Monday, October 23, 2000

WORLDWIDE PROBLEMS AND CHALLENGES IN THE INDUSTRY

Photograph and caption by Earl Dotter

"The wave made such a roar that the first mate shouted out to the rest of the crew, 'I'm going over,' meaning that he thought he was going overboard. Crouching down to reduce the force, another man was tossed four times toward the port side, but managed to stay in the boat. Another man threw his sharp knife in the corner to avoid being tossed with the lethal tool in his hand. Yet another crew member surfed with the wave, managing to grab hold of the netting in his path."

SAFETY AND HEALTH IN THE FISHING INDUSTRY: AN ILO PERSPECTIVE

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Brandt Wagner graduated from the United States Merchant Marine Academy in 1981, after majoring in Marine Transportation and Marine Engineering and obtaining Merchant marine deck and Engineering officer licenses. At sea, he sailed on research and commercial merchant ships, the latter as a member of the International Organization of Masters, Mates and Pilots. He left the sea to work for a major shipping line and then left the shipping line to work for shipping and private port interests in Washington, DC. This was followed by work with a marine and environmental consulting firm, including a period in Valdez, Alaska during the Exxon Valdez spill response. In 1990, Mr. Wagner became an official with the International Labour Office in Geneva, Switzerland. He has since been occupied with international efforts to improve the living conditions of seafarers and, more recently, fishermen. He was involved in the revision of the FAO/ILO/IMO Document for Guidance on the Training and Certification of Fishing Vessel Personnel. In 1999 he served as the Executive-Secretary of the ILO's Tripartite Meeting on Safety and Health in the Fishing Industry, and was responsible for the report used as the basis for discussion at the meeting. Prior to IFISH he represented the ILO at the Joint FAO/IMO Ad Hoc Working Group on Illegal, Unreported and Unregulated Fishing and Related Matters.

SUMMARY

The International Labor Organization (ILO) held a Tripartite Meeting on Safety and Health in the Fishing Industry in December 1999. This paper describes the Meeting in the context of the ILO's principles and objectives, reviews the report prepared by the ILO secretariat for use as the discussion document, reports in detail on the conclusions reached by the international participants, and discusses how the ILO secretariat, in cooperation with others, can continue to contribute improving safety and health in the fishing sector. The paper deliberately seeks to draw the most attention to the negotiated text of conclusions reached by representatives of governments, employers and workers (fishermen) who attended the ILO Meeting.

THE CONTEXT OF THE ILO MEETING : WHAT IS THE ILO AND WHAT ARE ITS MAIN OBJECTIVES?

The ILO was founded in 1919 to bring governments, employers and workers' organizations together for united action in the cause of social justice and better working conditions everywhere. In 1946 it became the first specialized agency of the United Nations system. It is unique among other agencies in that it has a "tripartite" structure (its meetings, committees and conferences are attended not only by government delegates but also by delegates representing employers and workers). The ILO has 175 Member States. It has three main organs: the International Labor Conference, comprised of all Member States, which meets yearly; the Governing Body, which determines the agenda of the Conference and directs the work of the International Labor Office; and the International Labor Office, the permanent secretariat of the ILO. The ILO has forty field offices around the world.

The primary goal of the ILO today is to promote opportunities for men and women to obtain decent and productive work, in conditions of freedom, equity, security and human dignity. Decent work means productive work in which rights are protected, which generates an adequate income, with adequate social protection. The ILO has articulated four strategic objectives in order to pursue and achieve this goal. They concern promotion of rights at work, employment, social protection and social dialogue.

Each of these objectives may be considered relevant to the issue of safety and health of fishermen.[1] Rights at work are relevant to all fishermen who fear losing their jobs for raising safety concerns. Increased employment opportunities may not be directly relevant but may indirectly contribute to alleviate poverty and related health problems in remote coastal communities. The two latter objectives, concerning "social protection" and "social dialogue" are most directly concerned with issues to be discussed at the IFISH Conference. "Social protection" includes protecting the health and safety [2] of fishermen and providing medical, survivor and other benefits to fishermen and their families following an accidents or illnesses. The promotion of "social dialogue" means promoting and facilitating the sharing of information among government officials, representative organizations of fishermen and fishing vessel owners' organizations and developing consensus on policy approaches and practical measures to address safety and health issues.

A BRIEF HISTORY OF ILO'S WORK IN THE FISHING SECTOR

The conditions of work of fishermen were addressed by the ILO as early as 1920, with the adoption of a (non-binding) Recommendation[3] concerning the limitation of hours of work of all workers employed in the fishing industry (a subject which, eighty years later, remains controversial). This was followed by the 1959 adoption of Conventions on minimum age, medical examination and articles of agreement, and in 1966, Conventions concerning fishermen's competency certificates (a forerunner of the STCW-F Convention) and fishing vessel crew accommodation, and a Recommendation concerning the vocational training of fishermen.

The Committee on Conditions of Work in the Fishing Industry met in 1954, 1962, 1978 and 1988 to advise the ILO on its work concerning fishermen. The last session discussed systems of remuneration and earnings, occupational adaptation to technical changes in the fishing industry, and the social and economic needs of small-scale fishermen and rural fishing communities. The ILO has facilitated many other smaller meetings at the national level (e.g., Philippines) and has provided technical advice and support to several countries (e.g., South Africa, Philippines, Argentina, Vietnam, Sri Lanka).

Together with the International Maritime Organization (IMO) and Food and Agriculture Organization of the United Nations (FAO), the ILO has assisted in the preparation of several publications that are aimed at improving fishing safety and health of fishermen. These include: the FAO/ILO/IMO Code of Safety for Fishermen and Fishing Vessels, Parts A and B; the FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels; and the FAO/ILO/IMO Document for Guidance on the Training and Certification of Fishing Vessel Personnel. Other publications, such as the ILO/IMO/WHO International Medical Guide for Ships, include chapters related to fishing.

THE ILO'S TRIPARTITE MEETING ON SAFETY AND HEALTH IN THE FISHING INDUSTRY

One of the ILO's means of promoting "social dialogue" at the international level is through sectorial meetings. The Tripartite Meeting on Safety and Health in the Fishing Industry was selected as one of the twelve meetings for the

1998-99 biennium. It was agreed that the purpose of the meeting would be to:

Exchange views on safety and health issues in the fishing industry;

Assess work done by an FAO/ILO/IMO Working Group concerned with the revision of the Document for Guidance on Fishermen's Training and Certification;[4]

Adopt conclusions which identify follow-up activities and review ILO standards adopted specifically for fishermen; and

Adopt a report of its discussion.

It was further agreed that the meeting would be composed of eighteen participants from governments, eighteen worker participants and eighteen employer participants, as well as observers from certain inter-governmental and non-governmental organizations.

The ILO secretariat was instructed to prepare a report on safety and health in the fishing industry, including a list of discussion points to focus the participants' attention on the major aspects of the agenda. The secretariat therefore produced a report entitled '*Safety and Health in the Fishing Industry,*' which was sent out to all participants before the Meeting.[5]

THE DISCUSSION DOCUMENT PREPARED BY THE ILO SECRETARIAT FOR THE TRIPARTITE MEETING

In preparing the 100-page Safety and Health in the Fishing Industry, the secretariat decided not to go into great detail on any one aspect, such as vessel construction, qualifications or fisheries management, but to touch upon many safety and health issues so that the tripartite constituents would have the basis for a wide-ranging debate.

The report drew upon available international literature on safety and health in fishing as well as the experiences of several countries. It also included excerpts from several papers prepared for the ILO.[6]

The first chapter of the report provided a brief overview of recent developments in the fishing sector, including employment, production (catch) trends and

economic, environmental and legal changes that had, or would have, a major impact on fishing operations. It also drew attention to issues of particular interest to the ILO, such as the employer-worker relationship, the share system, living conditions at sea, child labor and fishing, cases of abuse and conflict relative to fishermen and "social dialogue" in the fishing industry.

In the second chapter, we touched upon the special characteristics of the working environment in the fishing industry, the various ways in which injuries, deaths, and adverse events are measured and recorded, the fatality rate in various countries,[7] diseases and health problems, causes of accidents, training and risk awareness, culture and attitude, the influence of the share system and lack of a minimum wage, the right (or lack of the right) to refuse unsafe work, fatigue, economic and fisheries management factors, and insurance.

When gathering information on these issues, we were particularly struck by the variety of ways adverse safety events and injuries were reported. As we noted in the report:

> "There is not only a great variety in fishing operations but also a great variety in the way fishing safety and health problems are qualified and quantified. For example, deaths and injuries can be related to vessel casualties or to personnel accidents not involving loss or damage to the vessel; they may be attributed directly to one cause (drowning) or indirectly to other causes (capsizing of vessel, falling over the side). Accidents may be attributed to a primary event or an underlying or primary cause; they may be associated with certain types of fishing (trawling, long-lining) or to certain types of equipment (winches, fishing gear). The external environment may be seen as the cause (bad weather) or an accident may be attributed to the human element (inattention, fatigue, lack of training). Causes may be described in very general terms used for all professions (falling from height, slipping) or be specific to fishing (caught in trawl winch). They can be categorized under various headings, including by vessel size."

We had also surveyed certain medical practitioners and others working with fishermen's health and safety issues to obtain their views on work-related morbidity and accidents among fishermen, and the replies received were summarized and included.

In the third chapter, we discussed national measures to improve safety and health in the fishing industry, addressing such issues as regulation and alternatives

to regulation, the roles of ministries and agencies, consultation and "social dialogue," research, training, raising awareness, inspection and risk assessment, the cost of regulation, small-scale and artisanal fishermen, medical fitness examinations, treatment and insurance, reporting and investigating accidents, and search and rescue. The chapter highlighted what seemed to us to be good examples of not only government but also non-governmental (industry) initiatives. We drew attention to the relatively limited regulation of small-scale and artisanal fishing in most countries.

In the fourth and fifth chapters, we reviewed efforts to improve safety and health in the fishing industry carried out at the regional and international levels. East and South-East Asia Regional guidelines covering vessels between 24 and 45 meters and Council Directives applicable to European Union Member States were described. At the international level, the Torremolinos Convention and Protocol,[8] the STCW-F Convention,[9] and several joint FAO/ILO/IMO publications were reviewed. This chapter also provided information on ILO standards for fishermen, as well as other ILO standards concerning occupational safety and health that may also be relevant to the fishing industry. Problems related to the collection of international statistics on occupational injuries in the fishing industry were noted.

The sixth chapter reviewed ILO standards concerning fishermen, as well as maritime and other labor standards that could be applied to fishermen. This information was provided to enable the participants to advise the ILO as to whether these standards should be revised, promoted or considered obsolete. This was part of a more general ILO review of all Conventions and Recommendations adopted before 1985.

The last chapter of the report included a summary (see below) and points for discussions in the form of questions to the participants e.g., what steps should be taken to promote the enforcement or application of existing laws, regulations and recognized good practices designed to protect fishermen? How can more reliable data on the incidence and severity of accidents and disease in fishing be collected and appropriate action for prevention and treatment be developed?

An addendum provided more detailed information on efforts to improve safety and health in the fishing industry in selected countries (Canada, Chile, China,

Japan, Republic of Korea, Morocco, Nigeria, Norway, Philippines, Russian Federation, South Africa, United Kingdom and the United States).

SUMMARY

Our report revealed or confirmed that:

Fishing is clearly a dangerous profession. In many countries it has the highest fatality rate of any occupation. While vessel casualties are an important cause of death, there are also other major causes of death or injury. Fishermen also suffer from a number of work-related injuries and diseases.

Several studies have indicated that fatigue is a serious safety and health issue. Fatigue appears to be linked to the nature of fishing operations and to employment arrangements that create an incentive to work long hours and to minimize the number of crew members.

We found limited information on efforts at the national level to reduce fatigue in the fishing industry.

Lack of awareness of certain risks may also be an important concern for some groups of fishermen.

Most fishermen are well aware that fishing is a hazardous profession, but they may not be receiving timely and clear information on the link between certain acts or omissions and resultant deaths, injuries and illnesses. For some, a tendency to deny or downplay risks may also serve to filter out important safety messages and reduce the impact of safety initiatives.

Under-reporting of fatalities, injuries and diseases appears to be a problem in the fishing industry. Even when these are reported, the many different approaches to collecting information on their types and causes may make it difficult to produce comparable data and statistics and thus make it difficult to identify and then address key issues. The nature of the employment arrangement in fishing, which may place many fishermen outside traditional occupational injury and disease reporting systems, also contributes to this lack of information.

Insurance should play an important role in improving safety and health in the fishing industry. However, it is not clear whether all forms of insurance

adequately reward fishing vessel owners for having good safety and health records or for putting in place or improving accident prevention measures. The lack of insurance coverage for many fishermen is a serious problem.

The nature of fishing operations places fishermen far from immediate, professional medical care. Important issues include ensuring adequate and regular medical fitness examinations, first aid and other medical training for the crew; the carriage of adequate medical equipment and clear instructions on how to use it; access to shore-side advice by radio or satellite communications and means for the medical evacuation of seriously injured or ill fishermen. Despite improvements in medical care for many fishermen, there are some who do not receive sufficient care.

While most fisheries and fishing operations have common features, there are also many differences. These differences apply to safety and health issues, which may vary depending on the type of fishing, the size of the vessels and their equipment, the geographical area of operation and other factors.

While the information included in the report was not based on data from all ILO Member States, it appears that there are great differences in the scope and content of national laws and regulations concerning safety and health in the fishing industry. There are generally fewer safety and health requirements covering fishermen working on smaller vessels.

The informal nature of many parts of the fishing industry, and the co-adventurer status of fishermen related to their pay arrangements, may also affect the degree to which they are protected by laws and regulations concerning other workers. In some countries the industry, or at least portions of it, has developed a self-regulatory approach, partly out of concern over possible government regulation. It appears that there may be a slowly growing trend toward placing some larger fishing vessels in "open" registers, some of which have had historically high casualty and port state control detention rates for merchant ships. This may in part be done to avoid safety and other regulations.

The safety and health of fishermen can involve a wide range of national and regional ministries and agencies. In some countries fishing safety, especially as it relates to vessel safety, is primarily the responsibility of the ministry or agency responsible for marine safety; in others it is the ministry or agency responsible for agriculture and/or fisheries that has the lead role.

Occupational safety and health agencies have an important part to play. While in some cases there appears to be regular coordination among these ministries and agencies, this does not always happen.

The degree to which fishing vessel owners, representatives of fishermen and other interested and relevant parties are consulted on fishermen's safety and health issues, and the method of consultation, may vary. Some national and regional bodies involve not just the social partners, but also non-governmental organizations, insurers, designers, builders, equipment manufacturers, fishermen's wives and families, training and research institutions and others. However, it does not appear that such broad consultation is universal.

Research and training institutions in several countries are carrying out substantial research on safety and health in the fishing industry. It is unclear whether and how this information is being regularly and efficiently exchanged among these institutions. There appears to be a substantial amount of high-quality training and awareness material (pamphlets, books, videos, etc.) produced in some countries that might be easily modified for use in other countries.

Some countries have extensive training and certification schemes for fishermen, often reflecting the provisions of the ILO's Fishermen's Competency Certificates Convention, 1966 (No. 125), and Vocational Training (Fishermen) Recommendation,1966 (No. 126), and more recently those of the IMO's International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel, 1995 (STCW-F), as well as the 1985 FAO/ILO/IMO Document for Guidance on Fishermen's Training and Certification. However, the focus of many training programs appears to be on skippers and senior officers. Training programs for crew members and for small-scale or artisanal fishermen seem to be limited, though some countries have established impressive apprenticeship programs.

It appears that a good portion of the world's fishing vessels may not be regularly inspected, particularly not for occupational safety and health aspects. This may be related to limitations on resources and, in certain cases, to resistance from some fishermen due to cost and other concerns. Some innovative schemes have been developed both to reduce the cost and subsidize the purchase of safety equipment.

Artisanal and small-scale fishermen have, as groups, received comparatively little attention with regard to safety and health. This may be due to the remoteness of their communities, their lack of political and economic power to improve their situation, a lack of government resources and other reasons.

Some countries require some form of medical examination and medical certificate for certain groups of fishermen. Medical examinations and certificates appear not to be required for small-scale and artisanal vessels. The extent of the provision of medical care to this latter group of fishermen, as well as to their families, requires further consideration. This issue may be an economic as well as a "fishermen's health" issue, as the availability and cost of health care to the families of fishermen affects the viability of fishing employment and the viability of fishing communities.

In some regions efforts have been made to improve the safety and health of fishermen. In Europe, several Council directives have regulated, or are likely to regulate in the near future, such areas as vessel construction and equipment, minimum conditions for safety and health and medical treatment for European vessels. The work is obviously also affecting safety and health at the national level. There has been regional cooperation in the production, translation and distribution of training and other safety and health information. A recent initiative by a European trade union, in cooperation with fishing vessel owners, government officials, insurers and others, demonstrates the possibilities for regional social dialogue on safety and health issues.

While there are several international standards related to safety and health in fishing, it appears that the benefits of these standards may not be reaching the majority of the world's fishermen. This is because these standards have not been widely ratified and, even if ratified, may not have entered into force. These standards also may not fully address the needs of small-scale and artisanal fishermen. This is, however, partly due to the inability to reach international agreement on safety standards for small-scale and artisanal vessels.

Codes, guidelines and other publications produced by the FAO, ILO and IMO, often jointly, may be contributing to the improvement of safety and health in the fishing industry. In some countries, the content of these publications is reflected in national regulations and practices. However, most are nearly two decades old and may require updating. The IMO has initiated work to

revise some of these publications, and this may present an opportunity to make substantial improvements. It may also permit the inclusion of additional information relevant to the safety and health of small-scale and artisanal fishermen.

Other ILO Conventions and Recommendations covering safety and health for all workers could be relevant to the fishing industry. However, the full benefits of these standards may not be reaching fishermen for some of the reasons described above. The ILO, together with the FAO and IMO, may also be able to provide, through its existing tools (the CIS system , hazard data sheets, publications, etc.), and with substantial input from research and training institutions, an efficient means of improving the international exchange of information on safety and health in the fishing industry. Given the FAO's strong contacts with agriculture and fisheries ministries and agencies, the IMO's strong contacts with maritime administrations and the ILO's strong contacts with labor ministries, occupational safety and health administrations and employers' and workers' organizations, a coordinated effort, replicated at the national level, might have a considerable impact on raising awareness of fishing safety and health issues and facilitating responses to those issues.

The collection of international data on accidents, injuries and diseases in the fishing industry has been hampered by different methods of collecting and reporting data, including the way in which these data are compiled at the national level and reported at the international level. If the production of useful international statistics on accidents, injuries and diseases, and fatalities is considered important, action may be required at the national level (e.g., by adopting a classification scheme which is convertible to ISIC Revision 3). Coordination between regional databases (e.g., the database under consideration in Europe) and international databases (e.g., ILO and IMO) seems an important issue.

While there are certain steps that might be taken by the ILO, FAO and IMO to address safety and health, and other issues, in the fishing industry, the greatest share of such work must be done by others. The real key to improving the safety and health of fishermen on a global basis will be to determine what should be done at the international, regional, national and local levels, and who should take that action. This requires achieving, at each level, an appropriate blend of harmonization and flexibility in laws and regulations in order to make

real gains in safety and health without sacrificing innovation and the importance of developing, or facilitating the development of, the means for the continual exchange of information and, where appropriate, assistance, among all concerned parties. Careful consideration should be given not only to what the ILO can do but also to what others can do to build relationships, to enhance social dialogue, leading to improvements in safety and health in the fishing industry.

The issue of improving safety and health in the fishing industry cannot be separated from other aspects of fishermen's living and working conditions.

THE TRIPARTITE MEETING

More important than the report prepared by the secretariat was the outcome of the meeting, as it reflects the views of representatives of governments, employers (representative organizations of fishing vessel owners) and workers (representative organizations of fishermen) from around the world.[10]

As noted, the meeting's task was to adopt a record of the proceedings (entitled the Note on the Proceedings)[11] reflecting the views expressed by the participants, conclusions giving guidance to the Governing Body and, through the Governing Body, to ILO Member States on the matters covered by the agenda, or both, and to adopt resolutions on matters other than those specifically covered in the agenda item.

In addition to the discussion of the agenda items, the meeting held three panel discussions concerning "tools for the improvement of safety and health in the fishing industry," "the social implications of responsible fisheries," and "promoting social dialogue and fundamental principles and rights in the fishing industry." Summaries of these are included in the Note on the Proceedings. The summary of the first discussion may be of particular interest to IFISH participants.

The meeting adopted twenty-seven conclusions and one resolution.[12] These were the result of long, hard negotiations by representatives of the three groups. When reading these, IFISH Conference participants may wish to consider: 1) how they might take into account these conclusions in their own work (or use the conclusions to support their work); and 2) how they might assist others, including the ILO, to carry out specific tasks called for in some of the conclusions.

CONCLUSIONS ON SAFETY AND HEALTH IN THE FISHING INDUSTRY AS ADOPTED BY THE TRIPARTITE MEETING

GENERAL

1. Fishing is a hazardous occupation when compared to other occupations. Sustained efforts are needed at all levels and by all parties to improve the safety and health of fishermen. The issue of safety and health must be considered broadly in order to identify and mitigate – if not eliminate – the underlying causes of accidents and diseases in this sector. Consideration also needs to be given to the great diversity within the industry based on the size of the vessel, type of fishing and gear, area of operation, etc.

PRIORITY AREAS FOR IMPROVING OCCUPATIONAL SAFETY AND HEALTH

2. The areas of priority for improving occupational safety and health in the fishing industry are:

   Implementing and improving safety and health training;

   Enhancing social dialogue at all levels in the sector;

   Extending social protection to cover fishermen where it does not exist;

   Collecting and disseminating statistics, data and safety information;

   Promoting appropriate international standards;

   Providing international guidance for the safety and health of fishermen, particularly on vessels under 24 m in length;

   Addressing the human element aspect, such as fatigue and manning; and

   The implications for fishing vessels of the entry into force of GMDSS and the planned phasing out of radio watch-keeping on VHFCH16.

