, with the bad weather and the turbulence in the sea, either the boats capsize or they drift and end up in neighbouring countries. Apprehensions take place, and the fishermen languish in jails and detention centres for long periods since the prevailing legislation and penal codes governing maritime infringements in many countries of the Bay of Bengal region involve lengthy and cumbersome procedures.

Who is responsible for this? Government, the boat owners, or the fishermen? All three entities are equally responsible. The case of the artisanal and small-scale fisheries is perhaps the most pertinent in terms of promotion of responsible fisheries operations and the most problematic because safety regimes are the weakest here.

Keeping in view the fact that fishing is the most dangerous occupation in the world and that there is a significant and growing problem relating to sea safety, the Bay of Bengal Programme, (BOBP) (see note a) in association with the Fishery Industries Division of the Food aand Agriculture Organisation (FAO) in Rome, organised a regional workshop on Sea Safety for Artisanal and Small-sale Fishermen in Chennai during 8–12 October 2001. Forty-three participants from all the BOBP countries–Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka, and Thailand–as well as experts and resource persons, attended the 5-day programme. The significant output of the regional initiative was the Chennai Declaration on Sea Safety, which resolved to meet the challenges effectively through holistic fisheries management, adherence to mandatory requirements, installation of regulatory mechanisms, community involvement, and education and training.

Based on a review (see note b) conducted prior to the workshop and the discussions that took place therein, a summary on the existence, status, and effectiveness of formal and informal arrangements for ensuring the safety of artisanal and small-scale fishermen in the countries in the Bay of Bengal region (except Myanmar) is given in the following paragraphs.

Bangladesh

Overall, fisheries contribute 4.7% of the national GDP, 8% to the export earnings, and 60% of the animal protein intake in Bangladesh. These percentages represent a significantly higher contribution from the fisheries sector than in any other BOBP member country.

In the sixth 5-year plan (2000-2005), the objectives identified were to increase fish production, improve protein access, increase foreign exchange earnings and employment, and adopt a participatory approach to resource management. Resource management instruments currently in place include a ban on estuarine bag net and push net fishing, adoption of a closed season from January 15 to February 15, and a ceiling on the size of the shrimp trawler fleet. In 1982, Bangladesh signed the United Nations Convention on the Law of the Sea and in the next year promulgated the Marine Fisheries Ordinance for the management and conservation of marine fisheries resources. The rules are enforced by the Director of Marine Fisheries.

The total number of artisanal and small-scale fishing boats in Bangladesh is reported to be between 27,000 and 30,000. Of these, approximately, 10,000 are mechanised and 17,000 nonmechanised. Nonmechanical boats propelled by sail and oar range from 5 to 20 metres in length and are typically engaged in day-to-day fishing in estuarine waters. Set bag nets, stake nets, or beach seines are used. Mechanised boats vary from 5 to 15 metres in length and have engine power ranging from 22 to 60 bhp. These vessels are engaged in drift net, longline, or marine set bag net fishing, and remain at sea for 4 to 6 days.

The bulk of the marine catch is landed by traditional craft, either plank-built or dugout. Plank-built boats are mainly of two types–*dinghi* and *chandi*. The *chandi* is one of the most widely used traditional fishing boats in Bangladesh. It is a round bilge, carved planked, open boat with a high sheer aft. It is usually constructed by stapling shaped planks, after which the framing is nailed into position. The boats are decked with split bamboo, and a thatched bamboo shelter is affixed slightly forward of amidships.

It was observed that swamping occurred most frequently in steep head seas with the foredeck getting buried as opposed to being broached. No reports of losses attributable to fire were reported, although open wood fires are used for on-board cooking. None of the vessels carry fire extinguishers. A recent practice adopted as a low-cost approach to the mechanisation of small traditional boats has been to fit tube-well engines. These vessels are considered a hazard both to themselves and to the other boats operating in the crowded waters.

The other main cause of fatalities at sea is pirates. The Chittagong Port Authority reports in excess of 50 casualties each year attributable to piracy.

Two primary regulatory agencies having a role in the fisheries sector are the Marine Fisheries Office of the Department of Fisheries (DOF) and the Mercantile Marine Department. The DOF has been expanding with new offices being established in the six most important coastal fishing areas. Monitoring, control, and surveillance are currently limited to the activities of the DOF staff and the Marine Fisheries surveillance check posts. The DOF has no at-sea or air surveillance capacity, vessel identification requirement, or fully developed fisheries data system in support of an effective monitoring, control, and surveillance capability.

Bangladesh and India are the two Bay of Bengal countries subject to the most severe weather conditions associated with tropical cyclones. Sea conditions in Bangladesh are further aggravated by the seabed topography, which funnels tidal action into the shallow coastal regions, resulting in high levels of turbulence. Swell heights are reported to reach 5 meters with storm surges up to 7 metres. Bangladesh has built a strong forecasting and emergency response capability. Observatories are maintained throughout the country. Weather radar stations have been established in four locations. Satellite data are received from Japanese and Indian satellites and other international sources. The Meteorological Department maintains a 24-hour operation. Regional forecasts are issued twice daily, and marine forecasts, which provide wind speed and direction, with a qualitative description of the state of the sea, are issued daily. In the event of a cyclone, storm warnings are updated every 3 hours.

The significant risks in terms of sea safety in Bangladesh relate to over-exploited resources with declining returns to the fishing enterprise, the need to coordinate the regulatory environment, enforcement of safety standards, the need to look at alternate designs for vessels, upgrading communication

equipment, piracy, and the development of a network of community organisations to address sea safety issues at the community level.

India

India has an open-access fisheries resource management regime. Under the Seventh Schedule, Article 246, of the Constitution of India, fisheries within the territorial waters of the country are under the jurisdiction of the coastal state government, and fishing beyond the territorial waters is under the jurisdiction of the union government.

The tenth 5-year plan (2002-2007) for the fisheries sector includes the objectives of optimising production and productivity, increasing export, generating employment, improving the socio-economic conditions of the fishermen and fish farmers, conserving aquatic resources, and increasing the per capita consumption of fish. A strong scientific capability and a network of fishery research institutes, which provide information on the marine environment, support resource management activity in India. The Department of Ocean Development is now focusing on areas such as satellite monitoring of sea surface temperature, identification of potential fishing zones, etc.

The total marine fish production in India has grown from 0.88 million tonnes in 1960 to 2.83 million tonnes in 2002-2003. The harvesting sector has evolved rapidly from a fleet of traditional canoes, dugouts, and small-planked boats to the development of a powerful fleet of small trawlers. The traditional Indian fishing fleets operating in the Bay of Bengal comprise about 128,400 traditional craft, of which about 16,300 are motorised. *Kattumarans*, which dominate the traditional crafts, are widely used on the east coast of India, from Puri in Orissa to Cape Comorin in Tamil Nadu on India's southern tip. The large number of *kattumarans* supports about half a million fisherfolk and accounts for a substantial quantity of the total marine fish production from the east coast of the country.

The *kattumaran* adapts itself to the harsh conditions of India's east coast, which features a high and dangerous surf and a lack of adequate landing facilities because of the constant movement of sand drifts. The *kattumaran* easily penetrates through the breakers, instead of riding over them, thus avoiding capsizing. It is, in fact, nearly unsinkable. It requires little upkeep since the hull does not have to be painted and caulked.

The *kattumaran* is the craft best suited for heavy surf beach conditions. At-

tempts to replace these traditional beach-landing craft with competitively priced surf-landing boats have so far been unsuccessful. Even in the very long term, the *kattumarans* are likely to be active in the near-shore fishery of the east coast states of India. Motorisation of *kattumarans* with outboard engines has helped the fishermen to overcome the drudgery of long trips, go faster and further into the sea, and navigate rough weather.

The crab claw sail is an old idea from the shores of Bay of Bengal. For a long time, experts have regarded this sail as primitive. But current wisdom regards the crab claw sails of *kattumarans* and outrigger canoes as very effective for navigation and propulsion. Besides the *kattumarans*, the popular traditional fishing crafts of the Bay of Bengal are *navas, masula* boats, *dinghies*, and *dhonies*.

The most remarkable traditional fishing craft anywhere are the *shoe-dhonis* of Kakinada in Andhra Pradesh. Shaped like shoes, they are both boats and homes. Each of these boats houses a fisherfolk family for almost 8 months a year. The *shoe-dhoni* families make a living by collecting shells from the Kakinada bay and selling them to traders. They return to their villages only for festivals and during floods.

From or to their villages, they journey through mangrove swamps for 20 to 30 hours, using sails and long poles. Women and children tend the rudder and even help in punting. The women also do the cooking, of course; none of the men can cook. Pregnant women continue life on the *dhoni* till the seventh month. Sometimes the children are born in the *dhoni*. These kids learn to swim before they can walk.