ROLES OF LEGAL, REGULATORY AND OTHER MEASURES

3. International standards concerning the safety of fishing vessels should be ratified and fully implemented, in particular, the STCW-F Convention.

4. Safety and health improvements cannot be achieved solely through legislation. A safety culture should be promoted in the fishing industry, including the use of safety management systems appropriate to the enterprise and the dissemination of safety information. Governments, employers and workers' organizations should be involved in the development and implementation of such systems.

PROMOTING ENFORCEMENT OR APPLICATION OF LAWS, REGULATIONS AND GOOD PRACTICES

5. Laws and regulations, essential for the promotion of safety and health in the fishing industry, are only of value if they are implemented. Government agencies responsible for enforcement must be given sufficient resources to monitor the implementation of safety and health requirements, ensuring, in particular, that vessel inspection services are adequate.

6. Governments should ratify the ILO's Occupational Safety and Health Convention, 1981 (No. 155),[13] and apply its provisions to the fishing industry.

7. Like workers in other sectors, fishermen should have access to social security protection; this should cover issues such as sickness, disability, occupational injuries, illness compensation, loss of life and pension schemes.

8. When Flag State legislation does not provide for insurance, fishing vessel owners, regardless of the size of the vessels, should carry insurance or other appropriate social security coverage for occupational injuries to fishermen. Insurance should cover medical treatment and compensation as well as survivor benefits.

9. Medical examinations are important to safety and health protection. All fishermen should undergo periodic medical examinations.

IMPROVING COORDINATION BY ALL MINISTRIES, AND THE ROLE OF LABOR MINISTRIES

10. Governments should ensure coordination of all ministries and agencies (national, regional and local) with an interest in the safety and health of fishermen and should avoid duplication of efforts. Officials responsible for fishing safety and health issues should have a thorough understanding of the fishing industry and its specific safety and health problems.

TRIPARTITE ACTION IN TRAINING AND MEASURES TO IMPROVE SAFETY AND HEALTH

11. Social dialogue is essential to improving the safety and health of fishermen, and it should be promoted at the enterprise, local, national, regional and international level and in all forums where fishing issues are discussed. This should include measures to build the capacity of employers' and workers' organizations, and facilitate their emergence where none exists.

12. Employers' and workers' organizations should be consulted during the development, monitoring and revising of laws and regulations relevant to the safety and health of fishermen. The social partners should also be consulted on other non-legislative efforts to address these issues. Standing consultative bodies, drawing on a wide range of interests in the fishing industry, should be established for the purpose of discussing safety and health issues.

13. Training is an essential means of addressing occupational safety and health issues, and occupational safety and health issues should be an integral part of all training programs for fishermen. Training, including refresher courses, should address different types of fishing gear, fishing operations and disaster preparedness, and should reflect the provisions of the STCW-F Convention, ILO's Vocational Training (Fishermen) Recommendation, 1966 (No. 126), and other relevant international codes and guidance.

14. Governments, employers, workers' organizations and research institutes should contribute to the development of hazardous occupation data sheets[14] for all types of fishing occupations and operations. They should submit studies, manuals and other material to the ILO for inclusion in the ILO's CIS database.[15] Such actions will assist in worldwide dissemination of

knowledge, experience and guidance on safety and health in the fishing industry.

SAFETY AND HEALTH FOR SMALL-SCALE AND ARTISANAL FISHERMEN

15. A pragmatic approach is needed to address the safety and health issues of many small-scale and artisanal fishermen. This approach should take into account their vessel types, equipment, education level and cultural background. Development assistance related to poverty alleviation may also be an appropriate means of aiding these fishermen. The costs of safety measures should be met by governments where appropriate, for example, through insurance and national welfare schemes, which should also compensate fishermen for lost income when fishing is prohibited by the competent authority due to extreme weather conditions.

ACTION ON SAFETY, HEALTH AND RELATED ISSUES FOR VULNERABLE GROUPS OF WORKERS

16. Governments should take urgent steps to ratify and implement the Worst Forms of Child Labor Convention, 1999 (No.182). Implementation should include removing children from all hazardous work in the fishing industry. National action programs to eradicate the worst forms of child labor should include schemes to assist fishing communities.

17. Better employment opportunities should be provided for women in the fishing industry. Furthermore, the involvement of fishermen's spouses and families in safety and health campaigns has been very effective in many countries. Spouses and families are also important sources of information on fishermen's safety, health and other problems. School curricula in fishing communities should include basic information on health and safety in fishing.

18. Action should be taken to improve the situation of abandoned fishermen and non-domiciled fishermen. Flag States should ensure compliance with national requirements and minimum international standards in respect of the social conditions, safety and health and environmental conditions on board fishing vessels flying their flag. Coastal States should make provision of decent living and working conditions on board fishing vessels a condition

that must be met in order to obtain and retain permission to fish in the Coastal State's exclusive economic zone.[16]

IMPROVING DATA ON THE INCIDENCE AND SEVERITY OF ACCIDENTS AND DISEASE

19. Reliable data and statistics are needed to identify fishermen's safety and health problems and focus response and resources effectively. Under-reporting of occupational accidents and diseases of fishermen is a very serious problem. Governments, employers' and workers' organizations should assist in developing or improving reporting systems. Governments should approach insurance providers to exchange information, where appropriate, on accidents, injuries and diseases.

20. Harmonization of data is important. The collection of data on occupational accidents and diseases in the fishing industry can be improved by the use of standardized forms. Statistics and lessons learned should be widely disseminated, especially to employers and fishermen. In order to prevent statistics on fishing from being lost in the general category of "agriculture, hunting, forestry and fishing," governments should adopt classification schemes which are convertible to the International Standard Industrial Classification of all Economic Activities (ISIC), Revision 3, as recommended by the ILO.

21. All maritime casualties involving fishing vessels should be investigated and subject to inquiries in accordance with international Conventions.

22. More information should be collected on occupational diseases and other health problems experienced by fishermen. This information should be collated and be made available to the ILO's constituents in the form of suitable guidelines addressed to fishermen.

ILO STANDARDS CONCERNING FISHERMEN

The conclusions concerning ILO's standards for fishermen are too lengthy to include in this paper. However, they may be found in the Note on the Proceedings. Among other things, the Meeting requested the ILO to undertake a study on working time arrangements in the fishing sector.

ILO ACTION TO PROMOTE SAFETY AND HEALTH IN THE FISHING INDUSTRY

23. The revised text of the FAO/ILO/IMO Document for Guidance on Fishermen's Training and Certification[17] requires no additional substantive changes prior to completion, and the IMO should be encouraged to finalize and publish this document as soon as possible.

24. The ILO should participate in the revision of the FAO/ILO/IMO Code of Safety for Fishermen and Fishing Vessels, Part B, Safety and Health Requirements for the Construction and Equipment of Fishing Vessels, and, following consultation with the IMO, should take a leading role in revising the Code of Safety for Fishermen and Fishing Vessels, Part A, Safety and Health Practice for Skippers and Crews.

25. The ILO, in consultation with its tripartite constituents, should develop a user-friendly manual on safety and health in the fishing industry specifically aimed at working fishermen and covering various types of fishing operations as well as both large and small vessels. This manual should reflect the reality of fishing operations.

26. The ILO, together with the IMO and WHO, should undertake to revise the ILO/IMO/WHO Medical Guide for Ships.

27. Moreover, the ILO should:

    Consider that fishing is a "hazardous occupation" when implementing the InFocus Program on SafeWork;[18]

    Continue to collect and disseminate information on "best practices" concerning safety and health in the fishing industry;

    Develop hazardous occupation data sheets for all aspects of all types of fishing operations;

    Promote the holding of tripartite national and regional seminars on safety and health in the fishing industry;

    Strengthen the framework and institutions for social dialogue through the InFocus Program on Strengthening Social Dialogue, and through

the Bureau for Workers' and Employers' Activities, enhance the capabilities of the workers' and employers' organizations to engage in and contribute to social dialogue in the fishing sector, particularly as it concerns safety and health issues;

Through its International Program on the Elimination of Child Labor (IPEC), assist the endeavors of tripartite constituents to eradicate child labor, and, in particular, its worst forms in the fishing industry;

Take into account the problems of abandoned fishermen when considering the issue of abandoned seafarers;[19]

Address the problem of fatigue; and

Take appropriate measures to eliminate the ill-treatment of fishermen.

FOLLOW-UP BY THE ILO TO THE CONCLUSIONS ADOPTED BY THE TRIPARTITE MEETING

The ILO is taking into account all of the above conclusions (as resources permit), but will focus in particular on those listed in conclusion no. 27. In doing so, it plans to work closely with the other FAO and IMO secretariats and with other interested organizations. The IFISH Conference provides an opportunity for discussing how those concerned with safety and health can continue to exchange information after the Conference ends. For the ILO, it also provides an opportunity to identify those organizations and individuals having the knowledge and resources to: assist in the establishment and strengthening of representative organizations of fishing vessel owners and fishermen; contribute to the preparation of hazardous occupation data sheets; provide examples of "best practices" in fishing safety which can be made available to others; assist in efforts at addressing the very difficult issue of fatigue; and otherwise continue to share their information and experience.

FOOTNOTES

1. The term "fishermen" is used in this paper as it is the term currently used in ILO standards concerning workers in the fishing industry. The term is meant to apply to both men and women.

2. The goals, mandate and strategy of the ILO's major programme concerning occupational safety and health, the InFocus Programme on SafeWork, are set out at: www.ilo.org/public/english/protection/safework/decent.htm.

3. A Convention is subject to ratification. Once a State has ratified a Convention, and the Convention has entered into force, the State is obliged to bring its domestic law and practice in conformity with the Convention provisions. A Recommendation is not open to ratification. Instead, it provides guidelines, including suggestions of a technical nature, to assist States in developing their national policy and practice with regard to the particular labour matter. All ILO Conventions and Recommendations are available on the Internet at "www.ilo.org".

4. Recently revised and renamed the FAO/ILO/IMO Document for Guidance on the Training and Certification of Fishing Vessel Personnel. The revision aimed, among other things, to update the publication to make it consistent with the International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel, 1995 (STCW-F Convention).

5. The full text of the ILO report, in English, French and Spanish, is available on the Internet at: www.ilo.org/public/english/dialogue/sector/techmeet/tmfi99/tmfir.htm.

6. One of the contributors was Menakhem Ben-Yami, who prepared a paper entitled, "Risks and Dangers in Small-Scale Fisheries: An Overview". As the ILO report, due to limits in space, could not do full justice to this paper, it has been published, in English and under the same title, as an ILO Working Paper, and is available from the ILO.

7. The ILO's Occupational Safety and Health Branch had estimated a worldwide fatality rate of 24,000 deaths in the fishing sector each year. This rough figure was based on a projection of a rate of 80/100,000 rate to a the FAO's estimation of 28.5 million people engaged in fishing, fish processing and fish farming.

8.Torremolinos International Convention for the Safety of Fishing Vessels, 1977, and the Torremolinos Protocol of 1993.

9. International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel, 1995 (STCW-F Convention).

10.The Meeting was attended by government representatives from China, Cuba, Denmark, Iceland, India, Indonesia, Mexico, Nigeria, Norway, Russian Federation, Spain, Thailand and United Kingdom; employer representatives from Senegal, Ghana, Argentina, Norway, New Zealand, Peru, Indonesia, Spain, San Salvador, France, Pakistan, Malaysia, Iceland, Japan, Nicaragua and Suriname; worker members from Chile, Argentina, Nigeria, France, Belgium, Morocco, India, Faröe Islands/Denmark and Japan (with advisors from some of those countries as well as Ivory Coast, Paraguay, Canada, Denmark, Russian Federation, Brazil, Norway and Iceland). Observers came from the FAO, IMO, Organization for Co-operation and Development (OECD), World Health Organization

(WHO), International Christian Maritime Association (ICMA), International Collective in Support of Fishworkers (ICSF), International Confederation of Free Trade Unions (ICFTU), International Maritime Health Association (IMHA), International Organization of Employers (IOE), International Transport Workers' Federation (ITF) and World Confederation of Labour (WCL). Two panel members in the panel discussions, one from the United States and one from Iceland, also participated.

11. The Note on the Proceedings, which contains the report of the discussion (which follows the same general headings as the conclusions), conclusions on safety and health in the fishing industry, resolution concerning future ILO activities in the fisheries sector and social dialogue, summaries of panel discussions, list of participants and other information is available on the Internet at: http://www.ilo.org/public/english/dialogue/sector/techmeet/tmfi99/tmfin.htm.

12. The Resolution concerning future activities in the fisheries sector and social dialogue called upon the ILO to carry out a number of activities concerning fishing. As the resolution is not related directly to safety and health, and as space does not permit inclusion of its full text, it will not be described in this paper. It is available on the Internet in the Note on the Proceedings.

13. This Convention prescribes the adoption of a coherent national policy on occupational safety, occupational health and the working environment. It is one of the ILO's main Conventions covering occupational health for all workers. A brief description is found in the secretariat's report.

14. The data sheets provide information on the hazards, risks and notions of prevention related to specific occupations. The data sheets consist of four pages covering information on the most relevant hazards related to the occupation; a detailed and systematized presentation on the different hazards related to the job, with indicators for preventative measures; suggestions for preventative measures for selected hazards; and specialized information for occupational safety and health professionals, including a brief job description, note and references. The ILO is considering developing data sheets for the fishing sector. For more information, see http://www.ilo.org/public/englsih/90travai/sechyg/fhazard.htm or contact David Gold at "sechyg@ilo.org."

15. The CIS is a worldwide service dedicated to the collection and dissemination of information on the prevention of occupational accidents and diseases. A brief description is included in the secretariat's report.

16. The ILO is investigating the link between Illegal, Unregulated and Unreported (IUU) Fishing and conditions of fishermen. In this regard, it was invited to, and has participated in, the Joint FAO/IMO Ad Hoc Working Group on Illegal, Unreported and Unregulated Fishing and Related Matters held in Rome 9-11 October 2000.

17. This work has been completed. The revised Document for Guidance will be published by the IMO.

18. This is the ILO's main programme on occupational safety and health. See footnote 3 for website address of this programme.

19. This issue of abandoned seafarers is being considered by a Joint IMO/ILO Ad Hoc Expert Working Group, which will meet in its second session at IMO headquarters from 30 October — 3 November 2000. Certain aspects of the problem of abandoned fishermen are being considered during this discussion.

Photograph and caption by Earl Dotter

Near a rocky cliff in the bay, the skipper of this Nova Scotia-designed drag boat raises the dredge as the sternman waits underneath the headgear supporting the dredge cable.

SAFETY AT SEA FOR FISHERMEN AND THE ROLE OF FAO

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Fishing at sea is probably the most dangerous occupation in the world. Data from those countries that collect accurate accounts show that occupational fatalities in their fishing industries far exceed their national average. For example, in U.S. the fatality rate is an average of 160 per 100,000, which is 25 to 30 times the national average;[1] in Australia, the fatality rate for fishermen is 143 per 100,000 compared with 8.1 per 100,000 nationally;[2] following a recent spate of accidents in South Africa, the casualty rate has risen from 62 deaths per 100,000 fishermen in 1995 to 585 deaths per 100,000[3] in 1999; in 1995-96 in the United Kingdom, there were 77 fatal injuries per 100,000 fishermen as opposed to 23.2 per 100,000 employees in the mining and quarrying industry (the next highest category in that year) without evidence of the improvements that are apparent in most other industries over the past six years.[4] In Samoa, casualty rates have dropped dramatically from 850 per 100,000 fishermen in 1997 to 350 per 100,000 in 1998 to 150 per 100,000 in 1999 following the introduction of safety regulations for vessels, equipment and training. However, very few countries are able to supply injury data; although the members of International Maritime Organisation (IMO) decided that the collection and analysis of statistical information on casualties, including fishing vessels and

fishermen, should be prepared on an annual basis,[5] they acknowledged in 1999 that there has been a very limited response.[6]

The Food and Agricultural Organisation (FAO) estimates that of the 36 million engaged in fishing and fish-farming, roughly 15 million fishers are employed aboard decked and undecked fishing vessels operating in marine capture fisheries, of whom more than 90 percent are working on vessels less than 24 m in length. It seems plausible that the fatality rate in countries for which information is not available might be higher than those mentioned above. Thus, the number of global fatalities might be considerably higher than the figure of 24 ,000 deaths world wide per year estimated by International Labour Organisation. The consequences of loss of life fall heavily on the dependents. In developing countries, these consequences can be devastating: widows have a low social standing, there is no welfare state to support the family and with lack of alternative sources of income, the widow and children may face destitution.

THE PROBLEM

The evolution of the fishing industry over the centuries has been accompanied by the development of skills and experience in vessel design, construction and equipment, as well as in fishing operations and safety at sea. Until the middle of the last century, these developments were almost invariably gradual and steady, largely unaffected by external influences. Technical developments from 1945 to 1970 drastically accelerated this evolutionary process; widespread use of outboard engines, the use of hydraulics for hauling gear and catches, synthetic nets and lines, fish-finding electronics and refrigeration equipment led to massive leaps forward in productivity and profitability. Under the free-for-all access to fisheries together with the market's insatiable demand for fish, the harvesting capacity of the fleets was bound sooner or later to reach or even exceed the maximum yield of the fishable stocks.

Over-exploitation of coastal resources and advances in vessel and fishing technologies are probably the major underlying factors that have negated the results of parallel efforts to improve safety at sea. Excessive fishing effort; increased competition; reduced profitability; economies in vessel maintenance, equipment and manpower; fatigue; recklessness; fisheries management measures (which do not take sufficient account of the human element or fishermen safety

into consideration); diversified fishing operations unaccompanied by training, traditional experience and skills; these are some of the factors that have resulted in fishing being the most dangerous occupation in the world.

POSSIBLE SOLUTIONS

There are a number of areas where improvements can be made: provision and analysis of data identifying the causes of fatalities and injuries; education and training of trainers, extensionists, fishermen and inspectors; improved fisheries management, safety regulation and enforcement; increased collaboration between fishermen, fishermen's organizations and government.

DATA

Some would argue that the root and actual causes of accidents in the fishing industry are known intuitively. While this may often be the case, reliable quantified data would be likely to show differing trends in different regions, countries and fisheries, and should contribute to understanding the main causes of fatalities. In order to focus and prioritize the actions that should be taken to increase fishermen's safety, the most frequent causes of danger and vessel losses must be fully investigated. Thus, vastly improved accident reporting is seen as central to the quest for improved safety in the industry.

Even when injury reporting takes place, the many different approaches to collecting information on the types and causes make it difficult to produce comparable data and statistics and thus make it difficult to identify and address key issues. The nature of the employment arrangements in fishing, which may place many fishermen outside traditional occupational injury and disease reporting systems, also contributes to this lack of information.[7]

REGULATIONS

Regulations and technical standards at the national level must be formulated, reviewed and amended through dialogue between the builders, owners, fishermen and administrations to ensure that all parties share a sense of ownership and responsibility in the application of the new regulations.

Enforcement of safety regulations is essential. This requires collaboration within administrations, and particularly between Fisheries and the Marine Authorities.

But in reality, very few of the individual inspectors attached to Fisheries Divisions have a background in boat-building, marine engineering or naval architecture, nor have had any training in the conduct of condition surveys of vessels of any sort at the level normally required for classification or insurance purposes. Thus while part of the solution may lie in regulating the quality to which boats are constructed and equipped, attention must also be paid to the necessary skills of the enforcers. Ensuring adequate enforcement implies a significant commitment on the part of the administration, taking into account the cost and effort of establishing, staffing and training a new section.

However, a safe working environment cannot simply be imposed from above. Even if all relevant international conventions were extended to include fisheries, ratified by sufficient numbers of countries and implemented and enforced in laws and regulations at national levels, a safe working environment could not be assured without community participation. Even after the most rigorous decision-making and regulation-formulation processes inside the administration, regulation has yet to pass the most demanding test of all: the public must agree to comply with it.

TRAINING

Training for fishermen is clearly one of the means that can be used to channel the results of the lessons learned from analysis of improved data. Historically, the formal training of fishermen has been limited to skippers, mates and engineers in developed countries and undertaken to ensure compliance with certification requirements. The British Merchant Shipping Act (1894) provided the basis for regulations that covered most of the Commonwealth including India, Australia, Canada and many other countries. The IMO Protocol to the Standards of Training, Certification and Watchkeeping for Seafarers (1978) provided standards for countries to follow, but the Protocol was never ratified and was superseded by the Convention for the Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (1995) (STCW-F). These provisions only referred to vessels greater than 24 m in length or powered by more than 750 kW, but for smaller vessels, the FAO/ILO/IMO Document for Guidance on Fishermen's Training and Certification gave further information on courses and syllabi. This document has been recently revised in line with the STCW-F and retitled "Document for Guidance on the Training and Certification of Fishing Vessel Personnel" (Document for Guidance).

Any mandatory program is prone to resentment, resistance and probable failure, unless it has the support and involvement of fishermen. In Europe, there has been a change in emphasis from formal training to functional training where trainees have to demonstrate their competence to complete tasks, rather than prove their knowledge by providing oral or written answers to questions. This type of functional training requires more resources than theoretical training, particularly where trainees are exposed to dangerous situations and safety during the safety training process becomes an issue.

ATTITUDE

Ensuring positive attitudes towards improved safety at sea must be a task of every fisheries institution, regardless of its function or hierarchical position. This process is one that in fishing communities could start at elementary or primary school. Such a process has been attempted in United Kingdom to introduce children to the idea of safe fishing.[8]

Despite increased safety legislation, mandatory courses and improved safety equipment, some European countries are concerned that the accident and fatality rates remain very high and have considered the Integrated Safety Management (ISM) system adopted by IMO for trading vessels to see if this could provide an answer to the problem. The ISM system requires that the master and crew of a vessel provide a written report, which analyses and describes the hazardous areas and activities which take place during the operation of the vessel (termed a safety management system). They are also required to state the precautions they will take to reduce or eliminate such hazards. Hence the fishermen are guided into a process whereby they have to think about safety on their own vessel using their particular fishing method rather than rely on the provision of equipment and training which is neither specific to the vessel nor the fishing method. However, there are reports that the objective of this measure is being circumvented with owners hiring consultants to draw up the ISM reports for their vessels. There are also concerns about such a system causing excessive paper work and it not being appropriate for crew members with limited literacy.

FISHERIES MANAGEMENT

An additional approach through which safety might be improved would be fisheries management. The seas and oceans are now recognized as sensitive and limited resources that must be carefully nurtured by all who exploit them. This is such a revolutionary concept that it will take considerable time until its consequences are realized in full: that free access to fisheries will disappear, be it on the high seas or within national waters. Every nation will have to find ways to manage its fisheries, collect information on the size and composition of the fleet, and adjust it to the capacity of the fish-stocks within its jurisdiction. While this implies that even artisanal fisheries amongst the developing nations will have to be contained and controlled in some way, it is recognized that restricting access to fisheries may prove a politically and practically daunting task. Fisheries have been free-for-all, the fleet largely uncontrolled and often operated directly from the shore with few or no harbors that might act as control points. Nevertheless, fisheries will have to be managed sooner or later, whether by the state or by the international or local community, and experience bears out that the benefits of such a regime may in fact compensate for the costs.

The new legal regime of the oceans gives coastal states rights and responsibilities for the management and use of fishery resources within their Exclusive Economic Zones, (EEZ) which embrace some 90 percent of the world's marine fisheries. This coincides with clear indications of over-exploitation in many waters, which motivates national governments to bring fisheries under proper control. An obvious instrument is the issuing of authorizations to fish, which can be applied to both vessels and crew.

The aim of managing fisheries should not only be the responsible harvesting of living marine resources so as to secure their sustainability, but also to provide fishermen with acceptable working conditions.

This development opens up new possibilities for managing safety at sea. Throughout the twentieth century safety issues were promoted almost exclusively on a voluntary basis, with limited results. By treating safety as an integral part of fisheries management, and making safety requirements prerequisites to fisheries authorization, progress is certain to ensue. These measures will require a change of attitude within fisheries, and consequently a firm motivation on behalf of the legislators, but given that fisheries are the most

dangerous occupation known on earth, these moves are justified and seem inevitable.

FAO

FAO is one of the three specialized agencies of the United Nations system playing a role in fishermen's safety at sea. The other two are the IMO and the ILO. IMO deals largely with international shipping and is the agency responsible for improving maritime safety and preventing pollution from ships; adoption of maritime legislation is still IMO's best-known responsibility. The ILO formulates international labor standards in the form of Conventions and Recommendations, setting minimum standards of basic labor rights, promotes the development of independent employers' and workers' organizations, and provides training and advisory services to those organizations. By virtue of the working methods of IMO and ILO, their results tend to have little impact on the safety of artisanal and small-scale fishermen who operate largely outside the regulated sector.

The FAO has the mandate to raise levels of nutrition and standards of living, to improve agricultural productivity, and to better the condition of rural populations. Over the last decade, much of the work of the Fisheries Department has been directed towards the formulation and implementation of the Code of Conduct for Responsible Fisheries[9] which recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interests of all those concerned with the fishery sector. It recognizes too the importance of the safety issue, and contains several references to the subject addressing working and living conditions, health and safety standards, safety of fishing vessels, training, certification and accident reporting.

Within the Fisheries Department of the FAO, the Fishing Technology Service promotes, develops and transfers appropriate fish capture technology and practices with due regard to protection of the environment and the well being of fishing communities. It develops, through consultation with governments, other international organizations, non-governmental organizations and those involved in fisheries, codes of conduct and standard specifications and guidelines in support of fisheries management, safety at sea and the protection of the environment.

The service has implemented a number of projects aimed at improved sea safety. These have particularly been directed at the developing countries and

carried out in the field, in cooperation with the local people. The issue has been tackled from various perspectives including improved vessel design and construction, better preparedness for natural disasters, improved collaboration between government and fishermen representatives, providing assistance in the setting up of national sea safety programs, and institutional strengthening to fisheries training centers.

FAO AND SAFETY AT SEA

Many developing countries face the need to design and implement a system to manage their fisheries and may look for external advice and aid to further their goals. FAO is the obvious UN agency to promote a holistic approach to fisheries management; FAO will continue to advocate the inclusion of safety at sea as an integral part of the proposed management regime. This will be reflected in its active use of the Code of Conduct for Responsible Fisheries to promote and monitor issues pertaining to safety at sea.

One of FAO´s major strengths in fisheries lies in the identification, formulation and implementation of field projects, which involve local administrations, expertise and communities, under the guidance of experts from FAO. Up to 1800 such field projects have been operating at any one time (in all areas of FAO's expertise including agriculture and forestries), resulting in the build up of knowledge of local conditions as well as a network of contacts both at local, national and regional levels. Regarding fisheries in particular, FAO has implemented hundreds of projects in the field directly related to the establishment of fisheries training institutions, improving the quality of design, construction and equipment of fishing vessels, improving methods of harvesting, processing and distribution of the products, and above all, working directly with and building up competence in the fishing communities.

Since its creation in 1945, FAO has taken an active part in the formulation and implementation of international standards, instruments and guidelines to further its aims, often in close cooperation with other UN agencies concerned, primarily the IMO and ILO. FAO will continue to work closely with IMO and ILO on the issue of safety at sea for fishermen, and in particular with regard to design, construction and equipment of fishing vessels, as well as on matters related to health and working conditions, training and certification.

THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES

With the Code of Conduct for Responsible Fisheries and the accompanying Technical Guidelines, FAO has provided a framework on which different fisheries management systems can be built. The Code of Conduct is a unique instrument in its holistic approach, being based on and bringing together key elements from international conventions and guidelines concerning fisheries and related environmental issues. The fact that the Code is to a great extent non-mandatory has proven to be more of an asset than weakness, as it renders the Code attractive as a model on which to base the management of fisheries, without having to be ratified as a whole.

The Code of Conduct refers to safety, training and certification of competency in eight paragraphs in the Code (see appendix). This provides an opportunity for FAO to use the Code of Conduct as a vehicle to promote various issues relating to safety at sea. Specifically, this can be done when monitoring the implementation of the Code. A questionnaire, which is sent out biennially to all member states, serves not only to gather information, but also to highlight key issues and is therefore important as a tool to arouse awareness of safety as an integral part of fisheries management.

TECHNICAL GUIDELINES ON THE ADMINISTRATION OF SAFETY AT SEA.

The series of Technical Guidelines that expand on the principles of the Code of Conduct enjoy credibility as practical and reliable sources of information. In the Code of Conduct safety at sea is the subject of several paragraphs. Expanding on those and explaining how they could be applied, the implications they may have, what kind of legal framework they may require, etc. could be useful for administrators who intend to meet the challenge of improving safety at sea in their country. The formulation of such guidelines is now under consideration for inclusion within the Department's work program.

TECHNICAL ASSISTANCE AND CAPACITY BUILDING

The problems encountered in safety at sea by fishermen in the developing countries are quite different from those in the developed ones. In the former, the vessels and fishing gear are often simple and labor intensive and their fishing communities are frequently dispersed along the shore, where harbor

facilities are limited and beach landings common. Furthermore, the basic perception of the value of human life is culturally determined. This affects the motivation of each society to invest resources in life-protecting measures. In many developing countries there is hardly any political pressure to invest in safety at sea. This is further confounded by the absence of organized representation, such as unions and pressure groups, which makes coordinated action difficult. There is generally a lack of commitment and financial resources to provide institutional support to the fisheries sector regarding data collection, vessel registration, technical training, regulation and enforcement, and search and rescue, and also a lack of cooperation between different governmental agencies.

Different approaches to improving sea safety are required, and FAO has the experience and expertise to provide the required guidance and advice as a result of its long tradition of cooperation with local people in developing countries from the community level to the highest authorities in civil service and government. These local networks and the knowledge of local conditions in different developing countries and regions are of supreme importance, and should be regarded as a valuable resource that has been built up through the efforts of FAO over more than half a century. FAO will therefore continue to provide assistance that may range from ad-hoc advice to full scale technical assistance projects.

USE OF THE INTERNET

The Internet is rapidly becoming the main source of information worldwide with a scope and flexibility that provide endless opportunities for adapting material to individual needs. Courses on all sorts of issues pertaining to fisheries, including safety, are already being offered on the Internet, but they are not composed for nor aimed at users in the developing countries. Going through the array of existing material in search of something useful is a daunting task for the individual users, such as trainers or inspectors in the developing countries. Suitable course material needs to be compiled and edited as ground material for these users to choose from. Outlines of courses could be provided with rich picture material and relatively simple texts, which could be translated into different languages. FAO has the necessary expertise and local knowledge to carry out such a task, and this would be a logical continuation of FAO´s long-standing role as provider of training and extension programs. FAO will take a

leading action in developing an Internet site and developing web based material for trainers/inspectors, suitable for adaptation to specific needs in different countries.

CONCLUSION

Measures to improve safety can only be truly effective where the motivation to apply them exists. To establish and maintain such a culture of safety is a never-ending task that demands the participation of the fishermen themselves and their families, the boat-owners, the legislators and the community at large. There are many examples of individuals interested in safety at sea who formed fishermen self-help groups or other NGOs and established a fruitful cooperation with the authorities to promote safety in their communities.

In those countries where appropriate regulations, enforcement and training are in place, there has been a measurable (though not always significant) reduction in the annual number of fatalities over the last 15 years. Although these countries account for less than five per cent of the world's fishermen, they demonstrate that results are achievable. Recognition of the issue of safety at sea as a major and continuing problem is the first step towards its mitigation. It is considered that responsibility for safety at sea should be borne by both administrators and fishermen, and similarly that effort and assistance is shared between those two groups to ensure an effective partnership enabling a safer profession.

APPENDIX: THE CODE OF CONDUCT AND SAFETY AT SEA

6.17 States should ensure that fishing facilities and equipment as well as all fisheries activities allow for safe, healthy and fair working and living conditions and meet internationally agreed standards adopted by relevant international organizations.

8.1.5 States should ensure that health and safety standards are adopted for everyone employed in fishing operations. Such standards should be not less than the minimum requirements of relevant international agreements on conditions of work and service.

8.1.6 States should make arrangements individually, together with other States or with the appropriate international organization to integrate fishing operations into maritime search and rescue systems.

8.1.7 States should enhance through education and training programs the education and skills of fishers and, where appropriate, their professional qualifications. Such programs should take into account agreed international standards and guidelines.

8.1.8 States should, as appropriate, maintain records of fishers which should, whenever possible, contain information on their service and qualifications, including certificates of competency, in accordance with their national laws.

8.2.5 Flag States should ensure compliance with appropriate safety requirements for fishing vessels and fishers in accordance with international conventions, internationally agreed codes of practice and voluntary guidelines. States should adopt appropriate safety requirements for all small vessels not covered by such international conventions, codes of practice or voluntary guidelines.

8.3.2 Port States should provide such assistance to Flag States as is appropriate, in accordance with the national laws of the Port State and international law, when a fishing vessel is voluntarily in a port or at an offshore terminal of the Port State and the Flag State of the vessel requests the Port State for assistance in respect of non-compliance with sub-regional, regional or global conservation and management measures or with internationally agreed minimum standards for the prevention of pollution and for safety, health and conditions of work on board fishing vessels.

8.4.1 States should ensure that fishing is conducted with due regard to the safety of human life and the International Maritime Organization International Regulations for Preventing Collisions at Sea, as well as International Maritime Organization requirements relating to the organization of marine traffic, protection of the marine environment and the prevention of damage to or loss of fishing gear.

FOOTNOTES

1. U.S.A. Bureau of Labour Statistic [1998].

2. ILO Yearbook of Labour Statistics [1998].

3. Fish Safe Foundation, South Africa [2000].

4. UK Government http://www.shipping.detr.gov.uk/fvs/index.htm.

5. IMO MSC/Circ.539/Add.2 and FSI 6/6/1.

6. IMO FSI 7/6/2.

7. ILO Report on the safety and health in the fishing industry, [1999].

8. MCA http://www.mcagency.org.uk/safefishing/ftintro.htm.

9. The Code is voluntary. However certain parts of it are based on relevant rules of international law, as reflected in the United Nations Convention on Law of the Sea of 10 December 1982. The Code also contains provisions that may be, or have already been given binding effect by means of other obligatory legal instruments amongst the Parties, such as the Agreement to Promote Compliance with Conservation and Management measures by Fishing Vessels on the High Seas, 1993.

SPECIAL HAZARDS OF IMMERSION IN NEAR FREEZING WATER

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Bill Keatinge was directed into research on survival in cold water during military service as a doctor in the British Navy, and published from this a series of papers on the factors that determined body cooling rates of volunteers in cold water. Other studies included the freezing of human skin in near-freezing seawater. His research since then has ranged over fields that include the causes of raised mortality in both cold and hot weather, but has always returned to cold water problems. It has recently focused on individuals with exceptional ability to swim and survive in extreme low water temperatures.

INTRODUCTION

Survival in near freezing water involves not only an intensified form of the problems encountered in less severe cold immersions, but also special hazards that are only presented by water temperatures below 12°C. The evidence about the nature and prevention of these problems of extreme cold immersion has come to light at intervals over the last 60 years. I would like to illustrate them from my and my colleagues' results, and to put them into a scientifically logical order rather than in the order in which the pieces of information came to light.

SUMMARY

Hypothermia is the main threat to the life of people immersed in cold water after shipwrecks, who usually have life jackets or other buoyancy aids. In cold water at temperatures down to 12°C a thick layer of subcutaneous fat can provide enough insulation to enable people to maintain safe core temperatures for many hours, though thin people without external protection cool rapidly. High surface area to mass ratio associated with small overall body size also accelerates body cooling.

At water temperatures below 12°C cold, vasodilatation, due mainly to cold paralysis of blood vessels in the skin, can lead to rapid heat loss even in obese people. In water colder than 5°C there are additional hazards from anesthesia of the skin, and progressive weakness due to impairment of nerve and muscle function from local cooling of the limbs. Severe nerve and muscle damage in the limbs can be produced by immersions in water below 12°C lasting for several hours. In seawater which freezes at -1.9°C, there is an additional risk of freezing of unprotected skin immersed in near freezing water for many minutes.

People who fall overboard clothed and without a life jacket are at risk of sudden drowning even if they are good swimmers, since the high viscosity of very cold water causes viscous drag and rapid exhaustion, and reflex respiratory distress in very cold water can incapacitate unadapted people.

Wearing of life jackets, and external protection against cold, with survival suits providing the most effective protection, are the most important preventive measures against immersion deaths after accidents at sea. Recent evidence shows that with cold adaptation people with thick subcutaneous fat can swim safely for several hours in water down to 5°C, without external protection, but based on current evidence, immersion suits with hand and foot cover are needed for anyone to do so in water colder than this.

EVIDENCE

The main fact underlying the hazards of cold immersion is that water is a much better conductor of heat than air. It also has a much higher specific heat, making it a better carrier of heat by convection. As a result, people without external protection in cold water have little external insulation, and lose heat at a rate that is determined largely by their own internal body insulation and heat production. The main facts about these heat exchanges were established by different research groups in experiments on volunteers, and from studies on long-distance swimmers, during the fifteen years after the Second World War.

The most important of the studies' findings is that adults without external protection cool in water at around 15°C at a rate that is closely dependent on the thickness of their subcutaneous fat. Body core temperatures of people with mean skinfold thickness less than 5 mm at subcostal, subscapular, abdominal, and biceps sites cooled by more than 2°C during 30 minutes in

water at that temperature. People with skinfolds at these sites averaging more than 10-20 mm cooled little if at all in water at 15°C. Although exercise greatly increases body heat production, people immersed in water that is cold enough to cause progressive body cooling usually cool faster if they swim, than if they float still in life jackets. Blood flow to the limbs is greatly increased by the exercise, carrying heat to them from the body core. With relatively thin layers of fat that are present on the limbs, the heat transferred to the limbs from the body core is rapidly lost to the water.

Surface area/mass ratio is greater in small individuals than large ones. Small people therefore have a larger area of body surface to lose heat from, in relation to body mass where heat can be produced and stored. As a result, other things being equal, small individuals cool faster than larger ones in cold water. This is particularly important in children, who cool rapidly for this reason as well as because they usually have thinner subcutaneous fat than adults.

All of these factors remain important in water temperatures below about 12°C, but cold vasodilatation becomes an important risk factor in colder water. This vasodilatation results mainly from cold paralysis of blood vessels in the skin and so cannot be overcome by increasing the intensity of vasoconstrictor nerve activity. As a result even obese individuals generally start to cool progressively after around 30 minutes of immersion in water at 5°C.

In recent years it became clear that some individuals were nevertheless able to survive and maintain body temperature during many hours in such frigid water. The most striking was Gudlaugur Freidthorsson, an Icelander who swam for five hours in water at 5.2°C after his fishing boat sank off the south coast of Iceland. Subsequent experimental immersion in a laboratory showed that he could indeed stabilize body temperature in such water, lightly clothed as he was during his swim, and without undergoing marked cold vasodilatation. Another swimmer, Lynne Cox, wearing only a bathing suit and hat, swam for two hours five minutes in water at 7.2-7.3°C in the Bering Straits without core temperature falling below the normal range.

Both of these people were cold-adapted from repeated exposure to cold water at the time of their swims. A possible explanation of their ability to avoid rapid heat loss was that the blood vessels in their skin had adapted to the cold so that they did not suffer cold paralysis in their swims. Experimental evidence

of such adaptation by blood vessels was later obtained from experiments in which one hand of volunteers was repeatedly exposed to cold. Subsequent immersion of a finger of that hand in ice water when the subject was generally chilled, and so had high vasoconstrictor tone, caused more vasoconstriction after, rather than before, cold adaptation. The likely explanation was that cold paralysis of the blood vessels was less after cold adaptation and so enabled the vasoconstrictor nerves to shut down blood flow to the skin more effectively.

The general conclusion is that some individuals with unusually thick and well distributed subcutaneous fat can survive and stabilize body core temperature for very long periods in water around 5°C, but probably only if they are cold adapted. The great majority of people immersed in water at that temperature following shipping accidents are not cold adapted, and even in cases where they have substantial subcutaneous fat, cannot be expected to survive for long without effective immersion suits. In the absence of immersion suits, any other external protection can have a dramatic effect in these extreme conditions. The rate of body cooling can be more than halved by ordinary, thick, non-waterproof clothing.

Immersion for around three hours in water below 12°C can cause non-freezing cold injury, with severe degeneration of nerve and muscle in the limbs, leading to lifelong disability in many cases. It is not known whether previous cold adaptation can reduce this injury, or can reduce the reversible cold anesthesia of the skin that develops in water below 5°C. However, with present knowledge, it is not clear that anyone can safely remain in water below 5°C for many minutes without external insulation.

It has often been supposed that human tissues cannot freeze in liquid seawater, but seawater in the oceans freezes at -1.9°C, and human skin freezes at -0.53°C. In practice, human fingers cooled below -0.53°C often supercool for many minutes rather than freezing, but in many cases they do freeze. This could be dangerous under any circumstances at sea, and highly dangerous to survivors in cold water. Seawater near coasts, and in gulfs with input of river water, often contain less salt than ocean water, but immersion of human tissue in ocean water at its freezing point for many minutes carries some risk of freezing for humans. This can be avoided by providing some insulation in the form of gloves or mitts, and by keeping the immersion brief.

The main conclusions from this with regard to survivors, as opposed to sports swimmers, are first that although thin people can die of hypothermia in water warmer than 12°C, obese people commonly survive many hours in water at 15°C without protection, and occasionally do so in water as cold as 5°C. Hope should not be abandoned too quickly in searches for survivors. Otherwise, the emphasis has to be on providing protection, preferably by inflatable life rafts with canopies, or less effectively by immersion suits or other protective clothing plus flotation for survivors immersed in the water. Heat loss can be reduced in the absence of effective protection by adopting huddle positions in which the legs are drawn up against the trunk, or by survivors holding together in groups. To ensure long survival of unadapted adults of any body build, protective clothing or rafts should aim to keep skin temperatures above 28°C. In briefer immersions, survivors should not allow skin temperatures to drop below 12°C for several hours, or below 5°C for many minutes, or below 0°C for a few minutes.

It was recognized in the 1960s that many accidental deaths in inshore waters, and some in the open sea, were taking place much too rapidly for hypothermia to be responsible for them. These deaths involved people without life jackets, but it was not clear why people who were often good swimmers should have drowned within a few minutes of entering or falling into cold water. Experimental swims showed that volunteers who were not cold adapted had no difficulty in swimming clothed for twelve minutes in water at 25°C, swimming pool temperature, but none were able to swim for that time in water at 4.7°C The reason was partly that intense reflex respiratory distress induced by cooling of the skin incapacitated them, and partly that the high viscosity of very cold water increased the work of swimming and so caused rapid exhaustion. Surprisingly, the middle-aged volunteers could swim further than younger and fitter people. The reason was that they had more fat, and the buoyancy of the fat enabled them to keep their heads above water even when fatigue had slowed swimming movements. The younger people, with less fat, sank immediately after their swimming slowed, and would have drowned if safety ropes had not been in place to pull them out. The practical solution is for all people liable to sudden immersion in cold water to have some form of buoyancy aid. A campaign on these lines in Britain, directed at children, was followed by a 20 percent fall in immersion deaths among children over the next four years. The most important way to prevent deaths from people falling overboard

from fishing vessels is to have working practices that prevent them going overboard at all, but wearing a life jacket or other flotation aid is an option for reducing the risk to people doing tasks on deck in circumstances where, for example, emergency action is needed and a safety line is not practical.

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COMMERCIAL FISHING VESSEL SAFETY

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LCDR Roberts is a 1983 Graduate of the United States Coast Guard Academy with a BS Degree in Electrical Engineering. He served two years as an engineering officer aboard the Coast Guard Cutter Monroe before entering the Marine Safety field. LCDR Roberts completed marine safety field tours at Port Safety Station Houston, Texas and Marine Safety Office Morgan City, Louisiana between 1987 and 1994, then was assigned to Marine Safety Office Wilmington, North Carolina as Chief of Vessel Inspections. He supervised implementation of the Commercial Fishing Vessel Voluntary Dockside Program in Wilmington through 1998. From 1998 to present, he has served as Chief of the Commercial Fishing Vessel Safety Division in the Coast Guard Headquarters Office of Compliance, which is responsible for national commercial fishing vessel safety policy development and program management.