Monitoring, control, and surveillance responsibility in coastal waters is the responsibility of the adjacent state, with the Coast Guard having the responsibility for offshore waters. The Coast Guard operates a highly professional service from 15 bases around the coast. The country has also established an integrated capability for disaster management. This capability includes communication, decision-making, and the immediate mobilisation of resources by all the agencies at various levels of government. The Coast Guard is the lead agency for search-and-rescue operations relating to artisanal and small-scale fishers. Ninety percent of the distress calls are due to mechanical breakdown or running out of fuel. The Coast Guard has indicated the need for improved communication and the need to develop procedures for vessels to check in and out from fishing operations.

The Meteorological Department maintains a Cyclone Warning Division in New Delhi, with cyclone warning centres in Kolkata, Chennai, Mumbai, Bhubaneswar, Visakhapatnam, and Ahmedabad. In addition to the dissemination of warnings through traditional communication mechanisms, a new warning system using INSAT has been established.

India has all along maintained a commitment to supporting the welfare of fishers and coastal community residents through collaborative programmes of the state and union governments. These programmes address issues such as insurance, accident disability, provision of housing and water, credit for procurement of fishing equipment, and a savings scheme to provide income during closed fishing seasons.

To enhance the safety of artisanal and small-scale fishermen in India, there is the need to harmonize the resource management framework among the coastal states, develop and strengthen the enforcement of the minimum safety levels required on all vessels, and develop and enforce safety-related competency standards.

Indonesia

As a nation with some 1,700 islands, 3.1 million sq km of territorial seas, and an Exclusive Economic Zone (EEZ) of 2.7 million sq km, fisheries in Indonesia play a central role in the socio-economic fabric of the nation. Laws and regulations governing the use of marine resources have their roots in the 1945 Constitution of the Republic. There are today about 2.7 million people engaged in the primary production sector of the fisheries industry, 90% of which is small scale. The fishing fleet comprises some 0.4 million fishing boats, of which 59% are nonpowered, 24% are outboard motor-powered, and 16% are inboard motor-powered.

Traditional boats in Indonesia are mostly dugout and plank-built boats. The fishermen use a variety of fishing gear from these boats. The 4- to 5-metre long, double-outrigger canoe is used mainly in the traditional fishery. The main hull is a dugout, and sail and paddles are used for propulsion. The basic wooden hulls of the larger boats are strongly built with heavy scantlings. The main engines in many of the vessels are reconditioned automobile engines. Virtually no vessel carries any safety or fire-fighting equipment.

Regulations regarding carrying safety equipment are in place for all categories of fishing vessels based on a 1935 ordinance, revised in 1972. However,

the level of enforcement is low. Monitoring and surveillance priorities focus more on fishing activities in the EEZ and poaching by unauthorised foreign vessels. Monitoring and surveillance of coastal fishing activity is absent. The Coast Guard coordinates search-and-rescue activities in collaboration with other agencies.

It is interesting to note the reasons for some of the fatalities recorded by the harbour master at the Pekalongan fishing port. They included loss overboard during rough weather from fishers sleeping at night on gill nets or seine nets stacked on the deck, fishers caught in the gear when settling seine nets, and pirates. On board one vessel, fatalities were associated with fuel blockage; the fuel tank was opened at sea, and two fishermen were sent inside to clean the tank without purging it.

Over-exploitation of near-shore resources is leading to an overall decline in the fishing economy with the resultant inability to invest in safety-related equipment or safety-oriented activity. There appears to be little skipper loyalty among Indonesian crew members. The level of enforcement of all regulations is also low.

Malaysia

The Malaysian Government has adopted a proactive stance toward sustainable utilisation of its marine resources. A strategy of maintaining the present level of production includes a programme to phase out surplus fishermen, including a scheme for buying back boats. The central fisheries management instrument is the establishment of fishing zones designed to prevent conflict between traditional and commercial fishermen and to ensure equitable distribution of resources. Prior to independence in 1958, fisheries in Malaysia were managed through a set of ordinances. The Fisheries Act was promulgated in 1963 and subsequently rewritten in 1985, with amendments introduced in 1996. All aspects of licensing, registration, and operation of small-scale fishing vessels in Malaysia fall under the responsibility of the Department of Fisheries.

Like other countries in the region, the small-scale and artisanal fisheries sector in the country was transformed by the introduction of commercial fishing gear. However, 80% of the 32,000 registered fishing vessels still operate with traditional gear, including gill nets, drift nets, hook and line, push nets, and traps.