One of the United States Coast Guard's (U.S.C.G.) overall goals is to increase the level of safety in the fishing industry so that it is no more dangerous than any other segment of the maritime community. The commercial fishing fleet in the United States is estimated to be between 100,000 – 120,000 vessels with approximately 1,500 vessels over 79 feet. The industry is reported to be one of the most hazardous in the nation; on average 78 crewmember deaths per year have been recorded between 1992 and 1999. Although the most serious deficiency in casualty statistics is the lack of firm population data to serve as the denominator for fishermen death rates, available data estimates between 160 – 180 fatalities/100,000 workers occur annually – well above 32 fatalities/100,000 workers goal set for the maritime industry as a whole.

The USCG's Commercial Fishing Vessel Safety (CFVS) Program for the past ten years has been aimed at gaining compliance with safety regulations through *voluntary* dockside vessel exams, public education and awareness campaigns.

Regulatory enforcement through the at-sea boarding of fishing vessels serves as a deterrent to safety violators and complements the voluntary program.

Damage control trainers and stability trainers, which allow fishermen to practice damage control skill on a vessel mockup and witness the affects of various vessel configurations on stability, have been deployed to address the professional knowledge gap in these areas. In addition we have deployed EPIRB test kits in all USCG districts to ensure EPIRBS are functioning properly and registered in the national SAR database to facilitate rapid search and rescue responses.

Over the years, our efforts in support of the Commercial Fishing Industry Vessel Safety Act have met with success in reducing fishing related casualties. To show the impact of the CFVS Program, two five-year periods of time should be examined – one before and one after implementation of the CFVS Program.

Before the Act, from 1984-88, 519 lives and 1,177 vessels were lost while commercial fishing, compared to 349 lives and 707 vessels lost during 1994-98 after the Act and the commercial fishing safety program were fully implemented. This represents about a 33 percent decrease in the number of fishing related deaths and a 37 percent decrease in the number of fishing vessels lost. Although this decrease is certainly a success, the number of deaths and vessel losses annually remains relatively high.

Despite our efforts, commercial fishing persists as our nation's most hazardous industry. In January 1999, the safety record the fishing industry and the USCG received widespread media attention after 4 clam vessels and 1 conch vessel sank off the Eastern Coast of the United States with 11 lives lost. In December 1998, just a few weeks prior to these casualties, five other fishing vessels were lost in just eight days with eight lives lost.

On January 29, 1999, in light of the increasing number of fishing vessel casualties and the impetus provided by the East Coast clam vessel tragedies, Admiral North chartered a Commercial Fishing Industry Vessel Casualty Task Force. The Task Force was comprised of USCG members, from both marine safety and operations, and from both headquarters and the field. Also included were commercial fishermen, representatives from the insurance industry, NTSB, NOAA, NMFS, OSHA and the Fishing Vessel Advisory Committee.

In March 1999, the Task Force issued a report containing 59 safety recommendations in 7 different categories.

In direct response to the Task Force report and evaluation reports, the USCG implemented *immediate action measure,* designed to improve CFVS under existing authority and focused attention on three improvement areas: at-sea boardings; voluntary dockside exams and education/outreach efforts; and CFVS training of USCG personnel.

DATA

The following is a brief description of the casualty statistics that influenced the strategies we intend to employ to address the unacceptable casualty rate for commercial fishing vessels. Figure 1 shows geographical USCG operational and jurisdictional districts. The sum of the following casualty data will be displayed in relation to these areas. The 17th District has the most fatalities over the time period displayed.

Figure 1: U.S.C.G. District areas

Figure 2 depicts the number of fishermen who died *or* were declared missing from operational causes from 1994 through 1998. During this period, the 17th (73), 8th (63), and 11th (56) districts top the list in total personnel losses.

This data, *though not normalized by denominator data,* such as number of fishermen or days underway, indicate that commercial fishing casualties occur on all coasts, and in all USCG districts.

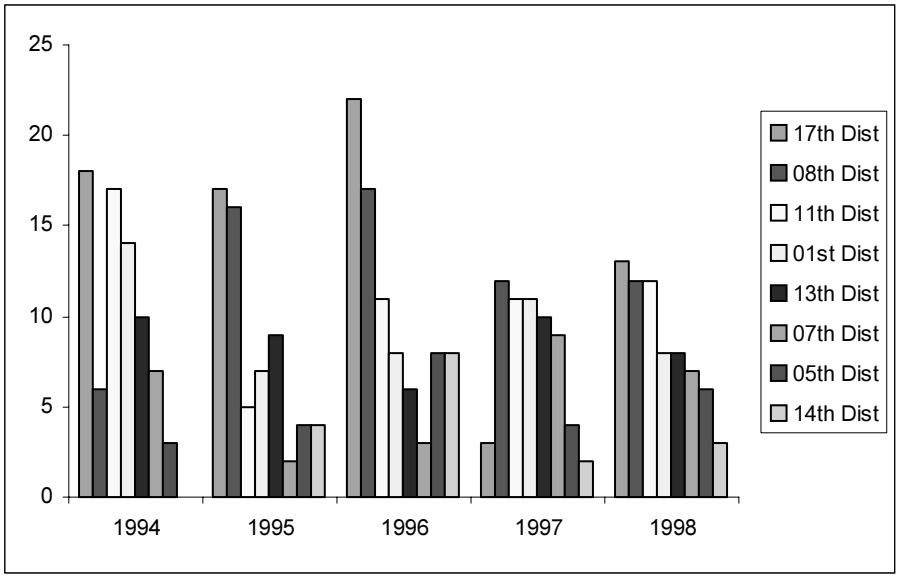

Figure 2: Dead and missing by Coast Guard District

Figure 3 shows the number of fishermen who were killed or lost by vessel type. Here you see that *trawl vessels* with a total of 116 lives lost are followed by vessels fishing with *traps and pots* with 81 fishermen lost.

The *unknown* category represents the loss of 33 fishermen over the 5-year period – our review of casualty data did not reveal *vessel type* for these 33 incidents. Improvement in data collection is necessary to further refine our analysis of casualty trends and better target prevention efforts.

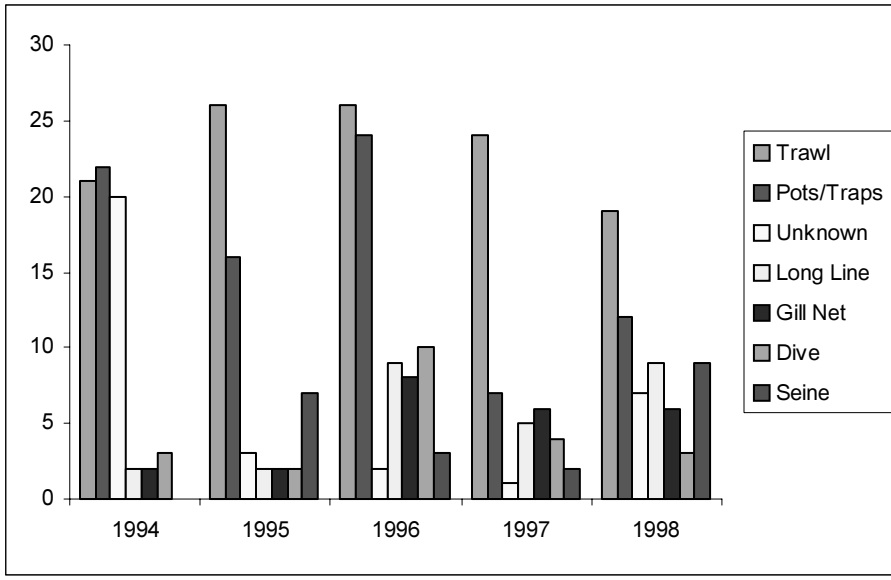

Figure 3: Dead and missing by vessel type. Note: includes types with over 20 total Deaths

Shrimp and *crab* were the two most hazardous fisheries during this period, with the shrimp fishery accounting for 64 losses while the crab fishery accounted for 62 losses. The *unknown* category also accounted for 62 losses. *Drowning* (49 percent) and *missing* (37 percent) lead the way as the primary causes of death among fishermen, accounting for 86 percent of all losses. The remaining 14 percent of deaths were brought about by exposure (7 percent), asphyxiation (4 percent) and being crushed (3 percent).

The primary cause of death among fishermen is drowning (49 percent). Commercial fishermen find themselves in the water, unexpectedly, by 2 major causes: 1.) flooding, sinking, and capsizing, which are interrelated to some degree, and 2.) falls overboard.

Fifty six percent of deaths result after vessels have flooded, sank, and/or capsized while 29 percent occur because of falls overboard. Arguably the *pulled overboard by gear* (5 percent) category could be added to the *falls overboard* category boosting its total to 34 percent of all losses.

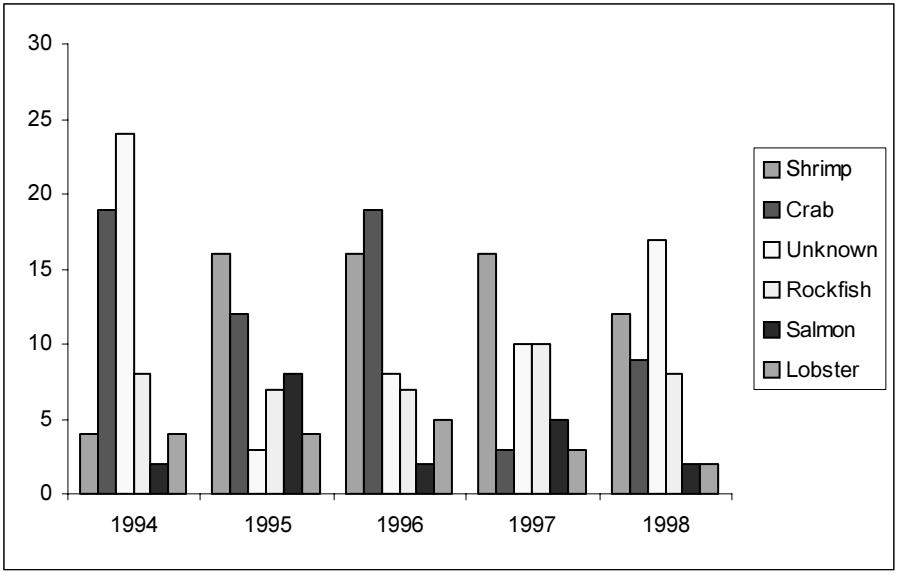

Figure 4: Dead and missing by fishery

The majority of fishing vessel losses (86 percent) occurs on vessels that are less than 80 feet in length. Please bear in mind that over 98 percent of all U.S. commercial fishing vessels falls into this size range; therefore, this distribution is to be expected.

The USCG Action Plan we are implementing on the nation level represents a consolidation of the top safety recommendations contained in the Task Force report and district evaluation reports as prioritized by USCG fishing vessel safety personnel and the Commercial Fishing Industry Vessel Advisory Committee, a citizen group charted to assist the USCG in developing fishing industry safety policy, as well as the data previously discussed in this paper. The Plan consists of three short-term and eight long-term action areas.

SHORT TERM ACTION AREAS

1. A Fishing Vessel Safety Division at USCG headquarters. The creation of this division will provide needed support *and* continuity to the CFVS Program. This division will also provide a stronger emphasis on commercial fishing vessel safety at the USCG headquarters level.

2. Field level enforcement operations on high-risk vessels were supported and encouraged to increase compliance with the minimum safety regulations. These activities hopefully will promote greater participation in fishing vessel exams nationwide in the long term.

3. Those involved with the CFVS program plan to improve upon the sharing of *best practices* and *lessons learned* with the fishing industry and USCG personnel. In theory education of the fishermen regarding the risks associated with their profession and risk reduction measures will help reduce casualties.

LONG TERM ACTION AREAS

1. Improve emergency preparedness drill enforcement. Commercial fishermen too often die because they *are not* well versed in emergency preparedness procedures, despite existing safety regulations. This action item will give law enforcement officers better tools to determine the degree of compliance with existing regulations, which require monthly drills for crewmembers.

2. Complete an existing regulatory project on fishing vessel stability and watertight integrity. From 1994-1998, 343 (or 49 percent) of all fishing vessels lost, were lost due to stability and/or watertight integrity casual factors. Also, 119 (or 33 percent) of all commercial fishing related deaths resulted from fishing vessel losses involving stability and/or watertight integrity as causal factors. Since stability and watertight integrity regulations already exist for *new* vessels of at least 79 feet – this action area will be applicable *only* to *new* fishing vessels *less* than 79 feet. The majority of U.S. fishing vessels are less than 79 feet, and the majority of marine casualties affecting fishing vessels and their crews involve these smaller vessels. So it makes good sense to address the larger pool of vessels at risk.

3. Improve casualty investigations and analysis. This action area is well underway. Currently a detailed review and analysis of about 1,100 fishing vessel casualty cases is being conducted in an attempt to identify casual factors and, in so doing, prevent similar casualties from happening in the future. Preliminary measures have been taken in the design of a new information database which will allow us to readily collect and query important casualty information, without a detailed review of individual casualty cases as is necessary when using the current database. The capabilities of this new database, along with analysis of SAR data, will help us better identify risks associated with certain variables, such as *fishery*, *operational design*, and *hull material*. We're also considering ways to better normalize casualty data to allow us to improve both our ability to identify relative risk and our focus on regional safety issues.

4. Improve communications. Measures have been taken to better communicate *lessons learned* and *best practices* to the fishing industry and USCG personnel in each of the following areas:
   National CFVS Week
   National CFVS Newsletter
   National CFVS Web Page
   National Media Campaign

5. Coordinate fishery management with safety. Fishery management decisions greatly affect the safety of fishermen. For instance, a decision to permit

fishing, *only* within a short time window, influences fishermen to fish during that time period in order to make a living. This practice, although quite effective in managing fisheries, sometimes leads to marine casualties and the loss of life when the short time window coincides with poor weather conditions. This action area is now in-progress and will be continued over the long-term. District CFVS Coordinators now attend Fishery Council meetings and provide advice on management decisions that might affect the safety of fishermen.

6. Seek authority and funding for mandatory vessel examinations and mandatory safety training. Fishing vessel exams help save lives, but our examiners spend too much time trying to convince fishermen to allow them on board and less time actually conducting exams.

   If fishing vessel exams were made mandatory, then examiners would be able to conduct a greater number of exams and evaluate the overall structural & watertight integrity of fishing vessels as well.

   We envision that the scope of mandatory exams would be similar to our existing *voluntary* exams and will concentrate on the existing safety equipment requirements.

7. A mandatory training based certificate program. Based on casualty investigations, it has been recognized that there is a safety training deficiency in the fishing industry. Moreover, the Fishing Vessel Advisory Committee, in their evaluation of Task Force recommendations, ranked *safety training* as one of their top ten initiatives to help save fishermen's lives. The certificate program will not be a traditional operator and crew licensing, and like mandatory examinations versus mandatory inspections, would likely be much more acceptable to most fishermen than *traditional* licensing. The training curriculum will reflect the existing emergency drill requirements and will address the basic safety knowledge needs of fishing vessel operators as well as their crews.

8. Request that Territorial Sea Baseline be substituted for Boundary Line in an amendment to the Fishing Vessel Safety Act. The location of the Boundary Line relative to the coast varies widely throughout the United

States and is not the best demarcation for safety equipment regulations. For instance, the Boundary Line swings out beyond 50 miles from shore in Southern California. Yet, in the Gulf of Mexico, the Boundary Line is 12 miles from shore, and in other areas of the United States the Boundary Line runs along the shoreline. For instance, the fishing vessel *Lindy Jane* sank about 50 miles off the Southern California Coast and the 3 fishermen on board died of hypothermia in about 4 hours. This vessel was not required to have a survival craft on board, since it was not beyond the Boundary Line. The Territorial Sea Baseline, however, is a much more consistent reference in relation to the coastline and will allow us to harmonize safety regulations with the risks associated with varying levels of environmental exposure.

Though the CFVS Program has been success in improving safety in the fishing industry through existing efforts, it has nevertheless reached a plateau – and while commercial fishing is safer than in the 1980s, it persists as one of our nation's most hazardous industries.

Through implementation of our Action Plan, we expect to have a significant and positive impact on the level of safety in the fishing industry.

FISHING VESSEL SAFETY — A MARINE ACCIDENT INVESTIGATOR'S PERSPECTIVE

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John Lang is a professional sailor who first went to sea in the British Merchant Navy in 1959. He transferred to the Royal Navy in 1962 and became a submariner and specialist navigator. During his naval career he commanded two submarines and a frigate and was, during the Gulf War, Director of Naval Operations in the Ministry of Defence in London. His last appointment before retiring from the Navy in 1995 was Deputy Chief of Defence Intelligence. He was appointed the United Kingdom's Chief Inspector of Marine Accidents in 1997. He lives in Winchester, is married and has two children.

INTRODUCTION

Fishing is among the most dangerous occupations in the world and has, in the UK today, one of the worst safety records of any industry. Although the number of fishing vessels being lost and fishermen being killed has reduced significantly in recent years as the size of the fishing fleet reduces, the number of deaths remains high and, on average, one UK registered boat founders every two weeks.

This paper focuses attention on the work of the UK's Marine Accident Investigation Branch (MAIB), explains what it is doing to prevent fishing vessel accidents, describes some of its findings from recent investigations and discusses the difficulties it has in trying to change attitudes within the industry. The problems it encounters are, it seems, identical to those experienced elsewhere in the world.

BACKGROUND

The UK's fishing industry is very diverse and embraces a wide range of activities from deep water pelagic fishing to scalloping, and from coastal netting to single handed potting. In June 2000 there were 7307 registered fishing vessels.

Although fishing's contribution to the UK's Gross Domestic Product is small, it tends to be a major employer in some coastal communities and is an established way of life for families who have been in the business for generations. The culture of the industry tends to be steeped in the past and those engaged in it are forever preoccupied with the traditional problems of battling with the elements, dwindling stocks, ever more regulations, rising costs, quotas and what they see as unsympathetic bureaucrats.

The majority of British fishermen are self-employed. Although many of them have an instinctive feel for safety and practice it in their own way, others virtually ignore it. Given a priority they will focus any new investment into ways of catching more fish.

Although many fishermen will maintain they are safety conscious, the evidence from accident investigation indicates otherwise. Costs weigh heavily on their minds and they will argue that meeting any new regulation to improve safety is prohibitively expensive. But as the MAIB frequently points out, nearly all the accidents investigated could have been prevented, not by investing in large sums of money, but by exercising greater care. Again and again it has been found that the enemy of safety is not so much a shortage of money, as the fisherman's failure to adopt a safety culture with everyone doing their best to prevent accidents happening in the first place.

THE MARINE ACCIDENT INVESTIGATION BRANCH

The MAIB was formed in 1989 and is responsible for investigating marine accidents to UK vessels and to any vessel involved in an accident in UK waters. It is entirely independent of the UK's maritime regulatory body and the Chief Inspector reports direct to the Secretary of State responsible for transport.

FISHING VESSEL ACCIDENTS — THE DETAILS

LOSS OF LIFE

Since 1992, 237 fishermen sailing in UK registered fishing vessels have lost their lives. A particularly tragic form of death that continues to feature regularly among the inshore fishermen, is the loss of lone fishermen who drown when they fall or are dragged overboard.

FOUNDERINGS

Two factors have emerged as the dominant features in vessel capsizings — a startling lack of knowledge about basic stability and adding top weight during conversions without recourse to professional naval architecture advice. Lack of stability knowledge is exemplified by conditions such as overloading, and an acceptance that water sloshing around in either the engine room or fish hold is no more than an inconvenience or occupational hazard. Fishermen may fail to realise that such a condition can lead to a rapid capsize and loss of life.

We have also been very struck by the near total indifference to the consequences of leaving weathertight hatches and doors open when not in use at sea. Few fishermen even know which doors fall into this category and the MAIB has argued strongly for them to be clearly marked so there can be no misunderstanding.

To aggravate the situation further, many fishermen fail to maintain bilge alarm systems in full working order. In many instances where undetected flooding has taken place, the alarm stopped working, but nothing had been done to repair it, or it had been landed for repair and was not on board when the flooding occurred.

NAVIGATIONAL ERRORS

Many accidents are caused by vessels running aground, usually at night, either en route to, or returning from, the fishing grounds. Analysis of the causes can be divided into two main categories, fatigue or an over reliance on automatic navigation aids.

Fatigue is endemic in the industry. Few fishermen get adequate sleep and, as they become increasingly tired, they make mistakes and there are numerous incidents of watchkeepers falling asleep in their wheelhouse chairs. The popular panacea for the problem is the fitting of a watch alarm but even this has its limitations. The alarm sometimes doesn't work, is occasionally switched off and, perhaps most worrying of all, can be ineffective in keeping an extremely tired man awake. The reality is that even the most efficient system does nothing to alleviate the root cause of tiredness; excessively long working hours.

Trawls have been known to snag on pipelines and one particularly tragic accident in the North Sea recently led to the vessel capsizing with the loss of her entire crew when her trawl caught beneath one.

LOOKOUT AND COLLISIONS

The number of collisions involving fishing vessels shows no signs of reducing. They usually occur between fishing vessels or with a larger merchant vessel; sometimes with a yacht or other small craft.

Two explanations feature repeatedly: an unmanned wheelhouse with the watchkeeper going below to help stow fish or have a cup of tea, or the watchkeeper's lack of knowledge about what to do. There have been several instances where the person on watch was found to have only a rudimentary knowledge of the Regulations for the Prevention of Collision at sea. There is a naïve, and widespread, expectation among many that because the fishing vessel is a 'working vessel,' and shows lights or shapes to that effect, everyone else is obliged to keep clear.

Although the two reasons given are the most common causes of collisions, the failure to maintain an efficient lookout is frequently evident. At one end of the scale we have watchkeepers physically prevented from maintaining a good lookout by the structure of the vessel itself while at the other we have those who deliberately occupy their time doing something else. The MAIB has evidence of watchkeepers more engrossed in reading a magazine, or watching television or using the opportunity to catch up on lost sleep.