The Malaysian fisheries monitoring, control, and surveillance system is the most comprehensively developed of all the Bay of Bengal countries. Monitoring activity covers catch and effort data, fish size, population structure, and socio-economic data regarding the fishing community. Control is maintained through a comprehensive licensing policy supported by effective legislation. Surveillance is implemented through aerial surveillance. The Maritime Rescue Co-ordination Centre coordinates search-and-rescue activity. The Meteorological Service maintains a Marine and Oceanography Division that prepares marine forecasts for the three coastal regions of the country. Forecasts are prepared twice daily, providing wind speed and direction as well as projected wave height.

Overall, there is clear evidence of a strong commitment to effective management of both coastal resources and coastal communities, including the safety of those who go out to sea. The current regulatory regime and supporting infrastructure leave few gaps as far as sea safety is concerned. However, there is a need to integrate safety issues into the regulatory framework associated with revisions to the Fisheries Act, as well as the development of appropriate life-saving appliances for carrying on traditional artisanal craft. Sea communication devices have to be expanded and the safety-training requirement integrated into fishing license renewal. There is also the need to strengthen communication, coordination, and response capability to address acts of piracy.

Maldives

The artisanal fishery in the Maldives has for centuries centred around the pole and line fishery for skipjack. The fishing boats, *masdhonis*, are typically 14.5 m long. They are traditionally built from wood and undertake day fishing activity. The three main types of fishing boats in the Maldives are the *masdhoni, vadhudhoni*, and *bokkura*. There are some 3,200 traditional *dhonis* and 2,000 mechanised *dhonis*. All of these are open wooden craft. *Masdhonis* are about 10 to 15 metres long overall, *vadhudhonis* are about 5 to 8 metres long, and *bokkuras* are about 2 to 3 metres long. Motorisation of *masdhonis* started in 1974, and now almost all *masdhonis* active in fishing have marine diesel engines of 22-33 hp installed on them. Motorisation of *vadhudhonis* started much later, but is now becoming quite widespread.

A *dhoni* is wide and flat forward with a short stem; it narrows a little to the aft and has a square transom stern. The fore and aft parts are decked in; about two-thirds of the length has tumble home-sides, and the well is nar-

row and restricted. A high transverse coaming protects the well at the fore deck. The *dhoni* is sufficiently robust and stable in local sea conditions. It maintains watertight integrity. The seaworthiness and safety of traditional Maldivian fishing crafts are well known, and boat-building experts have hailed their craftsmanship.

The fleet of 1,500 craft and 22,000 fishermen are supported by collector vessels and three island-based freezing facilities. Investments in the sector during the past two decades have resulted in the establishment of a strong technical boat-building capability and enhancements to construction and outfitting standards for the traditional vessel. Recent changes to the fisheries policy have resulted in the evolution of another class of larger vessels that engage in multi-day fishing up to 100 miles offshore. These vessels are being built both in wood and GRP without technical input relating to the design or construction standards. The fleet sector is causing considerable concern to both the Ministry of Fisheries and the Ministry of Transport in terms of sea safety.

In 1999, the Ministry of Transport and Civil Aviation, working collaboratively with the Ministry of Fisheries, Agriculture, and Marine Resources, the Ministry of Defence, and the Atolls Administration, promulgated new regulations for fishing vessels. These regulations comprise the basis for the issuance of a safety certificate, which covers communication, navigation and safety equipment, lights, and signals.

In the Maldives, the control and surveillance function focuses mainly on the outer EEZ to deter poaching by foreign vessels. The National Security Service and the Coast Guard conduct approximately 400 enforcement visits to the various islands annually. Search-and-rescue activities are regulated by the Coast Guard, which responds to nearly 200 calls each year, especially during the southwest monsoon period.

Maldives is less exposed to the severe cyclonic weather patterns experienced further north in the Bay of Bengal. Weather forecasts provide both wind speed and wave height. A 24-hour service is maintained for fishermen. Storm advisories are issued 18 hours ahead. There are no formal fishing community organisations in the Maldives through which sea safety issues can be addressed. However, the historical and administrative focal point for communities throughout the country has been the Atolls Department, which coordinates the delivery of services to the respective island residents.

While the Maldives EEZ covers approximately 1 million sq km, the artisanal fishing fleet is relatively small and homogenous in nature. With the exception of the emerging new fleet sector, the vessels fish a common fishing profile, which has few inherent risks. The fishing environment is not particularly hostile, and regular marine forecasts are available throughout the country. Maldivian fishing vessels are of a design that has evolved over centuries to most effectively address the sea conditions within and between atolls. Construction standards of the wooden vessels are high. Standards for locally built GRP vessels, however, require upgrading.