PERSONAL INJURIES

A fishing vessel is by its very nature, a hazardous place to work. No other industry involves its people having to function in a constantly moving environment by night and day in every type of weather. The risk of personal injury to individuals is extremely high and most especially to the inexperienced or the unwary. Although in many ways it is remarkable there aren't more injuries, investigations reveal that many of those that do occur could have been avoided had better protection been provided or greater care taken by individuals.

Some preventative measures are self-evident. A number of accidents have occurred because winch operators have not had a clear view of the working

deck, winches or derricks and had failed to recognise the importance of watching colleagues as they worked in their vicinity. A hard hat can protect against some head injuries. Winch guards may stop people falling into them. Properly supervised repairs on equipment will avoid sub-standard work that could lead in turn to something parting when a load is applied. The provision of an effective, and well-placed, emergency stop button to cut power to machinery might prevent a person's hand being trapped or severed.

FIRE

The numbers of fires on board fishing vessels are similar to those found elsewhere in the shipping world. The causes are often the same, such as leaking oil coming into contact with a hot surface, or impregnating combustible material.

Some fires start in the galley, often through carelessness. The galley in a fishing vessel tends to be part of the communal living area and provides a greater number of opportunities for fires to start. Heat sources are often left on without people being aware of it while clothing left hanging close by sometimes catch fire.

The fisherman may also be less prepared than seafarers in other types of vessels in his ability to handle a fire. Although many fishermen receive a basic training in fire-fighting, investigations into fires at sea suggest that many of the lessons they should have learned are forgotten, usually because any form of onboard training is virtually unheard of. Even the routine securing of fire doors is extremely rare.

Until fishermen start to take the risk of fire more seriously and begin to practice even basic drills on board, the risk of a fire seriously damaging a vessel and affecting the livelihood of the crew will remain.

LIFESAVING APPARATUS

When the most serious events occur and it becomes necessary for the crew to abandon ship, there is an expectation that the lifesaving apparatus will function as designed. Too often it fails to do so, not so much because the design is at fault but because the equipment has either been installed incorrectly, or it has

not been serviced or maintained properly. There are even instances of it not being on board at all.

The MAIB has uncovered examples of Electronic Position Indicating Radio Beacons (EPIRB) not being serviced correctly, registered to the wrong vessel, and even installed in such a way that they were unable to release automatically. The hydrostatic release mechanism in one EPIRB examined revealed it had been painted over and could not operate at all. There is also evidence that EPIRBs tend to get caught in the structure of a sinking fishing vessel and cannot reach the surface if the vessel inverts. Such a discovery has lead to studies being undertaken to resolve the problem.

Life raft installation is a perpetual problem. Although the life raft is very much the last resort for survival, many of the smaller boats do not carry them even though they can, and do, save lives. Many single-handed operators argue against the expense of providing them to the standards required by the regulatory body. The failure to connect the hydrostatic release unit correctly, and steps to ensure the painter is attached properly, are commonplace.

SURVIVAL

If everything goes wrong and the fisherman goes over the side, the last link in the safety chain is personal survival. The average fisherman is extraordinarily reluctant to wear a life jacket, usually because he will claim it is too bulky, is impractical for the work he does or is too expensive. To an extent the criticisms are justified; very few life jackets are suitable for use by fishermen but they do exist and are available. There are two other reasons for such reluctance to wear them; it doesn't fit the image and few will risk the derision of their peer group, and there are still many who adopt the fatalistic approach that if they fall into the sea, death is inevitable.

There are, however, signs of change. Families are beginning to realise that following an accident the chances of their loved one surviving could have been greatly increased had the victim worn a life jacket. The tragedy is that it takes a loss of life to persuade people to change the culture of a lifetime.

A number of fishermen are believed to have died from hypothermia rather than drowning and this is often overlooked as a cause of death. Survival suits for people who work at sea warrants further attention.

GETTING THE MESSAGE ACROSS AND SUMMARY

Informal discussions with similar marine accident investigation organizations across the world indicate that the causes of fishing vessel accidents tend to be very similar. Identifying the causes is not the problem; doing something about it is. There are three ways of reducing the number of accidents; more effective regulations, improving the design of vessels, and the equipment carried; and persuading the fisherman to change the habits of a lifetime and adopt a more safety conscious culture. Each of these solutions has a part to play.

One of the traditional traps that most people fall into when trying to change the culture of the industry is to impose measures from outside. The fisherman does not take kindly to non-fishermen telling him what to do. An official in a grey suit, or a seaman who has come ashore from the merchant navy, or the enthusiastic academic who tries to persuade fishermen to change is as likely to aggravate the situation as improve it.

The fishing community must change its attitudes and adopt a safety culture. Every individual fisherman must be concerned about safety so that it becomes second nature to carry out basic checks and to correct things that are wrong. They must be seamen as well as fishermen and they must resist the temptation to condemn anyone who suggests there are better ways of doing things.

There are, arguably, already far too many regulations in the industry. There is not so much a need for more of them, but a greater willingness to enforce those that already exist. But many of the regulations would be superfluous if fishermen would adopt a more safety conscious attitude; by not overloading their craft; by seeking professional advice when adding new top weight; by looking to see if their life rafts were correctly installed and by not watching TV when on watch during a passage back from the fishing grounds.

Ministers, civil servants, the police, coast guards, even accident investigators can make compelling cases for improvements but ultimately, it is the fishermen themselves who are best placed to change things. The fisherman will seek his own council and only listen to those he respects. There are four people who can influence him: his girlfriend or his wife, his mother and, most important of all, his grandmother. She is the one person who has seen it all before; who has experienced the agony of death or crippling injury, the loss of an income or the high cost of an accident.

Safety at sea in the fishing industry must be taken seriously but need not be expensive. To ignore it only adds to the costs. To think it doesn't matter will only mean the list of those who have lost their lives at sea will increase, and the number of people mourning the loss of fine vessels and people will grow. The trends must be reversed.

Nearly every accident at sea is preventable. It only requires a little more care, and more attention paid to learning the lessons from the misfortunes of others, to make fishing a safer and more profitable industry.

FACTORS GOVERNING THE DEVELOPMENT OF NATIONAL RULES AND REGULATIONS FOR THE CONSTRUCTION AND EQUIPMENT OF SMALL FISHING CRAFT

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This paper draws extensively on the 1995 Recommendation of the Council of the OECD on Improving the Quality of Government Regulation (OECD, Paris).

Given that there has been no significant reduction in fatality rates in the fishing industries of most countries of the world despite many initiatives to improve safety, it is clear that the processes of government and industry intervention addressing the design, construction and equipment of fishing vessels, together with those dealing with training and certification, require fundamental review.

Profound effort has been invested at an international level in attempting to improve safety at sea through the formulation of guidelines and conventions. This work has been meticulously done, taking into account the design and construction of vessels, stability, load lines, mechanical equipment and gear, safety equipment, communications, effects of weather and icing, working conditions and hours, training of licensed personnel, etc. The various international voluntary guidelines, developed primarily to serve as a guide to those concerned with framing national laws and regulations, have had little effect because they have not been put into practice. The Torremolinos Protocol,

being the only international instrument adopted for fishing vessels (decked fishing vessels over 24 m [approximately 79 ft] in length) is unlikely ever to come into force because its provisions are seen as being either too stringent or too lenient by the countries whose signatures are required to bring it into force.

While many countries have regulations concerning the design, construction and equipment of their vessels, these regulations in developing countries are sometimes outdated, inappropriate and not enforced. In developed countries, regulations (ranging from stringent to lenient) have not always lead to a significant decrease in fatalities. The following failings have been suggested: they may not be in tune with the operation or requirements of the industry; they may be poorly enforced or unenforced; they may be unclear; there may be insufficient training within the industry to ensure full compliance, and insufficient training to enforcers to ensure their expertise and credibility. Furthermore it seems that on one hand, as vessels are made safer, the risk barrier taken by the operators is pushed further towards the limits in the ever increasing search for good catches; on the other hand, the continued upgrading of technical equipment is not always accompanied by sufficient training in its operation.

Poor relations between regulators and the industry do not foster compliance and have been seen as a contributory factor to lack of effect.

Before considering in detail the many issues to be addressed during the formulation of regulations concerning the safety of fishing vessels, it is pertinent to explore in some depth the broader role, objective and necessity of regulations within society, and to consider their formulation, effectiveness and implementation.

THE NEED TO IMPROVE REGULATION

Regulation refers to the diverse set of instruments by which governments set requirements on enterprises and citizens. Regulations include laws, formal and informal orders and subordinate rules issued by all levels of government, and rules issued by non-governmental or self-regulatory bodies to whom governments have delegated regulatory powers, and fall into three categories: economic, social and administrative.

Economic regulations intervene directly in market decisions such as pricing, competition, market entry, or exit. Reform aims to increase economic efficiency

by reducing barriers to competition and innovation, often through deregulation and use of efficiency-promoting regulation, and by improving regulatory frameworks for market functioning and prudential oversight.

Social regulations protect public interests such as health, safety, the environment, and social cohesion. The economic effects of social regulations may be secondary concerns or even unexpected, but can be substantial. Reform aims to verify that regulation is needed, and to design regulatory and other instruments, such as market incentives and goal-based approaches, that are more flexible, simpler, and more effective at lower cost.

Administrative regulations are paperwork and administrative formalities — so-called "red tape" — through which governments collect information and intervene in individual economic decisions. They can have substantial impacts on private sector performance. Reform aims at eliminating those no longer needed, streamlining and simplifying those that are needed, and improving the transparency of application.

While numerous economic regulations have been reformed or repealed over the last two decades to make markets more competitive and encourage economic efficiency, few efforts have been made to reform or enlarge the vast majority of social regulations. This is largely due to the fact that powerful interest groups exist that support or oppose these rules, especially those on the environmental front. Critics of current social regulations argue that rules are inflexible, expensive and administered in a "command and control" fashion. Proponents of the current system reply that strict rules are needed to deter unfavorable behavior and outcomes.

Industry leaders argue that workplace laws and mandates are placing unfair and expensive burdens on their shoulders. Supporters of the regulatory system argue that strict rules and regulations are needed to protect worker safety and guarantee employee rights. Employers reply that such edicts actually end up hurting workers more in the end than helping them since they increase costs, lower wages and eliminate employment opportunities. All this makes it clear that the process of regulating effectively is fraught with difficulties. During the provision of assistance to its member governments regarding the formulation of regulations aimed at improving safety at sea in the fishing industry, FAO has found that use of the OECD Reference Checklist for Regulatory Decision-

making is of interest and value as a methodology for improving the regulatory process.

The Checklist responds to the need to develop and implement better regulations and contains ten questions about regulatory decisions that can be applied at all levels of decision and policy-making. These questions reflect principles of good decision-making that may be used by administrations to improve the effectiveness and efficiency of government regulation by upgrading the legal and factual basis for regulations, clarifying options, assisting officials in reaching better decisions, establishing more orderly and predictable decision processes, identifying existing regulations that are outdated or unnecessary, and making government actions more transparent.

QUESTION 1: IS THE PROBLEM CORRECTLY DEFINED?

The first stage of defining the problem must include not only evidence of its nature and magnitude, but also explain why and how the problem has arisen. The process must include the views of all partners, taking account of their perceptions and perspectives.

Definition of the problem will suggest potential solutions, as well as eliminate those that are unsuitable or unworkable. Regulators must document the full scope of the issue in question, and examine supporting and opposing linkages between incentives of affected groups. When existing regulations are under review, the regulator must assess whether the nature or scope of the problem has changed since the adoption of the original regulations in such a way that a complete change in regulation is required.

In addressing fishing vessel safety, it would be expected that the regulator would be confronted with evidence of high rates of accidents and fatalities, as well as statistics revealing the primary causes of loss of life. But to formulate regulations which can be effectively implemented, the formulator must be aware of the state of the fisheries under consideration: how have they developed and diversified, how are they managed and by whom and with what effect, are they primarily artisanal or industrial, what are the levels of experience, skills, training and education, and so on.

Insufficient understanding by regulators with merchant marine backgrounds of the fishing industry, its evolution, nature and significance within many coastal

communities, and particularly in regarding a fishing vessel as a place of work as opposed to a means of transport leads to basic flaws in regulation formulation leading to lack of their acceptance by those who should abide by them.

Not all problems can be resolved by government action. Problem definition must isolate those factors which government can influence through intervention, or alternatively, illustrate that government may not have the capacity to address the issue.

QUESTION 2: IS GOVERNMENT ACTION JUSTIFIED?

Government intervention should be based on clear evidence that a problem exists, and that government action is justified, taking into account government policy, the likely benefits and cost of action (based on a realistic assessment of government effectiveness) and alternative mechanisms for addressing and solving the problem. In the fisheries sector, such alternatives for consideration might include the provision of voluntary guidelines, delegation of responsibilities to fishermen's associations and other non-governmental organisations (NGOs,) etc. Since these alternatives are non-mandatory, and given that fishing is probably the most dangerous occupation, government intervention is justified as an additional measure to safeguard the health and safety of fishermen.

QUESTION 3: IS REGULATION THE BEST FORM OF GOVERNMENT ACTION?

The decision about how to intervene is as important as the decision about whether to intervene. A number of regulatory and non-regulatory instruments are available, having very different implications for results, costs, and administrative requirements. Regulators prefer a "command and control" form of regulation for a number of reasons: ease of enforcement, clarity for regulated groups, and certainty of intent. The drawbacks might include rigidity, tendencies to be over-detailed, inflexibility, high costs, adversarial nature, and in some cases, ineffectiveness and unenforceability.

It is the view of FAO that quality regulation is one of the key tools to ensure safety at sea, but that it serves little purpose unless accompanied by high quality training and enforcement programs. Voluntary safety initiatives initiated by government administrations have in general not been effective in improving safety due to inadequate participation by those concerned.

QUESTION 4: IS THERE A LEGAL BASIS FOR REGULATION?

Where parliaments delegate broad regulatory powers to ministries, sub-ministries and independent arms of departments of ministries, there may exist the difficulty of ensuring legality because the nature and limit of the delegated authority may become more open to interpretation.

Furthermore, it is pertinent to ask whether the regulation is compatible with existing legislation, including internal agreements, convention or internationally agreed (though voluntary) codes of practice. Where it is deemed that new regulations are required, they must co-exist comfortably with existing regulations, or the latter should be repealed or amended. Examination of international agreements will not only indicate whether the problem has been dealt with elsewhere, but will also support a longer-term process of regulatory coordination and harmonization.

In this respect, it is worth noting that Ministers responsible for fisheries from 126 countries [1] met in Rome on 10 and 11 March 1999 as a sign of their attachment to the implementation of the Code of Conduct for Responsible Fisheries adopted by the FAO Conference at its Twenty-eighth Session in October 1995 which contains several references to the responsibilities of governments concerning safety at sea, and in particular, the statement that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

QUESTION 5: WHAT IS THE APPROPRIATE LEVEL OF GOVERNMENT TO TAKE ACTION?

Governments can chose whom should act. Given the nature of the problem, what level, or system of cooperation among levels of government can regulate most efficiently? The answer to this question rests on several criteria: does the problem cross political boundaries, are the issues of a national, regional or local character, are there economies of scale in regulating at national level, what are the institutional capacities at national, regional or local levels? All these criteria are of particular relevance to fisheries.

It would be expected that various Ministries or departments, competencies as well as levels of government, be involved in the development and

implementation of regulations. The regulator should consider how consultation and coordination could be effectively carried out during both formulation and implementation between levels and departments of governments, recognizing that ultimate responsibility for fishing vessel safety can lie with only one authority.

The selected authority must recognize the diversity of the industry that they are to regulate. Taking account of the evolution, ownership patterns and operating norms of the artisanal and industrial fisheries might result in differing regulatory approaches. In many countries, artisanal fisheries have existed outside the regulatory framework and opportunities may exist to develop good partnerships in the regulatory consultation process from the outset. Within larger countries, some fisheries are likely to be specific to a particular region of the country, operating with different loading patterns, for differing durations in different sea conditions, suggesting differing regulations for different regions.

QUESTION 6: DO THE BENEFITS OF REGULATION JUSTIFY THE COSTS?

Regulators rarely assess the cost of new regulations, nor do they assess the magnitude or value of expected benefits. While it is possible and desirable to assess the fiscal value of benefits derived from effective safety legislation and regulations (which would include putting fiscal value on human injury and life), it is harder to determine the standard or magnitude of acceptable risk. The cost of each regulatory proposal should be estimated and should include cost of compliance to all affected parties including consumers, owners, crews and various levels of government. Estimates should also include the administrative costs of regulation (and nonregulatory alternatives) including enforcement costs, although these costs are likely to be significantly lower than those costs borne directly by the private sector. It is reasonable that a pragmatic approach be taken to the issue of cost and benefit estimation, and the effort invested should be in proportion with the potential impact of regulation. Given that the fishing industry has the highest fatality rate amongst all occupations, a significant effort of estimating costs and benefits seems well justified, and will enable a prioritization among the alternative regulatory proposals by enabling the cost of each to be considered, together with its likely impact and ease of implementation.

QUESTION 7: IS THE DISTRIBUTION OF EFFECT ACROSS SOCIETY TRANSPARENT?

Regulators should consider the distribution of regulatory costs and benefits across those groups affected by the proposed regulations. Often, costs are not imposed on the same segment of society that benefits from the regulation. For example, labor regulations may benefit workers with jobs while making it harder for the unemployed to find jobs; vessel safety regulations are likely to impose costs on vessel owners while benefiting the crews. This means that policy officials should consider the issue explicitly to determine whether compensation or incentives are appropriate for adversely affected groups.

QUESTION 8: IS THE REGULATION CLEAR, CONSISTENT, COMPREHENSIBLE AND ACCESSIBLE?

Regulators should assess whether rules will be understood by all likely users, and to that end should take steps to ensure that the text and structure of rules are as clear as possible. This step in the decision process can improve not only the text of regulations, but can reveal unexpected ambiguities and inconsistencies. Clear and precise language also reduces the costs of learning about rules, minimizes disputes during implementation, and improves compliance. Regulators should also examine regulations for consistency of language and format with other regulations, the logical sequence of drafting, and the adequacy of definitions. Use of technical jargon should be minimized. Regulations incorporated by reference should be easily available. Finally, the strategy for disseminating the regulation to affected user groups should be considered.

QUESTION 9: HAVE ALL INTERESTED PARTIES HAD THE OPPORTUNITY TO PRESENT THEIR VIEWS?

Regulations should be developed in an open and transparent fashion, with appropriate procedures for effective and timely input from interested parties such as affected industry representatives, trade unions, wider interest groups such as consumer or environmental organizations, or other levels of government. Of particular value would be fishermen's safety councils or fishermen's organizations dedicated to safety. Consultation and public participation in regulatory decision-making have been found to contribute to regulatory quality by:

Bringing into the discussion the expertise, perspectives, and ideas for alternative actions of those directly affected;

Helping regulators to balance opposing interests;

Identifying unintended effects and practical problems;

Providing a quality check on the administration's assessment of costs and benefits; and

Identifying interactions between regulations from various parts of government.

Consultation processes should ensure that all parties share a sense of ownership and responsibility in the application of the new regulations and also enhance voluntary compliance, reducing reliance on enforcement and sanctions.

QUESTION 10: HOW WILL COMPLIANCE BE ACHIEVED?

Even after the most rigorous decision-making process inside the administration, regulation has yet to pass the most demanding test of all: the public must agree to comply with it. Yet implementation, consisting of strategies such as education, assistance, persuasion, promotion, economic incentives, monitoring, enforcement, and sanctions, is very often a weak phase in the regulatory process in countries that tend to rely too much on ineffective punitive threats and too little on other kinds of incentives. Implementation should be considered at all phases of decision-making, rather than left to the very end. One common source of noncompliance, for example, is failure of affected groups to understand the law, which may result from poorly drafted or overly complex regulations, or inconsistent interpretations by enforcement officials. Implementation considerations will also strongly affect decisions about alternative forms of action. Realistic assessment of expected compliance rates, based on available compliance and enforcement strategies, may suggest that one policy instrument is more attractive than another that appears more effective on paper, but is likely to be more difficult to implement.

CONCLUSION

The Checklist cannot stand alone: it must be applied within a broader regulatory management system that includes elements such as information collection and analysis, consultation processes, and systematic evaluation of existing regulations.

Government policy to regulate for safety at sea in the fishing industry must be accompanied by a total commitment to implement that regulatory regime, along with the necessary resources. Implementation encompasses a set of strategies that might include education, assistance, persuasion, promotion, economic incentives, monitoring, enforcement and sanctions, all of which are accompanied by the setting up or improvement of administration and associated costs. Implementation must be considered at every phase of the regulation formulation, and not considered as a final consequence of regulation.

While it may be true that "legislation is only as good as its enforcement," legislation cannot be improved by enforcement. The quality of the legislation remains the limiting factor. In many parts of the world, additional regulations for fisheries are not required. The overriding need is for regulations to be reviewed and amended to reflect the problems and their root causes; the process of regulatory review must be as dynamic as the industry being regulated. The regulators and regulated need the necessary training to ensure compliance and enforcement as well as a working relationship promoted by mutual respect and trust.

FOOTNOTES

1.The Rome Declaration on Responsible Fisheries was adopted unanimously by the Ministerial Meeting on the Implementation of the Code of Conduct for Responsible Fisheries, convened in Rome on 10 and 11 March 1999. The Meeting was attended by 126 Members of FAO: Albania, Algeria, Angola, Argentina, Australia, Austria, Bahamas, Bangladesh, Barbados, Belgium, Belize, Benin, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Chad, Chile, China, Colombia, Republic of Congo, Costa Rica, Cote d'Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Democratic People's Republic of Korea, Denmark, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Estonia, Ethiopia, European Community, Fiji, Finland, France, Gabon, Gambia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea Bissau, Guyana, Haiti, Hungary, Honduras, Iceland, India, Indonesia, Iraq, Ireland, Islamic Republic of Iran, Italy, Jamaica, Japan, Kenya, Republic of Korea, Liberia, Libyan Arab Jamahiriya, Lithuania, Madagascar, Malaysia, Malta, Mauritius, Mexico, Morocco, Mozambique,

Namibia, Nepal, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Samoa, Saudi Arabia, Senegal, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Syria, Tanzania, Thailand, The Former Yugoslav Republic of Macedonia, Tonga, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, United Kingdom, United States of America, Uruguay, Vanuatu, Venezuela, Viet Nam, Yemen and Zambia.