The new fleet sector is growing rapidly with no regulations in place for design approval, construction, and outfit standards. The unregulated use of propane to fuel fishing lights is a potential fire risk. The use and onboard fuelling of small gasoline engines to drive spray pumps is also a fire risk. Severe fatalities have occurred through the improper use of scuba gear when diving for lobster or supporting bait-fishing operations.

Sri Lanka

The fisheries management regime in Sri Lanka was initially an open-access regime managed under the Fisheries Ordinance of 1940. Subsequently, regulations to specific regions or fisheries, such as the beach seine or purse seine fisheries, were introduced to reduce gear conflicts. Following clear evidence that coastal fishing was occurring beyond sustainable limits, a new Fisheries and Aquatic Resources Act was promulgated in 1996. The active fishing population in Sri Lanka is estimated to comprise approximately 0.15 million fishers landing some 0.16 million tonnes annually.

The small-scale fleet in Sri Lanka is typically divided into traditional craft and introduced craft. The former category comprises approximately 14,000 dugout canoes (with or without outriggers), beach seine craft, and *kattumarans,* the majority of which are unauthorised. A number of fisheries development programmes during the past 15 years has resulted in the construction of vessels for mullet day fishing in offshore waters.

Sri Lanka's traditional craft consist of dugouts with and without outriggers, log rafts, and planked craft. It is estimated that the country has about 16,500 traditional fishing boats, of which about 1,400 are motorised. The indigenous fishing crafts represent a large number of different building methods and designs. They are mainly utilised for coastal and lagoon fishing.

The *oru* outrigger canoe has existed for centuries with almost no change. An advancement of the *oru* has been the attachment of the outrigger as a balancing device. In the early days, the *orus* were propelled only by oars. The introduction of the sail was also a big achievement. The *orus* are gradually giving way to fibre-reinforced plastic boats, which fish in deeper waters and can make trips of 2 to 3 weeks.

Under the 1996 act, the Director of Fisheries and Aquatic Resources is responsible for the licensing of fishing operations and the registration of all fishing vessels. The Ministry of Transport currently plays no role in the registration or certification of fishing vessels or operators. The 1996 act empowers the Director of Fisheries to designate fisheries inspectors and other nominated personnel as authorised officers to enforce regulations. A Coast Guard act is also being drafted. Search-and-rescue activities for the small-scale fisheries in the country have traditionally been fishing community issues, with local vessels assisting as and when required.

Two specific environmental conditions impact the safety of small-scale fishing operations in Sri Lanka. For one, many of the traditional craft are beach-landed, and for another, the country is subject to severe storms associated with the onset of the southwest monsoon. The Department of Meteorology maintains 10 observation stations around the coast and nine stations inland. Marine forecasts are prepared twice daily and forwarded to the Ministry of Fisheries and Aquatic Resources, which broadcasts them at specified times.

Although the fisheries policy environment in Sri Lanka is proactive and supported by professionals, there is an absence of succession planning. Gaps are present in terms of standards for the construction and outfitting of safety equipment for all fishing vessels. Monitoring is perceived to be weak. No standards exist for fishing vessel operator training or competency certification. There is an urgent need to develop design and safety standards for multi-day vessels and to improve communication equipment

Thailand

The fisheries policy in Thailand has evolved over the past three decades to reflect the changing circumstances of resource abundance. Under the first three National Economic and Social Development plans, the fisheries policy focused on increasing production, particularly through the exploitation of resources in the Gulf of Thailand. Under the eighth plan, the focus has been

to attain fisheries sustainability with the rehabilitation of fisheries resources and environment.

The endeavour has also been to implement regulations governing the conduct of Thai fleets in compliance with fishing or joint venture agreements with other coastal states; to accelerate coastal aquaculture development with diversification of cultivable species; prevention and control of environmental degradation due to aquaculture development; and to improve the quality of Thai fish and fishery products to enable them to compete in foreign markets. The need for a new fisheries act became evident in the early 1990s, following rapid decline in coastal fisheries resource abundance. A comprehensive draft law was completed in 1996, but has not yet been adopted.

Based on a 1995 census, the profile of the artisanal and small-scale fishing fleet included 2,826 unpowered boats principally using lift nets and crab traps, 35,430 outboard-powered boats using various types of gear, 6,925 inboard-powered boats of less than 10 gross tonnage (GT), 6,550 inboard-powered boats of 10-49 GT using otter trawls or pair trawls, and 1,807 inboard-powered boats of 50 GT. Traditional fishing boats in Thailand do not vary much in shape and structure.

Fishing licenses are issued annually by the Director of Fisheries. Monitoring, control, and surveillance functions are carried out by the Fisheries Resources Conservation Division of the Director of Fisheries, which maintains seven stations in the Gulf of Thailand and four along the coast of the Andaman Sea. The Thai Maritime Enforcement and Co-ordination Centre coordinates search-and-rescue operations.

Fishermen on the Andaman Sea coast experience the effects of cyclonic activity in the Bay of Bengal, while those in the Gulf of Thailand are subject to typhoons. Marine forecasts are issued twice daily using radio and television. Storm warnings are also displayed at coastal fisheries stations. Most fishers using mechanised boats carry radios. The fishermen's cooperatives offer the best potential for promoting community participation in sea safety.

The principal factors affecting sea safety were seen to include conflicts associated with the intrusion of trawlers into zones reserved for passive gear; lack of appropriate safety equipment on all vessels; trawler designs that carry a lot of top hamper that are at risk during typhoons or cyclones; and the declining

economic viability of small-scale fishing enterprises associated with a declining resource base, leading to higher levels of risk taking.

The Chennai Declaration on "Sea Safety for Artisanal and Small-Scale Fishermen" and a Summary of Factors Affecting Sea Safety for Artisanal and Small-Scale Fishermen in the Bay of Bengal region are provided in Appendixes A and B, respectively.

Conclusion

The issues highlighted in the foregoing paragraphs are not insurmountable, but may need many attempts, and perhaps a long-term programme, to inculcate the habit of sea safety among fishermen and reduce the loss of human lives and misery. Although the basic problems of safety at sea are common to all the countries of the Bay of Bengal, local conditions and complexities vary widely. Creating a safer working environment for artisanal and small-scale fishers is a huge challenge. It merits urgent and critical attention from all concerned, especially the donor countries that can provide the much-needed assistance for implementing a long-term programme on sea safety in the region.

Safety measures have to be tailored to meet the specific requirements of each country in the Bay of Bengal region, in Cupertino with policy makers, legislators, vessel owners, fishermen, and other stakeholders. The economics of safety measures should be an important criterion, and awareness of the need for a legal framework covering safety aspects is absolutely necessary.

To ensure integration of sea safety measures in the day-to-day life of the fishermen, it is essential that they be built around the entire community and not the fishermen *per se*. The school curriculum in the coastal areas should include lessons in sea safety. This would go a long way in preparing a young fisher boy to adopt safety habits when he graduates into a mature fisherman. Extension programmes are necessary for the fisherwomen so that they can persuade the men-folk to use safety measures for their protection and for the protection of the family.

Safety at sea should be an integral part of fisheries management. Implementation of sea safety programmes should include mandatory regulation, a

sound implementation mechanism, training and education, prevention and survival strategies, etc. Finally, to make it sustainable, both groups, the government, and the fishermen, should share the effort and assistance.

I place on record my thanks to the Fisheries Division of the Food and Agriculture Organisation, Rome, and the Alaska Marine Safety Education Association for providing me this opportunity to participate in the conference and present this case study on the Bay of Bengal region.

Appendix A: Chennai Declaration on Sea Safety for Artisanal and Small-Scale Fishermen

Conscious that fishing is the world's most dangerous occupation with more than 24,000 deaths per year attributable to weaknesses in the institutional and regulatory environment, a declining resource base, and poor socio-economic conditions in the sector;
Realising that sea safety regimes are weakest amongst the artisanal and small-scale fisheries sectors, particularly in developing countries;
Realising that more than 80% of the world's artisanal and small-scale fishers are concentrated in Asia, where many of the coastal target stocks are over or fully exploited;
Recognising that the consequences of loss of life fall most heavily on the surviving families, for whom alternative sources of livelihood may not exist;
Concerned about the inadequacy of social and political will to address the issue of fatalities among artisanal and small-scale fishermen;
Accepting that the issue of safety for the artisanal and small-scale fisheries sectors is not fully recognised, or acknowledged, by fisheries policy objectives and further, that the focus is more on economic and resource management issues than the safety of artisanal and small-scale fishermen;
Concerned that current fisheries management regimes for coastal fisheries in the region may lead to increased levels of operational risk for artisanal and small-scale fishermen;
Concerned that safety measures, together with supporting regulations and standards relevant to the needs of artisanal and small-scale fisheries sectors, remain inadequately addressed by fisheries and maritime administrations in the region;
Recognising that neither the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, as amended by the 1993 Protocol, and the