FISHERMAN'S OVERVIEW OF THE MARINE PREDICTION CENTER

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Mr. Chesneau graduated from the University of Wisconsin, Madison,Wisconsin in January 1972 with a BS in Meteorology, and then received a Commission as Ensign in the U.S. Navy where he served for seven and half years. During his career with several agencies of the U.S. government and the private sector, Lee provided marine weather and oceanographic warnings, analyses, and forecasts on a global scale covering all ocean and seasons. As an experienced ship router, he developed a keen awareness of the issues that confront marine vessels of all type including the commercial fishing industry. In addition to his ongoing forecast experience,he is a certified instructor at the Maritime Institute of Technology and Graduate Studies (MITAGS), in Linthicum Heights, Maryland in support of the National Weather Service (NWS) outreach goals.He teaches Heavy Weather Avoidance (HWA) and NWS warning and forecast product interpretation to mariners enrolled in the course curriculum. This endeavor has helped shape today's Marine Prediction Center.

MARINE PREDICTION CENTER'S (MPC) MISSION

The U.S. National Weather Service (NWS) has the responsibility for issuing warnings and forecasts to protect life and property for the maritime community. Located in Camp Springs, Maryland, the Marine Prediction Center (MPC) is a component of the NWS's National Centers for Environmental Prediction (NCEP), of which there are eight centers. The MPC was first established in 1995, as the NWS modernized to meet the U.S. national interest. The International Maritime Organization (IMO) established The Safety of Life at Sea treaty, better known as SOLAS, so member nations as signatories can standardize and enhance opportunities for safer passage while at sea. The U.S. is a signatory to this treaty. Thus, the products and services provided by the MPC support the U.S. treaty obligations of SOLAS. These warnings and forecasts provided by the MPC are distributed by high-frequency (HF) radio-facsimile broadcast via the U.S. Coast Guard Communications Centers at

Boston, Massachusetts, and Pt. Reyes, California, for the North Atlantic and North Pacific Oceans, respectively. This paper will summarize both products and services produced by the MPC.

THE CUSTOMERS AND HIGH SEAS PRODUCTS

Marine vessels engaged in national and international trade routinely conduct transoceanic voyages with fast turn around times between ports of call. Large commercial ships require timely and accurate presentation of meteorological and oceanographic information in time and space over a large geographical area in order to plan for safe and economical operations. As illustrated by the tragic circumstances surrounding the *Andrea Gail* of "The Perfect Storm" fame, the commercial fishing community also requires the same timely and accurate information in perhaps a more regional geographic format. This information is most user friendly when presented in graphic form. The MPC, which includes an operational service unit, the Marine Forecast Branch (MFB), recognizes HF radio-facsimile as the most widely used medium by sea going vessels for receipt of graphically displayed environmental analyses and forecasts. It also meets its text product obligations as well.

RADIO-FACSIMILE PROGRAM

In the new millennium, mariners rely more and more on graphical presentation of weather and oceanographic information. The goal and mission of the MPC is to address the common needs and requirements of professional as well as recreational mariners engaged in transoceanic or regional crossings. Thus MPC offers the maritime community complete and timely graphic and text products to support navigation safety and operating efficiency. Three primary graphic types of products are issued: upper air 500-millibar (mb) charts, surface pressure, and sea state charts. Additional charts include sea surface temperatures (SST), tropical streamline and surface analyses, and meteorological satellite imagery. Text information is based on high seas and regional geographic boundaries consistent with a wide variety of maritime interests. Users whose specific or specialized requirements for high seas information are not met by these general safety-oriented products, are generally referred to the private meteorological and oceanographic sector for assistance.

UPPER AIR 500-mb PRODUCTS

The 500-mb charts are produced from a computer model of the atmosphere. The value of the 500-mb product to the mariner is of substantial significance that when understood and used properly can be the best tool for the mariner's safety decision making. These products are automated unmodified computer outputs that depict lines of equal height contours above the earth's surface (geo-potential heights) at 60 meter (m) intervals. Within the 60-m interval height contours, wind speeds of 30 knots (kn) and greater are shown with wind barb increments of 5 or 10 kn. Also embedded within the 500-mb height field are short wave troughs, generally 50 degrees or less in longitude. The trough axes are drawn on the charts as dashed lines. These short wave troughs will assist the mariner in locating surface low-pressure systems or developing lows on frontal waves, or can represent the bases for locating extended surface frontal boundaries or troughs. The 500-mb chart contains useful information for determining surface weather conditions and behavior of synoptic scale low and high-pressure systems. The 500-mb products are not intended to be used alone. The mariner is strongly advised to examine other radio-facsimile products described in the User's Guide located in the MPC Web Site (www.mpc.ncep.noaa.gov) in order to derive a complete picture of weather and sea state conditions.

SURFACE PRESSURE PRODUCTS

These products include four Surface Analyses per day transmitted in two parts, two full North Atlantic and Pacific Ocean 48-Hour Surface Forecasts, and one full 96-Hour Surface Pressure Forecast, once daily for the North Atlantic and Pacific Oceans. (See Figure One.) The MPC computer workstation aided surface analyses depict isobars, surface winds, frontal systems (occluded, stationary, cold, and warm), low- and high-pressure center positions, and central pressure. The Analyses include abbreviated ship reports participating in the NWS's Voluntary Observation Ship program. The 24-hour track history and 24-Hour Forecast position of each synoptic scale system's position and central pressure are displayed on 48/96-Hour Surface Forecasts. Wind feathers or barbs of winds 35 kn or greater, are depicted in increments of 5 kn. Synoptic scale systems having or expected to have "Gale", "Storm", or "Hurricane Force" conditions are labeled in bold capital letters. Similarly systems expected to develop "Gale" or "Storm", or "Hurricane Force" conditions within the

next in 36 hours have labels of "Developing Gale" or "Developing Storm". Surface low pressure falls of 24-mb or greater during a 24-hour period are denoted in large capital letters as "RAPIDLY DEVELOPING" or RAPIDLY INTENSIFYING"

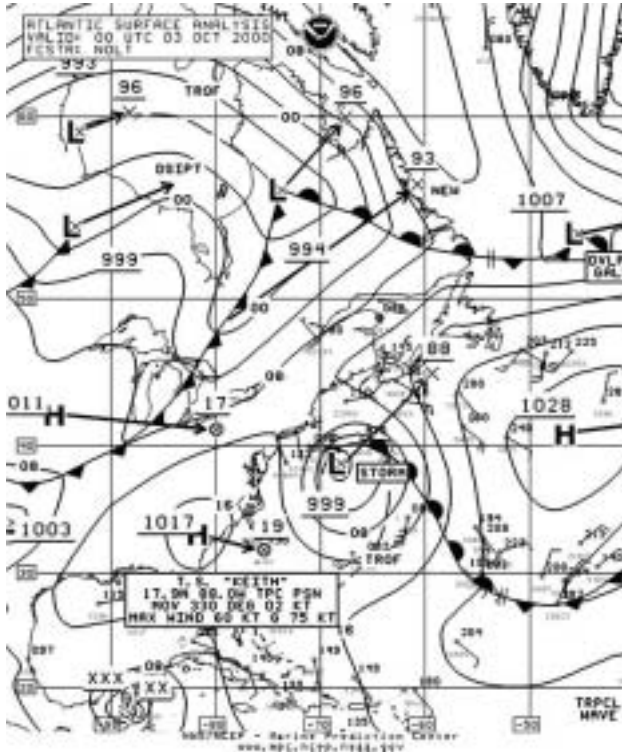

Figure 1: Sample Surface Analysis
(West half of North Atlantic Ocean)

SEA STATE AND WIND/WAVE PRODUCTS

One of the greatest hazards to a vessel's safety and sea keeping capability is the need to maneuver around and through changeable sea state conditions. Vessel Captains have the awesome responsibility to make transoceanic crossings with crew safety the highest of their priorities, while ensuring that the ship and its valuable cargo arrive at destination ports safely while meeting tight schedules. The duration of adverse or slowing seas must be minimized since turn around time in each port is usually less than 24 hours. The MPC issues one Sea State Analysis (1200 Coordinated Universal Time (UTC)), two 48-

Hour Wind/Wave Forecasts (from 1200 UTC/0000 UTC) and one 96-Hour Wind/Wave Forecast each day. During the winter cold season, the ice edge is depicted as a bold jagged line. The contours for these products are in 1-m intervals with a maximum combined sea height values centrally displayed and underlined. Forecast of primary swell direction arrows is also depicted. The Wind and Wave Forecasts, when viewed with the 48-Hour Surface Forecasts and Wave Period and Direction Forecasts, will help vessels make course and speed adjustments to avoid hazardous conditions and minimize exposure to slowing conditions.

REGIONAL PRODUCTS

Regional surface graphic products target both coastal and high-seas users. These products produced on polar stereographic map backgrounds encompass the western Atlantic Ocean west of 50° W. and north of 30° N., including the U.S. east coast and the Baja Peninsula, south to Cabo San Lucas, and north to the Gulf of Alaska, including Prince William Sound as far west as 150° W. The regional products consist of the 0000 UTC and 1200 UTC sea state analysis and 24-Hour Forecasts of the surface and wind/wave. The MPC's Marine Forecast Branch at NCEP in Camp Springs, Maryland, near Washington D.C., issues the sea state analysis and forecast products twice daily per ocean for 0000 UTC and 1200 UTC. The sea state analysis shows ship observations with observed winds (knot) and sea state in feet. The short range forecast products depict synoptic and mesoscale features of surface low and high pressure systems and isobars with frontal features, areas of reduced visibility, wind speeds, and significant wave height as generated by the synoptic and mesoscale weather systems within 1000 miles of the U.S. east and west coasts. The process of product preparation includes wind speeds derived from Special Sensor Microwave Imagery (SSM/I) or Scatterometer data received from a U.S. satellite from oceanic areas. This high state of the art technology of data input represents a significant enhancement in analyzing wind conditions in the marine environment. SSM/I and Scatterometer data is especially noteworthy in data sparse areas where there are no ship or buoy reports available. They also aid in short range prediction of the 24-Hour Forecast products by enabling marine meteorologists to compare initial data from forecast model output and making the necessary adjustments to the near term forecast solutions.

BASE MAPS

There are two types of base maps. The larger scale ocean base map is a Mercator projection and has latitude and longitude marked in 10-degree increments with 60° N. and the International Dateline highlighted in the larger Pacific Ocean basin. The Atlantic Ocean basin also in Mercator projection highlights 30° N. and 30° W. The second type of base map is the regional which encompasses the west and east coasts of the U.S. covering subsections of the Atlantic and Pacific high seas areas in polar stereographic projection. (See Figure Two.)

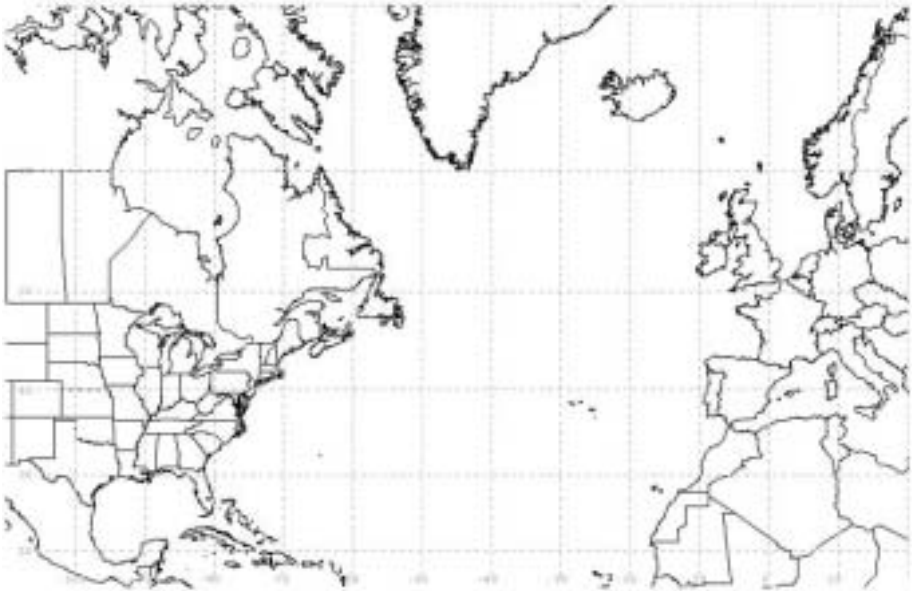

Figure 2: Sample Atlantic base map

500-mb ANALYSIS

These analyses are generated twice a day at 0000 UTC and 1200 UTC. They depict synoptic scale flow patterns, location, and amplitude of short waves. These synoptic scale features can be compared with previous analyses to determine the movement and trends of the upper air pattern. They can be used in conjunction with the surface analyses, sea state analyses, and meteorological satellite imagery, which are valid at the same synoptic time.

The surface analyses are generated four times per day (0000 UTC, 0600 UTC, 1200 UTC, and 1800 UTC) for each ocean. The analyses consist of isobaric pressure analyses at 4-mb contour interval spacing, labeled every 8-mb. The central pressure mb values of low and high pressure systems are depicted in bold three or four digits and underlined and placed adjacent to or under the "H" or "L". The surface analyses also consist of abbreviated automated ship plots of wind direction (eight points on the compass rose), wind speed (in kn), present reported weather (using current standard symbols), and cloud cover amount. The product is issued in two parts, which overlap by some 10-degrees of longitude (between 165° W.-175° W. in the Pacific Ocean, and between 50° W. - 60° W. in the Atlantic Ocean). Both parts will project the low or high pressure system's forecast position by drawing an arrow to the 24-hour position labeled as an "X" for lows and a circle with an "X" in the middle for highs with a bold two digit millibar central pressure value underlined under or adjacent to the 24-hour position label (e.g., 1050-mb high would be written as a 50 and a 960-mb low would have 60). Significant weather systems have labels depicting whether the system has "Gale" or "Storm" or "Hurricane Force" conditions, as observed by ship and buoy observations, Special Sensor Microwave Imagery (SSM/I), Scatterometer satellite data, or computer model guidance. If 36-Hour Forecast Gale, Storm, or Hurricane Force conditions are expected, the appropriate area has the label "Developing Gale" or "Developing Storm" or "Hurricane Force".

The surface analyses have been doubled in size and issued as a two part product (0000 UTC Pacific Part 1, Part 2 ; 1200 UTC Atlantic Part 1, Part 2) to allow the mariner to use the surface analyses as a work chart. The mariner can also have the option to use the appropriate Parts 1 or 2 if operating only in that part of the ocean that will impact the vessel. The mariner can also compare the ship's current barometric pressure reading and Beaufort Wind

Scale force conditions or anemometer readout of winds observed at the vessel to determine the product's validity. Mariners can then make their own inferences on how specific weather systems will impact their vessels. Used in conjunction with a 500-mb analysis, 1200 UTC Atlantic, the 24-Hour Forecast position of synoptic scale weather systems will aid in determining a weather system's motion and intensity trends, thus extending the usefulness of the product. The surface analyses will also be broadcast in a very timely manner, less than 3 1/2 hours from the valid synoptic time. This product is an important tool that can substantially aid in the independent decision making process for crew safety, protection of the vessel, prevention of goods or cargo damage, and maintaining schedules. These charts are produced every three hours (on the Internet) and twice daily (1200 UTC/0000 UTC) via HF Radio-facsimile broadcasts depict actual buoy and ship reports. Sea heights are analyzed every 3-feet increments.

SEA STATE ANALYSIS (1200 UTC ATLANTIC/0000 UTC PACIFIC)

This product is once a day per ocean at 0000 UTC for the North Pacific and 1200 UTC for the North Atlantic (example, 1200 UTC Atlantic and 0000 UTC Pacific Ocean with analysis of ship synoptic reports and automated weather stations such as CMANs for sea state in "meters". The sea state analysis is prepared for each ocean at the time of day when the greatest number of observations are taken. The sea state analysis has solid 1-m contour intervals. Where appropriate, maximum and minimum combined wave height values (approximately 1/3 the height of the wind wave added to the height of the swell wave) are centrally depicted and underlined. To produce the final analysis ships and buoys reporting data along with the NCEP and Navy significant wave forecast models are used for guidance in areas of sparse data and are used to verify model guidance. The sea state analyses highlight where the most significant combined sea states prevail. When viewed together with the surface analyses, the user should have a complete picture of surface weather conditions in a very timely manner, thus substantially aiding the mariner in crew safety and the protection of property. (See Figure Three.)

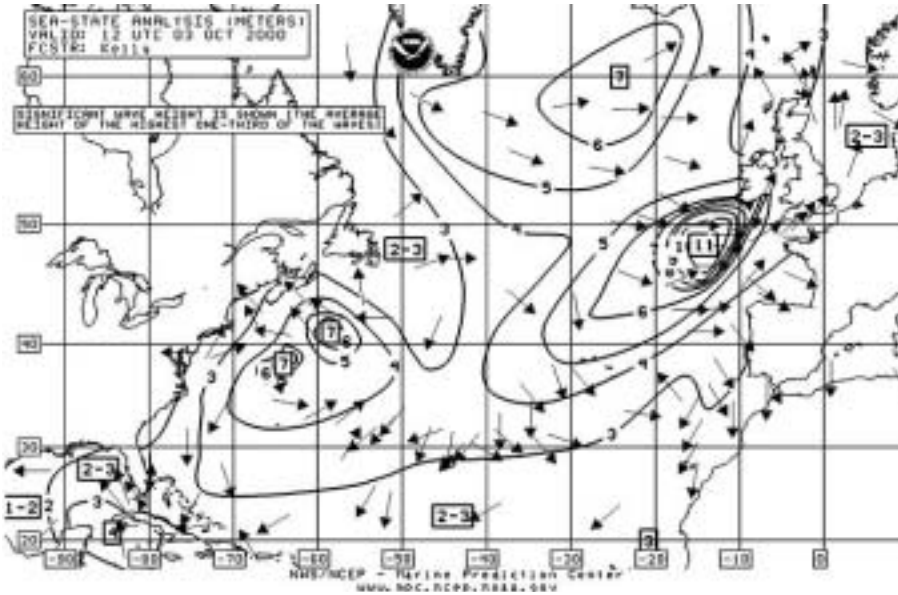

Figure 3: Sample Sea State Analysis

SUMMARY

In consultation with its customers, MPC has designed a timely product suite of graphics and high seas marine warnings and forecasts. When displayed together and organized the charts provide the mariner with a complete meteorological and oceanographic picture. Prudent decision-making dictates the mariner use all available information from as many sources as possible.

The MPC's Marine Radio facsimile Charts and High Seas Text Warning Forecasts program is designed to assist mariners in making decisions regarding the protection of the crew from injury, prevention of ship and cargo damage, fuel economy, and meeting fixed schedules, as well as serving the commercial fishing and recreational communities. The product suite is based on user feedback and input, and is always subject to review and revision. We strongly encourage input from the marine user community. For more information, please see MPC's Homepage website at www.mpc.ncep.noaa.gov.

Photograph and caption by Earl Dotter

College students repair nets after having signed on as crew on a commercial fishing vessel. Such inexperienced crews often face great danger in the Alaskan fishing grounds in hopes of short-term financial gain.

FISHING VESSEL SAFETY IN THE UNITED STATES: THE TRAGEDY OF MISSED OPPORTUNITIES

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This paper is adapted for IFISH 2000.

This paper examines the history of fishing vessel safety legislation in the United States, and the missed opportunities that would have saved many lives. For most of the twentieth century, fishermen in the U.S. lived – and died – by the proposition that "as long as only the fisherman is hurt in an accident, it can remain his own business, accomplished at his own risk."[1] Many still believe that. In 1988, the United States finally adopted legislation[2] requiring that fishing vessels be provided equipment to increase lives saved, in the event the vessel is no longer habitable. The U.S. has yet to adopt legislation designed to prevent casualties, or minimize their effect, given that they have occurred.[3]

A COST-BENEFIT ANALYSIS OF ALTERNATIVE SAFETY PROGRAMS FOR U.S. COMMERCIAL FISHING VESSELS

For twenty years we have searched out and stumbled across bits and pieces of history that are the basis for this paper, portions of which have appeared before.[4]

On the eve of World War II, legislation requiring that fishing vessels be inspected was proposed. Recently we discovered legislative initiatives in the 1950s that would have required "inspection" of U.S. Commercial Fishing Vessels. Many lives were lost as a result of these missed opportunities, and commercial fishing is more hazardous today than it should be.

On the brink of the 21st Century it is important to understand our past failures in order to better judge what would succeed in the future. Not for the first time there is an opportunity "to…turn the corner from response to prevention."[5] Will this be just another missed opportunity?

INTRODUCTION

The level of safety on fishing vessels increased with the transition from sail to steam, but declined again with the introduction of diesel propulsion. In the days of sail – when cod was king – designers and builders sought speed to bring a perishable catch to market quicker, and seaworthy vessels to take the punishing gales on the Grand and Georges Bank. Vessels sailed from Gloucester and Boston and some years many did not return. There was no radio to call for help, nor were there aircraft, and few cutters to come to their aid.

By the 1930s diesel power was readily available, but diesel-propelled vessels were not "inspected," nor the officers "licensed." Sailing schooners were converted to diesel trawlers, and the "modern" American fishing fleet was born.

It is ironic to realize that were we to put steam plants into fishing vessels today, they would immediately become "inspected" and carry a complement of licensed officers. It is even more painful to contemplate what the state of our fishing fleet would be today had steam propulsion remained the standard.

PART I – THE DISTANT PAST

Early marine safety statutes established inspection and manning requirements for steam-propelled vessels, including fishing vessels. Subsequent legislation enacted by the Unites States Congress required the inspection of most passenger and commercial vessels regardless of the means of propulsion.[6] As a general rule, any vessel that required inspection was also required to have a licensed master or operator.[7]

There were no specific licensing requirements for masters, operators or other personnel for commercial fishing vessels.[8] A provision of the "Officers Competency Certificates Convention, 1936" did however require licensed masters, mates, and engineers on all documented vessels over 200 gross tons operating on the high seas.[9] Use of "creative" measurement permitted most fishing vessels to measure less than 200 tons thereby avoiding licensing requirements.

Unlike the statutes establishing the Federal Aviation Administration (FAA) that grant the agency broad authority to regulate all aircraft, Congress has never considered or adopted a statute granting the Coast Guard similar authority to make all vessels safe.[10] Unfortunately, legislation governing marine safety has been enacted only after terrible tragedies.

THE 1930s

The *Morro Castle* and the *Mohawk* disasters in the 1930s resulted in a thorough Congressional investigation of the marine safety statutes and organization. The years 1936 and 1937 were one of the most active periods in the history of marine safety legislation in the U.S., and established much of the legislation that we live with today.[11]

There were several proposals to regulate motor vessels – including fishing and towing vessels – as steam vessels. Steam vessels – including steam-propelled fishing vessels – were already subject to inspection, manning and equipment requirements.

Towing vessel interests, particularly those from the west coast, along with many fishing vessel interests objected to requiring inspection of diesel-propelled vessels. The major objections were to the increased manning requirements that "inspection" would bring,[12] an objection that is worth keeping in mind even today.

Congress did adopt legislation subjecting "seagoing motor vessel(s) of 300 gross tons and over, except "vessels engaged in fishing, oystering, clamming, crabbing, or any other branch of the fishery or kelp or sponge industry" to the regulations applicable to steam vessels.[13] But Congress failed to adopt legislation applicable to fishing vessels, and by the end of the 1930s,

"uninspected vessels" were firmly ensconced in the legislative and regulatory framework established by the Congress.

FIRST FISHING VESSEL SAFETY BILL

In 1941, Representative Thomas A. Flaherty of Massachusetts introduced a bill specifically addressing fishing vessel safety. It proposed "to place fishing boats … under the supervision of the Bureau of Marine Inspection and Navigation (BMIN)."[14] Specific provisions of the bill would have required that fishing vessels be in "good and seaworthy condition" with "sufficient … watertight bulkheads … so that the vessel shall remain afloat with any one compartment open to the sea." The bill also required that vessels be equipped with: bilge pumps, ring buoys, life preserver for each person on board, lifeboats, a compass, distress signals, emergency rations, a radio telephone, first-aid kit, and a line throwing gun with projectiles. The bill proposed licensing of fishing vessel operators, with the license subject to "suspension and revocation."

Hearings were held on the bill in October 1941 at which time the bill was supported by the Atlantic Fishermen's Union of Boston representing Northeast fishermen. However, most other segments of the fishing industry opposed the measure, particularly the provisions for watertight bulkheads and the licensing of operators. Owing largely to the events of December 1941 (the bombing of Pearl Harbor, and the subsequent participation of the U.S. in World War II,) no further action was taken on this bill.

Despite a shrinking fleet, (the Navy acquired many large fishing vessels) the demand and prices for fish grew rapidly during World War II for several reasons. First, due to German U-boat blockades, European nations were unable to send vessels to sea; second, fish became a valuable source of protein for Allied troops, and as other sources of protein became scarce, civilians turned to fish.[15]

PART II – POST WORLD WAR II

In the post war era, the U.S. offshore fleet shrank again as domestic demand for fish declined and European nations got back to fishing. But, fishing vessel casualties in the early 1950s took many lives. Evidently, these losses did not go unnoticed. In several casualty reports of the early 1950s, the U.S. Coast

Guard Marine Boards of Investigation make reference to pending legislation that would have placed commercial fishing vessels under inspection.[16][17] Despite the terrible loss of life in the early 1950s, however, no bill requiring the establishment of construction, maintenance or operating standards for commercial fishing vessels was enacted. It is painful to think of the number of lives that might have been saved had such action been taken.

A RETURN TO "BOATING SAFETY"

But in the 1950s Congress did return to the issue of boating safety, for along with post war prosperity came a boom in recreational boating and a consequent increase in boating accidents and fatalities. In 1958 Congress enacted the "Federal Boating Act of 1958" amending Motor Boat Act of 1940 making it applicable to all "motor boats … on the navigable waters of the United States" and requiring the numbering of all vessels propelled by machinery of more than ten horsepower and established a system whereby individual states could adopt a uniform numbering and certificate system.[18] The Act further required that accidents involving numbered vessels be reported to the state in which the accident occurred and that the data collected by the states would be reported to the Coast Guard. During the next decade accident data compiled by the Coast Guard indicated the need for additional efforts to promote safety of recreational boats.

The provisions of the Motor Boat Act of 1940 for fire extinguishers, life preservers, flame arrestors, and ventilation of engine and fuel tank compartments remained the only requirements applicable to commercial fishing vessels. The limitations of these provisions became obvious when the U.S. Marine Safety Statutes were codified in 1983.[19] As the Motor Boat Act of 1940 – unlike the FBSA-71 – limits the Coast Guard's regulatory authority to those few items set forth in the act, the Coast Guard did not have the authority to adopt regulations requiring modern fire fighting, life saving or safety equipment on uninspected fishing vessels.

DOCUMENTATION VERSUS STATE NUMBERING

The numbering requirements of the 1958 Boating Safety Act created different ways to register vessels with the government. A vessel could be documented, which establishes its nationality, or it could be numbered by a state of principle

use. Fishing vessels over five net tons are required by law to be documented and licensed for the fisheries.[20] But, many fishing vessels – those that measure less than five net tons – are numbered by the state. Unfortunately, the casualty reporting requirements applicable to documented and numbered uninspected commercial vessels are different. The resulting lack of uniform casualty reporting criteria limits the accuracy of casualty information on fishing vessels. Further the most important provisions of the 1988 Fishing Vessel safety legislation apply only to "documented vessels."

THE 1970s, STUDY BUT LITTLE PROGRESS

In 1968, the Coast Guard conducted – at the request of both the Congress and the Executive Branch – what is probably the most comprehensive and significant study ever carried out on fishing vessel safety in the U.S. The report, published in 1971, was entitled *A Cost Benefit Analysis of Alternative Safety Programs for U.S. Commercial Fishing Vessels,* and documented the fishing industry's poor safety record, concluding that one of the major contributing causes of this dismal safety record was that fishing vessels, with few exceptions, have traditionally been exempted from safety regulations. The study recommended licensing of masters, mandatory safety standards including full inspection and certification of new vessels and mandatory and voluntary standards combined with inspection and certification of existing vessels.[21]

In July of 1976, the Secretary forwarded copies of the 1971 study to the Senate Committee on Commerce and the House Committee on Merchant Marine and Fisheries. The Secretary did not recommend the Coast Guard's legislative program proposals, citing the inflationary impact and increased interest in a voluntary safety program by the U.S. fishing vessel industry. This action by the department stopped the initiative for fishing vessel safety legislation.

In 1978, the Coast Guard established a voluntary dock-side examination program for uninspected vessels. Forty five new billets for a Coast Guard-wide boarding and examination program were requested in the Coast Guard's FY 1979 budget, to improve safety throughout the U.S. uninspected commercial fleet including commercial fishing vessels.

In 1978, Rear Admiral (ret.) William J. Ecker, U.S. Coast Guard, (then a Commander) prepared *A Safety Analysis of Fishing Vessel Casualties* for

the 66th National Safety Congress and Exposition.[22] He examined "some of the more frequent types of marine casualties involving fishing vessels and highlighted the salient aspects of these casualties as they relate to circumstances, location, fishing fleet type, and the subsequent result of these casualties, be it loss of vessel, loss of life, or other." He concluded, "there would appear to be ample evidence to warrant additional study and research into those incidents resulting in loss of life and loss of vessel for the purpose of ameliorating those circumstances and conditions that frequently precede tragic consequences."

THE 1980s

In June of 1980, J. E. DeCarteret, N. W. Lemley and D. F. Sheehan, Office of Marine Safety, Coast Guard Headquarters, presented a paper entitled *Life Safety Approach to Fishing Vessel Design and Operation* at a SNAME meeting,[23] and published a similar article *Proceedings of Marine Safety Council*.[24] The authors, drawing on the work of Admiral Ecker and the 1971 analysis of fishing Vessel safety, suggested that training combined with the recently initiated Coast Guard education and voluntary dock-side boarding program should have a positive effect on casualties. Their conclusions and recommendations echoed those of past investigations. Unfortunately, due to budget cuts, the USCG voluntary dock-side-boarding program was terminated, casualties continued and the pressure for action mounted.

In February 1983, the A-Boats – the F/V *Altair* and *Americus* – capsized and sank in the Bering Sea with the loss of fourteen fishermen. Captain DeCarteret, then chief of the Marine Safety Division in Seattle, led a joint Coast Guard/National Transportation Safety Board (NTSB) investigation that lasted more than two years. The final report recommended that the Coast Guard require stability analysis of new or modified vessels, adopt a modified load line system, and seek authority to promulgate minimum competency standards and require licensing of masters of fishing vessels. The Commandant of the Coast Guard did not concur, preferring to turn the matter over to the newly formed Fishing Vessel Safety Initiative Task Force that was pursuing voluntary approaches to fishing vessel safety. The Commandant said, "Being voluntary, it would require no legislation and would have no disruptive effect on industry."[25]

In August 1983, the House Merchant Marine and Fisheries Subcommittee on Coast Guard and Navigation held a series of hearings on Marine Safety. During one of the sessions the Committee heard testimony on fishing vessel safety from three individuals representing very different points of view.[26]

We testified on the need to establish a comprehensive program for fishing vessel safety in the Office of Marine Safety, to improve information on casualties, to coordinate ongoing safety projects, and update the Coast Guard's 1971 safety study, and suggested that Chapter 41 of Title 46 U.S.C. (Uninspected Vessels) be amended using the same flexible language set forth in Chapter 43 (Recreational Vessels) to permit the Coast Guard to develop comprehensive regulations for all uninspected vessels.

No action was taken on the suggestion for safety legislation, but the next year Congress did amend the statutes by defining fishing, fish tender, and fish processing vessels; exempting fishing tender vessels less then 500 gross tons and fish processing vessels less than 5,000 gross tons from inspection; and, adopting a new Chapter 45 setting forth requirements for "Fish Processing Vessels."

In 1984, the Coast Guard Office of Merchant Marine Safety established a fishing vessel safety program with the hope of reducing the number of uninspected commercial fishing vessel casualties by not less than ten percent by 1991 without a net increase of the level of commercial vessel safety resources, and established a full time task force to study how the fishing vessel safety initiative could best be implemented. Based on a paper by LCDR William Morani, a two pronged voluntary program was developed.[27]

One part of the initiative was intended to promote vessel safety through voluntary standards written by the Coast Guard in five Navigation and Vessel Inspection Circulars (NVIC). These voluntary standards, proposed in NVICs 5-85 through 9-85,[28] were revised and consolidated in NVIC 5-86.[29] The voluntary standards were written primarily for fishing vessel designers, builders, outfitters and marine surveyors. The second part of the safety initiative sought to promote crew safety through a safety manual that was developed jointly by the Coast Guard and North Pacific Fishing Vessel Owner's Association (NPFVOA).[30] Additional regional manuals – based on the NPFVOA manual – were developed and published for the Gulf[31] and Atlantic coasts.[32] The

Fishing Vessel Safety Initiative became part of the Coast Guard Marine Safety Program in January 1987, with the policy implementing the safety program published in a Commandant Instruction in November of that year.[33]

TRAGEDY STRIKES AGAIN

In August 1985, the F/V *Western Sea*, a seventy-year-old purse-seiner, departed Kodiak, Alaska to fish for salmon. There was no indication the vessel was in trouble until the body of crew member Peter Barry was recovered from the sea by the F/V *Dusk*. An intensive search by Coast Guard cutters and aircraft failed to locate any survivors. After the death of their son, Robert and Peggy Barry galvanized support from safety advocates, government officials, the legislature and the surviving families of other commercial fishermen lost at sea to renew the campaign for mandatory safety regulations.

In 1986, three bills were introduced in the House of Representatives specifically addressing fishing vessel insurance and liability issues. H.R. 4407 authorized the Coast Guard to write regulations for new fishing vessel (five net tons and over), and required load lines for fishing vessels over 79 feet. It would also have required crew training and licensing of skippers on new vessels. In exchange the bill would have limited liability on the newly regulated vessels.[34]

H.R. 4415 modified the liability statutes (Jones Act) and authorized the Coast Guard to require documented fishing vessels on the "high seas" to carry (in addition to the existing requirements) immersion suits, EPIRBs, lifeboats or life rafts, Visual Distress Signals, and communications equipment.[35] H.R. 4465 eliminated the existing exemption of inspection of fishing vessels, and required that some fishing vessel be inspected, and would have made additional requirements for inspected fishing vessels, but this bill did not address liability.[36]

In April 1986, three subcommittees of the House Merchant Marine and Fisheries Committee held hearings on these bills. Then Rear Admiral J. William Kime, Chief of the Office of Merchant Marine Safety, presented testimony supporting the Coast Guard's voluntary approach to fishing vessel safety. It was the position of the Coast Guard that, "A voluntary program would be as effective as regulations, with little difference in cost to the fishermen, and much less costly to the Government, and would achieve the desired results much more rapidly." Peggy Barry and several others who lost family on the *Western*

Sea testified passionately for enactment of legislation that would, at a minimum, require modern emergency rescue equipment on U.S. commercial fishing vessels.[37] After much deliberation by the Committee a compromise bill, *The Commercial Fishing Vessel Liability and Safety Act*, was sent to the full House. H.R. 5013 limited the liability of fishing vessel owners to a maximum of U.S. $500,000 in cases of permanent injury, except where there was gross negligence or willful misconduct, and required the carriage of additional lifesaving equipment on fishing industry vessels, including Visual Distress Signals, EPIRBs, life rafts, exposure (immersion) suits, radio equipment and other equipment to reduce the risk of injury.[38]

On August 13, 1986 after an intense lobbying effort by the American Trial Lawyers Association (ATLA), H.R. 5013 was defeated in the House. The defeat of this legislation placed added emphasis and urgency on the Coast Guard's voluntary initiative, and sparked the development of new bills for introduction in the next Congress.

SECOND TRY

In March 1987, two bills were introduced in the House dealing with fishing vessel safety and insurance liability. Congressman Lowry of Washington, on behalf of Robert and Peggy Barry, introduced H.R. 1836.[39] It would have required "new" documented "fishing vessels" to be "inspected" by the Coast Guard, but existing vessels "except when compliance with major structural or major equipment requirements is necessary to remove and especially hazardous condition" would not be subject to the inspection provision, and would have required all other vessels to be equipped with modern survival and rescue equipment, permitted the Secretary (Coast Guard) to prescribe additional requirements for fishing, fish processing and fish tender vessels including, and required the establishment of regulations for the operating stability of "new" or "substantially altered" fishing, fishing processing and fish tender vessels. It also "prohibited" the operation of the vessels "unless emergency assignments for individuals on board the vessel and periodic emergency drills" are conducted, and permitted "termination" of unsafe operations creating an "especially hazardous condition."

The bill called for licensing and training. All crewmembers would be required to be trained "in vessel safety and emergency procedures" using an approved

manual, or by an approved training course. The operator of a documented "fishing industry vessel" would be required to hold a Coast Guard license.

The bill established uniform casualty reporting for all commercial vessels and established a Fishing Vessel Safety Advisory Committee of 17 members to make recommendations to the Secretary on matters relating to fishing, fish processing, and fish tender vessels, including navigational safety, safety equipment and procedures, marine insurance, vessel design, construction, maintenance and operation, and personnel qualifications; review proposed regulations. Finally, the bill proposed to add "safety" to Section 303(a)(2) of the Fishery Conservation and Management Act of 1976. H.R. 1841 was introduced by Congressman Studds of Massachusetts, Chairman of the subcommittee on Fisheries and Wildlife Conservation and the Environment and addressed liability and safety, but did not propose inspection or licensing.[40] The Studds bill had two sections, or "titles." Title I dealt with "compensation for temporary injuries on fishing industry vessels."

Title II of the Studds bill proposed to amend Chapter 45 of Title 46 U.S.C. by replacing the existing chapter applicable only to fish processing vessels with a new chapter applicable to all fishing, fish processing and fish tender vessels. There are many similarities between the safety proposal in the Studds bill and that of the Lowery bill (H.R. 1836) described above. But H.R. 1841 required additional regulations only for "new uninspected fish processing vessels … having more than sixteen individuals on board primarily employed in the preparation of fish or fish products." The requirement for "operational stability" was the same as H.R. 1836 as was the "equivalency" provision for fish processing vessel. But the section on "prohibited acts" did not include a paragraph on requirements for training, as did H.R. 1836. The sections on "termination" and "exemptions" were the same in both bills. The requirements for gathering casualty information from underwriters were the same in both bills, but H.R. 1841 did not call for uniform casualty reporting for all commercial vessels. H.R. 1841 also established an advisory committee, but the name did not mention "safety" as it was called the "Commercial Fishing Industry Vessel Advisory Committee."

Hearings were held in the House in June 1987 on H.R. 1836 and H.R. 1841.[41] During the hearings Captain Gordon Piche, Program Manager of the Coast Guard Fishing Vessel Safety Task Force, testifying on both bills stated, "the

Coast Guard can support consideration for safety management in H.R. 1841, the stability criteria that is recommended by both bills and the record keeping by the insurance companies." But, the Coast Guard did not "fully support or cannot support inspection, licensing, termination, and the proposed advisory committee." The Coast Guard "remains convinced that the voluntary approach is a viable program."

In March, Senator Chafee introduced a companion bill (identical to H.R. 1841) in the Senate,[42] S. B. 849, "To establish for timely compensation for temporary injury incurred by seamen on fishing industry vessels and to require additional safety regulations for fishing industry vessels."

The Senate Committee on Commerce, Science, and Transportation held hearings in September in Washington DC and in Wakefield, Rhode Island in December 1987.[43] Additional testimony on the bills at both the House and Senate hearings were held. The families of those lost on the *Western Sea* and in other fishing vessel tragedies supported the tough provisions of H.R. 1836. Those representing the fishing industry – including FAIR (Fishermen's Alliance for Insurance Reform representing eighteen fishing associations) – all testified in support of the liability provisions of H.R. 1841 and in general supported – sometimes reluctantly – the minimal safety provisions in the Studds bill. Most of the fishing industry representatives also recommended establishment of a notice requirement for crewmembers injured while in service of a commercial fishing vessel. All of fishing industry representatives expressed strong opposition to H.R. 1836, particularly to the proposed requirements for training and licensing. In addition, the committee also received written statements from a number of individuals and organizations.

In September 1987, the National Transportation Safety Board (NTSB) published a comprehensive study on *Uninspected Commercial Fishing Vessels* which recommended the establishment of minimum safety training standards requiring that captains and/or owners provide minimum safety training for all crewmembers; requirements for basic lifesaving equipment including imersion suits, flooding detection and dewatering systems, fire detection and fixed firefighting systems; approved lifeboat or life rafts; emergency radios; EPIRBs; safety certification and periodic inspection; prohibition of the use of alcohol or drugs when engaged in commercial fishing operations; education regarding the dangers of toxic gas exposure in unventilated spaces; and the

need to examine and conduct research on stability issues. The NTSB testified at both Senate hearings in support of its recommendations.[44] In October, the House subcommittees met to consider H.R. 1841.[45] There was no consideration of 1836. Congressman Studds offered an amendment in the form of a substitute bill incorporating the major suggestions made by witnesses during the hearings. Many of the changes dealt with Title I. Congressman Studds' substitute also proposed some substantial changes to Title II, the safety portion of H.R. 1841. First, it proposed additional navigation and first aid equipment for documented vessels operating beyond the Boundary Line, and authorized the Secretary (Coast Guard) to adopt additional safety regulations for any new (entering into service after December 31, 1987) fishing industry vessel with more than 16 persons on board. It also required the Secretary, in consultation with the Commercial Fishing Industry Vessel Advisory Committee (CFIVAC), to prepare a plan for the licensing of operators of documented fishing industry vessels, and submit it within two years.

The Studds amendment was adopted and the following were then added :

> Require "buoyant apparatus" on fishing industry vessels as prescribed by the Secretary. (Rep. Bonker)
>
> Require the Secretary after consultation with the CFIVAC to adopt regulations for the inspection of fish processing vessels. (Rep. Lowery)
>
> Require that the members of the CFIVAC be appointed within 90 days of enactment of the bill. (Rep. Lowery)

Rep. Lowery also offered an amendment that would have required the training of crewmembers on board all commercial fishing industry vessels and the licensing of operators of documented vessels. The amendment was defeated on a voice vote.

The Studds amendment with changes was reported favorably to the House Committee on Merchant Marine and Fisheries. The committee met in April 1988 to consider both Titles of H.R. 1841. Chairman Studds offered a substitute for Title I making the compensation system for temporary injuries mandatory rather then voluntary, requiring an injured seaman, if requested, to undergo a medical examination in order to benefit from the compensation plan provided for in amendment, and removing the bar of civil action if a seaman failed to

give notice of an injury. Studds also offered an amendment to Title II requiring the prominent display of the provisions of Title I and requiring all seamen to report all injuries within seven days.

Representative Lowry offered an amendment to Title II requiring, instead of Coast Guard inspection, that processing vessels be subject to classification by the American Bureau of Shipping (ABS) or a similar organization, and that the National Academy of Engineering carry out a study of the safety problems of fishing industry vessels and make recommendations on vessel inspections.

Efforts by the committee during the spring of 1988 to reach an agreement on the liability provisions of Title I were unsuccessful. The amended bill did not contain any provisions regarding liability. The bill did require that the Coast Guard develop a licensing plan and conduct studies on Fishing Industry Vessel Inspection and Unclassified Fish Processing Vessels. H.R. 1841 contained a new chapter, Title 46 U.S.C., regarding Fishing Voyages, which require fishing and wage agreements and prompt notification of illness, disability, and injury on fishing industry vessels. H.R. 1841, as amended, was favorably reported to the House by a unanimous vote of the committee. The House passed the Bill, as amended, on June 27, 1988. On August 11, 1988 the Senate passed the House version of the bill.