1995 Convention for the Standards of Training, Certification and Watch Keeping for Fishing Vessel Personnel are in force, nor are they applicable to fishing vessels under 24 metres in length;
Recognising the limitations in institutional capacity of fisheries and maritime administrations in the region to undertake all responsibilities associated with their mandate;
Realising that fishing operations are carried out in a hostile and hazardous environment from vessels often having weaknesses in their design, construction, and equipment, thus being prone to failure;
Accepting that fishermen in both traditional and diversified fisheries are exposed to inherently high levels of risk and resulting accidents, for which there are few survival or rescue strategies;
Emphasising the urgent need to address the multi-dimensional issue of sea safety for artisanal and small-scale fishermen on a regional basis and in a holistic manner; and
Recognising that the problem is not insurmountable;

We, the representatives of Fisheries and Maritime Administrations, Coast Guard/Navy and Fishermen's Associations, nominated by the Governments of Bangladesh, India, Indonesia, Malaysia, the Maldives, Sri Lanka, and Thailand, having participated in the BOBP/FAO Regional Workshop on Sea Safety for Artisanal and Small-scale Fishermen held in Chennai, India, from 8 to 12 October 2001, now therefore:

Resolve to address, as a matter of urgency, the issue of safety at sea for artisanal and small-scale fishermen;
Recommend that sea safety issues be comprehensively integrated into member countries' fisheries policy and management frameworks. This would include associated commitments under the Code of Conduct for Responsible Fisheries and other regional, inter-regional or global instruments and initiatives;
Recommend measures which would result in a harmonised and holistic fisheries management framework for the Bay of Bengal;
Emphasise the need to rationalise institutional mandates, legislation, regulation and enforcement at the national level, in order to enhance sea safety in artisanal and small-scale fisheries;
Ensure the incorporation of FAO/IMO/ILO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels and the FAO/IMO/ILO Document for Guidance on the Training and Certification of Fishing Vessel Personnel into regulatory frameworks, as appropriate;

Recommend that fisheries and maritime administrations enhance their knowledge of the operations and constraints of the artisanal and small-scale fisheries sectors in order to formulate effective guidelines, standards, and regulations for the safety of fishing vessels, including the certification and training of crews;

Recommend the development and implementation of education, training and awareness programmes, which satisfy regulatory requirements, while also building a culture of sea safety within artisanal and small-scale fishing communities;

Recommend that mandatory requirements for improving sea safety be supplemented by other strategies, which involve the participation of the fisher communities, families, the media, and other stakeholders in order to promote the adoption of a wide range of safety measures;

Recommend that member countries undertake measures directed towards ensuring enhanced economic viability of artisanal and small-scale fishing enterprises as an essential element of the sea safety issue;

Recommend that administrations consider the provision of financial and other incentives to encourage and ensure the widespread use of safety equipment, together with training in the use of such equipment;

Recommend that a programme of applied research and development be initiated, focusing on the development of cost effective safety related equipment relevant to the needs of the artisanal and small-scale fisheries sectors;

Strongly recommend the formulation and implementation of a regional sea safety programme, employing a consultative and participatory approach, building upon institutionally derived data, together with the operational experience of artisanal and small-scale fisher communities;

Recommend that the issue of sea safety be addressed on an urgent basis, possibly achieved through a regional mechanism such as the Inter Governmental Organisation proposed by the BOBP member countries during the 24th meeting of the BOBP Advisory Committee at Phuket, Thailand (The Phuket Resolution - October 1999);

Agree to seek the support of the donor community for the development of a sea safety programme, and also request FAO to seek such assistance on our behalf.

(Adopted on Friday, 12 October 2001 in Chennai, India)

Appendix B: Factors and issues of concern in Bay of Bengal fisheries

Country	Factors	Issues of Concern
Bangladesh	Open-access mangement regime leading to overexploitation, reducing overall profitably of operations; affects investing in safety-related equipment or safety orientation activities. Need to coordinate and harmonise the regulatory environment. Need to upgrade mechanical installations to replace use of tube well engines. Upgrading communication equipment on artisanal vessels. Risks associated with the economic structure of the industry. General need to upgrade fishermen safety training and awareness.	Weak enforcement of all safety and operator competency standards. Fishing gear conflicts. Cyclone-related risks. Piracy.

Country	Factors	Issues of Concern
India	Need to harmonise resource management framework between respective states with a view to reducing conflicts amongst adjacent resource users. Need to develop and strengthen the enforcement of the requirement to carry a minimum level of safety-related equipment on all vessels. Develop low-cost safety equipment for use on small-scale vessels. Need to promote expanded use of communcation equipment at sea, together with training in its proper use. Increased dialogue between Sri Lanka and India with a view to reducing unacceptable levels of risk and detainment of fishers. Continuing assessment of resource management instruments to determine their impact on socioeconomic structure of coastal communities and associated levels of safety. Potential for development of informal, community-based search-and-rescue activities in an auxiliary Coast Guard model. Attention to communication and community participation in disaster prevention.	

Country	Factors	Issues of Concern
Indonesia	Review of sea-safety-related incidents indicates that the safety issue must be addressed primarily through the window of practice and awareness and secondarily through the window of legislation and regulation. The Fisheries Department is in a state of transition and there is a lack of clarity in functional responsibilities with adverse impacts on monitoring, control, and surveillance activities. Overexploitation of near-shore resources reduces overall profitabililty of operations, affects investing in safety-related equipment or safety orientation activities. Crew move from boat to boat, making it difficult to develop integrated team approach at sea with an associated adverse effect on safety issues. The national network of fishermen's associations offers promise as a vehicle to upgrade safety standards and practices throughout the sector. Practically oriented education and training capability is in place.	Levels of enforcement of all regulation low. Vessel outfitting standards on all vessels dangerously low. Low level of adoption of technology in navigation or communication equipment.

Country	Factors	Issues of Concern
Malaysia	Clear evidence of a strong commitment to effective management of both coastal resources and coastal communities, including the safety of those who go to sea. The current regulatory regime and supporting infrastructure leave few significant gaps in the sea safety question. Integrating safety issues into the regulatory framework is underway. Developing appropriate life-saving appliances for use on traditional artisanal craft. Strengthening the regulatory requirement for life-saving appliances for use on traditional artisanal craft. Expanding the use of at-sea communication devices. Promoting a Coast Guard auxiliary model for search-and-rescue. Integrating safety training requirements into fishing license renewal.	Strengthening the communication, coordination, and response capability to address acts of piracy.

Country	Factors	Issues of Concern
Maldives	Few inherent risks in the artisanal sector. Fishing environment not particularly hostile and good forecasting systems prevail. Traditional boat building evolved to suit the sea conditions. Appropriate standards for safety equipment introduced recently. High percentage of boats carry either VHF or CB radios and GPS. Administrative structures for regulation and enforcement in place. All agencies familiar with safety issues but are under-resourced. Coordinated efforts to expand fisheries training and increase safety awareness. Few fatalities in the fishing sector.	New fleet growing rapidly with no regulations for design approval, construction, or outfit standards, nor operator certification standards. Unregulated use of propane to fuel fishing lights. Use and on-board fueling of small gasoline engines to drive spray pumps. Improper use of scuba gear.

Country	Factors	Issues of Concern
Sri Lanka	Proactive policy environment, supported by widely experienced professional and technical capability. Safety is recognised as a serious policy issue. Community-based resource management models are being pilot-tested and evaluated. Monitoring in regulation of fishing effort and activity appears to be weak. No standards for fishing vessel operator training or competency certification. Need to strengthen monitoring, control, and surveillance capability. Search-and-rescue capability most effective at the community leve. Environmental forecasting capability sound and effectively distributed. Increased conflicts between traditional and introduced vessels.	Need to develop and design safety standards for multi-day vessels. Need to improve the engineering and navigation skills of operators of multi-day boats. Need to improve level of communication equipment, operator training, operator radio discipline. Assign emergency radio channel for fishermen. Need to channel safety training and awareness through community organisations. Need to address issues associated with apprehensions of fishermen in neighbouring countries.

Country	Factors	Issues of Concern
Thailand	Conflicts associated wth intrusion of trawlers into zones reserved for passive gear fishers. Lack of appropriate safety equipment on all vessels. Trawler designs that carry a lot of top hamper, which are demonstrably at risk during extreme typhoon or cyclonic weather conditions. Piracy. Declining economic viability of small-scale fishing enterprises associated with declining resource base leading to higher levels of risk-taking.	