SUCCESS

On September 9, 1988, the President signed into law the "Commercial Fishing Industry Vessel Safety Act of 1988" (P.L.100 424); the first safety legislation enacted in the U.S. applying specifically to commercial fishing vessels. The implementation of the Act began in earnest almost immediately. The Commercial Fishing Industry Vessel Advisory Committee (CFIVAC) was appointed and drafting of regulations to implement the Act began by late 1988.[46] By September of 1991, the regulations were ready, and the Coast Guard developed a "voluntary dockside examination program" allowing a vessel owner to request that the Coast Guard or other recognized "third-parties" examine the vessel for compliance with the new regulations (and other federal requirements) and obtain a decal indicating compliance. In the event that deficiencies were found, recommended action would be suggested, but no penalty would be assessed. The Coast Guard established new positions – primarily civilian – to conduct the examinations.

Since adopting the Act and the implementing regulation, the fishermen who learn how to *use* the modern emergency rescue equipment required on the vessels they work on now have a better chance of surviving vessel casualties. But unfortunately far too many vessel casualties still occur and too many lives are lost. Many of these casualties could be prevented by the application of recognized design, construction, maintenance and operating standards. The Act provided opportunities to make progress in these areas, but again, opportunities have been missed.

PART III – MORE MISSED OPPORTUNITIES

The passage of "Commercial Fishing Industry Vessel Safety Act of 1988" was a great victory for all who had worked so hard to make commercial fishing safer for the American fisherman. But as the drafters intended when including requirements for additional study of licensing and inspection, this is a work in progress. Unfortunately opportunities to promote fishing safety continue to be missed.

The consideration of the licensing began soon after the Commercial Fishing Industry Vessel Advisory Committee (CFIVAC) was appointed. By early 1990, the Licensing Subcommittee of the CFIVAC made a detailed report regarding the licensing proposal, and specifically recommended a plan for the "certification" rather than licensing of commercial fishing vessel operators, and the plan adopted by the CFIVAC included "competency" requirements. The Committee laid out a number of specific recommendations to the Coast Guard for inclusion in its report to Congress on the licensing plan.

Two years later, in January 1992, the Coast Guard submitted "A plan for Licensing Operators of Uninspected Federally Documented Commercial Fishing Industry Vessels" to Congress. This "original" Coast Guard plan followed the traditional pattern for Coast Guard licensing, requiring an examination rather than "hands-on-training" as recommended by the CFIVAC.

The CFIVAC reluctantly endorsed the Coast Guard's licensing plan, but requested an opportunity to develop a response to a letter from Rep. Young of Alaska who asked for specific input from the Committee. A 'licensing working group' met in the fall of 1992 and drafted a proposal incorporating the "hands-on training requirements" preferred by the Committee into the "plan" as

submitted to Congress. In December, the full Advisory Committee approved most of the revised plan, and recommended that it should apply to all vessels 36 feet or more in length, not just "documented vessels." In May of 1993 the Coast Guard submitted a revised executive summary, including the recommendations jointly agreed to by the CFIVAC and the Coast Guard. Despite this effort, no legislation to adopt the "licensing plan" was ever introduced in Congress.

As called for in the Act the National Research Council (NRC) of the National Academies of Sciences and Engineering carried out the inspection study. The project was assigned to the Marine Board of the NRC, and a Fishing Vessel Safety Committee was selected.[47] Its comprehensive report *Fishing Vessel Safety – A Blueprint for a National Program* was published 1991.[48] At its May meeting that year the CFIVAC reviewed the report and endorsed most of the recommendations including the establishment of an inspection program.

In November 1992 the Coast Guard sent to Congress its plan to require inspection of commercial fishing industry vessels, requesting authority (legislative changes) that would authorize the Coast Guard to:

Establish a self-inspection program for vessels less than 50 feet in length;

Require third-party inspection for vessels greater than 50 feet but less than 79 feet in length;

Require Coast Guard inspection of vessels greater than 79 feet in length;

Required load lines on new vessels 79 feet or more in length and on existing vessels 79 feet or more in length within ten years;

Require that all new fishing industry vessels 79 feet or more length be designed and built to class standards; and

Authorize the Coast Guard to impose additional hull and machinery standards for existing fishing industry vessels 79 feet or more in length.

Coast Guard noted, in its report to Congress, "that material condition of the vessel and equipment was a direct cause for over 85 percent of the known vessel-related casualties."[49] That neither the licensing nor the inspection plan

ever received serious consideration by Congress is evident in that no bills were introduced or hearing held on the issues. Nonetheless, the tragedies continued, and at the end of the 1990s a series of casualties, this time involving fishing vessels on the East Coast of the U.S., prompted yet another look at fishing vessel safety.

Between December 1998 and January 1999 eleven fishermen died when their vessels were lost along the East Coast.[50] While these terrible losses were consistent with losses that occur all around the U.S. every year, the timing of the casualties garnered a lot of media attention. The Coast Guard responded by forming a "Fishing Vessel Casualty Task Force" made up of representatives of the federal agencies that interact with the fishing industry (Coast Guard, National Marine Fisheries Service, Occupational Safety and Health Administration, National Transportation Safety Board, and the National Oceanic Atmospheric Administration) and several industry advisors including managers, trainers, investigators, insurance, and fishermen.

The Task Force met in Washington DC in mid-February 1999, and released its report in April.[51] The Task Force posed the following question to policy makers, "Do the continued high loss rates in the commercial fishing industry represent an acceptable risk by today's standards?" The Task Force concluded, "… the risk is not acceptable, that pushing for breakthrough levels of reduced fishing industry losses is the right thing to do, and that the time is right to take on this challenge."

The Task Force recommended operator licensing, safety inspections, stability standards, better investigations, and improvements to the Coast Guard program. Out of these recommendations the Coast Guard developed an "Action Plan" including short term goals, program initiatives, and long-term proposals, including:

Improving drill enforcement;

Completing the regulatory project on stability and watertight integrity begun in 1992;

Improving casualty investigations and analysis;

Improving communication (with the industry);

Seeking authority and funding for mandatory vessel examinations;

Seeking authority and funding for mandatory safety training; and

Requesting that the geographic marker used for safety equipment be changed from the Boundary Line to the baseline from which the territorial Sea is measured.

This Action Plan is yet another opportunity to "work for a breakthrough to significantly lower casualty losses." It remains to be seen whether significant progress will be made, or whether this will be yet another lost opportunity.

POSTSCRIPT

In the recently published report on the loss of the F/V *ADRIATIC*, the "Action by the Commandant" seems to indicate a change in direction for the U.S. Coast Guard. The Commandant now supports seeking authority for 'mandatory examinations of inspections' and 'operator licensing.'[52] This is an encouraging development! We can only hope that the momentum is sustained. It would be a tragedy to miss yet another opportunity.

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FORECASTING EXTREME OCEAN WAVES

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INTRODUCTION

The recent best seller *The Perfect Storm* by Sebastian Junger and the subsequent Hollywood depiction brought extreme waves into the public focus. Fishermen and other mariners have long known the dangers of extreme waves. However, not until recently have marine forecasters possessed the understanding and tools to predict in advance the conditions that lead to the development of extreme waves.

In order to predict large ocean waves, the driving force or wind stress must be understood. In the case of extratropical cyclones, observational studies in the late 1980s greatly enhanced the knowledge of the evolution of the wind field associated with rapidly intensifying low-pressure systems [Shapiro and Keyser 1990]. Following the observational studies, the evolution of the wind field was simulated by high-resolution atmospheric models. Today, the cyclone wind field structure, described by Shapiro and Keyser, is routinely forecast by operational atmospheric numerical models.

A second advancement is that operational numerical wave models such as National Oceanographic and Atmospheric Administration (NOAA) WAVEWATCH III [Tolman1998b] more realistically demonstrate the creation

and dispersion of swell energy than earlier wave models. The generation and dispersion of swell energy is critical in the development of extreme waves.

A third factor is the forecasters themselves and the skill that they bring to the forecast process. The NOAA Marine Prediction Center has a core of dedicated forecasters that analyze wave heights every three hours over the western North Atlantic and eastern North Pacific Oceans, 365 days a year. This routine task has helped make the forecasters quite familiar with the characteristics of both the atmospheric and wave model forecast systems. The forecasters are then able to confidently apply adjustments to the numerical forecast guidance fields before forecasts are distributed to mariners. Forecasters have come to recognize the potential for the development of extreme waves due to the phenomena dynamic or "trapped" fetch. In these instances, wave development is maximized due to a wind area moving in resonance with preexisting swell.

WAVE BASICS
FETCH, DURATION, WAVE DISPERSION

Wave growth is a function of the strength of the wind speed, the duration in time of wind stress acting upon the ocean surface, and the distance or fetch that the wind stress occurs. The limitation of any one of these factors will restrict wave growth. In nature, it is difficult to maximize all three at once due to turning winds and changes in wind speed.

A slow moving area of wind blowing across an area of open-ocean will create wind waves. The wind waves then move away from the wind area or generation area and begin to disperse by increasing their wavelength and decreasing the wave height. Wave period and wavelength are directly related, the longer the wave period, the longer the wavelength. Ocean waves move at approximately 1.5 times (m/s) the wave period (sec). Wave energy or group velocity moves at half the individual wave speed or 0.75 times (m/s) the wave period in seconds. Therefore longer period waves will migrate away from the generation area as swell. A swell with a 17 second period will have a group velocity of approximately 12.5 m/s or 25 knots.

Sailors have long recognized that longer period swell is a precursor to the inset of bad weather. This works well for swell generated by a slow moving or turning storm system. Unfortunately, under the right combination of storm

movement and swell movement it is possible to have both the leading edge of swell and the high winds within a cyclone arrive at a given location at the same time. When this happens it is called dynamic fetch and extreme waves can occur.

DYNAMIC FETCH

A slow moving weather system generates swell, then swell migrates outward away from the source. Suppose that the weather system begins to accelerate and runs over or moves in resonance with its earlier produced swell. Wind stress would be acting on existing swell and building wind waves on top of that swell. Individual wave heights would be maximized due to constructive interference. This resonance of storm system with swell propagation is called dynamic or "trapped" fetch and produces extreme seas.

During a dynamic fetch event, since swell has no longer outrun the storm, there is no precursor to a rapid rise in wave heights, therefore, little or no warning is given. Wave heights can double, triple, or more in several hours. During Hurricane Danielle in 1998, significant wave heights increased from 2 to 16 meters in just 6 hours at Canadian buoy 44141. Significant wave height is defined as the average height of the one-third highest waves. It is no coincidence that Danielle had accelerated from 7 to 17 m/s over an 18-hour period. Buoy 44141 was to the east or right of the track of the storm.

Hurricane Luis in 1995 produced seas of 17 meters at the same buoy south of the Canadian Maritimes with peak individual waves in excess of 30 meters. Luis, over the previous 24 hours, had accelerated from 8 m/s to 19 m/s over a relatively straight track. This phenomena is not restricted to rapidly moving tropical cyclones but is also observed with extratropical or mid-latitude cyclones.

CASE STUDIES

Two examples of extreme waves are presented in this section. The first is from a mid fall 1999 extratropical cyclone that developed in the eastern Pacific and intensified west of the Oregon Coast. Significant wave heights of 16.5 meters were measured by buoy 46006. The second example is from an accelerating tropical cyclone, hurricane Gert, in the western Atlantic in 1999.

EXTRATROPICAL CYCLONE

Over the oceans, autumn is a time of transition when deep tropical moisture can be forced into higher latitudes and cold air can surge southward. The result is the potential for violent, explosive developing storms. Sanders and Gyakum [1980] described such storms as bombs.

The incipient cyclone developed southeast of Japan on 22 October 1999 in an area of tropical moisture and then moved slowly to the northeast. On the 24th the cyclone began to accelerate straight east along 42º N. latitude while gradually dropping in central pressure. Marine Prediction Center forecasters began to warn for possible storm force winds with the cyclone on the 25th. On the 26th , rapid intensification began as the cyclone made a very gradual turn to the east northeast. Maximum intensity was observed mid day on the 27th with the cyclone center near 46º N. 135º W., just off the Oregon Coast. Winds to 65 knots were observed to the south and southwest of the center at the time of peak intensity. In an eight-hour period, significant wave heights rose from 5 meters to 16.5 meters. Significant wave height is defined as the average of the 1/3 highest of the waves. Peak waves or highest waves observed are typically 1.9 times the significant wave height. In this example individual seas were likely in excess of 30 meters or 100 feet. Very large swells in excess of 25 feet were observed along the West Coast of the U.S. over the following two days.

TROPICAL CYCLONES

Hurricane Gert was one of several Category 4 hurricanes observed during the 1999 Atlantic Season. Gert developed south of the Cape Verde Islands on the 11th of September and tracked west-northwest through the 17th. The storm reached peak intensity on the 16th with winds to 130 knots. On the 17th, Gert changed to a more northwest track in response to a weakness in the subtropical ridge. On the 21st, Gert changed to a more north-northeast track and began to accelerate from 5 to 12 m/s. The storm brushed Bermuda later on the 21st. Although the hurricane itself posed no threat to the U.S. mainland, Gert produced swell that brought seas to 12 feet along much of the East Coast. The beaches of New England became a haven for surfers. Two people were washed off the shoreline at Schoodic Point in Maine and into the surf. Unfortunately, they did not survive.

As Gert passed across the Canadian array of ocean buoys it passed just west of buoy 44141. The maximum significant wave height observed by 44141 was 45 feet as shown in the MPC Wind/Wave analysis for 0300 UTC 23 September 1999.

DISCUSSION: WHAT TO LOOK FOR

The examples of Danielle, Luis, Gert, and the October 1999 Pacific all produced extreme waves. Buoys recorded significant wave heights from 45 to 56 feet with individual waves up to 100 feet. In the four events discussed, there are some common threads. All of these storms were moving very rapidly, between 12 and 19 m/s along straight tracks. The highest waves were observed to the right of the direction of motion with the exception of Luis. Luis passed just to the east of buoy 44141.

For tropical cyclones this rapid speed of motion typically occurs along a north-northeast or northeast direction as a cyclone passes out of the tropics into the mid-latitudes.

For extratropical cyclones, the track for optimized wave production appears to be from west to east or west-southwest to east-northeast track. The cyclone usually explosively deepens or bombs. It has become evident to forecasters that west to east movers are dangerous.

The rapid motion in excess of 12 m/s appears to allow the cyclone and area of wave generation to either move in resonance or catch up to swell generated earlier by the storm. Wave and swell generation are optimized to the right of the direction of motion (northern hemisphere) of a cyclone because winds are blowing parallel and in the same direction as the cyclone. (The cyclone winds act on an already disturbed ocean surface). Once the cyclone catches up with or moves in harmony with its swell then wind waves do indeed build upon the swell and extreme waves can be produced.

Of the two possibilities, the tropical cyclone case is probably the easier to understand and forecast. If the track is going to remain straight in excess of 12 m/s then an extreme wave event is likely.

A version of the WAVEWATCH III model is now run two times a day using the very high-resolution wind field from the NOAA GFDL Hurricane Model

[Kurihara et al 1998]. The GFDL-WAVEWATCH III model forecasts were in the process of being evaluated by MPC forecasters during the hurricane season of 2000-2001. So far the results have been encouraging.

FORECASTING LIMITATIONS

An understanding of dynamic fetch is just one necessary ingredient needed by Marine Prediction Center forecasters to produce accurate wave forecasts. Numerical forecasts of winds are not perfect and thus the resultant numerical wave forecasts are less than perfect. The forecaster must understand the limitations of all the ingredients that go into producing a numerical forecast and apply that knowledge in a variety of circumstances. A key ingredient is an understanding of how cyclones behave, their life cycles, and wind evolution. Numerical forecasts still have trouble with forecasting rapidly developing extratropical cyclones. The result is too weak a wind forecast and thus too low a wave forecast. Forecasters must compensate for this.

Producing three-hourly wave analyses has had its benefits for the forecaster. Wave model biases become obvious. A clear bias of the NOAA WAVEWATCH III is to produce waves too slowly and too low in strong cold air advection across warmer waters. There may be two explanations for this; either the wind is extremely efficient transferring energy to the ocean in the form of wind stress or wave growth is not fully understood and accounted for in fetch limited cases. Perhaps the best example of this is off the East Coast of the U.S. in winter in strong northwest flow with cold air flowing across the warm Gulf Stream. MPC forecasters often can compensate for this bias and increase both the seas and the winds. It is possible that this bias also occurs in cold air advection in rapidly intensifying cyclones and would cause an underestimate of seas.

Extreme waves also occur in areas of strong ocean currents such as in the Gulf Stream and the Kuroshio Currents. Unfortunately, there is very little observational data in these areas. Operational wave models are not at the stage yet that they contain the effects of ocean currents. Forecasters do warn for higher seas in the vicinity of ocean currents and define the current areas. Warm and cold eddies association with larger currents also have small current maximum associated with them. Even if the larger scale ocean current could

be introduced into operational wave models, the effects of these eddies would not be resolved, therefore not forecast.

Extreme seas with the 1991 Halloween Storm occurred in a large area of strong winds. The cyclone itself was nearly stationary. It has been suggested that these extreme waves were the result of a rapidly moving wind maximum sweeping along the sea surface in resonance with developing swell. Unfortunately, diagnosing and forecasting the motion and intensity of a wind maximum embedded in a large-scale wind field is currently beyond the capabilities of the operational science due to the small scales involved.

Forecasters do not forecast wave shape or make any estimation as to whether waves are breaking or not. Although breaking waves and steepness are critical for mariners, forecasting these conditions is also beyond the current state of the operational science.

SUMMARY

Until recently, forecasters did not have the tools or understanding to confidently forecast extreme wave events. Three factors have made the forecasting of extreme wave events possible; advances in atmospheric wind forecasts, realistic treatment of swell generation and dispersion by ocean wave models, and better understanding of extreme wave events by NOAA Marine Prediction Center forecasters.

As presented here, many extreme wave events are produced by rapidly moving storms (extratropical and tropical) (speed of motion 12 m/s or more) that travel along a straight track. For extratropical cyclones, typically the cyclone is rapidly intensifying. As pointed out in section 4b, there are other factors that produce extreme seas such as ocean currents and current maximums associated with thermal oceanic eddies that are not able to accurately forecast for various reasons. Forecasters do not have the ability to forecast whether seas are breaking or even the steepness of seas.

What does this mean for the mariner? Although forecasters are not able to anticipate all extreme sea events, many can be predicted.

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SAFETY IN SMALL SCALE FISHERIES — WHAT IS TO BE DONE?

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INTRODUCTION

Marine fishing has always been the most dangerous of all civilian occupations [Ben-Yami 1998]. Fish workers frequently operate under hostile conditions, often using imperfect vessels and technology. Small-scale fisheries are particularly vulnerable to worker injuries [Ben-Yami 2000; Holliday 2000].

Casualties are high in countries and areas where small-scale fish workers operate under conditions where their vessels, safety and communication equipment, first-aid, search-and-rescue (SAR), and early warning services are less than adequate [Gallene 1995, 1997; Johnson and Tore 1994; Satia 1993]. These workers fish and collect aquatic organisms by swimming, diving, wading, or using small-scale fishing craft. Such craft are defined as mainly decked boats of less than 10-12 m length overall, and less than 12-15 MT displacement, powered by engines not exceeding 200-300 hp (150-225 kW), as well as rafts, canoes, pirogues, and open-deck dhows up to 16 m length overall, powered by engines not exceeding 200 hp (150 kW) [Ben-Yami 1988].

Safety problems of small-scale fishermen have so far received low priority even in many industrial nations, and have been all but neglected in most of the others [Ben-Yami 1998, 1999 & 1999a; Wagner 1999]. Reduction of casualties can be achieved through concerted action of fishing communities and organizations, national and sub-national authorities, international organizations, and voluntary bodies.

This paper provides, in outline form, a brief overview of recommendations for fishing safety that could be implemented by local, regional, and/or international bodies. Some sections contain more information than others: Later sections of this paper have been severely abridged. An unabridged version of these recommendations will be made available by FAO/FIIT in the future. The bibliography attached to this paper can provide further references for recommendations.

OVERVIEW OF INTERNATIONAL INITIATIVES AND A PROPOSED PLAN OF ACTION TO IMPROVE

FAO, ILO, IMO, and WHO are the main inter-governmental bodies institutionally qualified to deal with problems of safety and health of fish workers on the world scale. FAO, in particular, has decades of experience and involvement in the various aspects of development and management in fishing communities, including boat design and construction, and fishermen's safety. It appears, therefore, that FAO should assume the leading role in international and intergovernmental activities in small-scale and artisanal fisheries safety issues, particularly in developing countries. Institutional-administrative feasibility represents another reason for centralizing such program under the umbrella of a single international organization. Nonetheless, with respect to some aspects of seamanship, such as certification, and international and national safety codes, standards, insurance, and legislation, IMO and ILO ought to be consulted and should extend their assistance [IMO 1998; Wagner 1999].

Internationally supported programs, sponsored by intergovernmental regional and worldwide organizations, would carry the necessary weight to negotiate with governments and to deal with political "anti-regulation" pressures and official opposition based on implementation difficulties.

Such international endeavors may assume various forms. Here, one option is proposed.

A WORKING GROUP MODEL

FAO could formulate a world program for safety in small-scale fisheries. A full-time Chairman (or a Group Secretary) would be appointed to coordinate a specially established Working Group. Among its first tasks would be identification of financial sponsorships, and approach to all governments to carry out surveys of the state of safety in their small-scale fisheries. In Third World countries, nongovernmental organizations (NGO) and FAO field projects might assist. Since NGOs play important roles in many developing countries, especially where it comes to community-related work, the integrated joint program should allow for drawing in NGOs wherever they are willing and able to help, while those NGOs that provide substantial input into the program ought to be represented on the program's Working Group.

An important task of the program would be a worldwide convention on safety-at-sea for small-scale and artisanal fisheries that would provide guidance and legal background to member countries. This convention should contain fishing standards that promote safety for fishermen.

SURVEY OF WARNING SYSTEMS AND SAR

The Working Group would review the existing warning systems and SAR services throughout the world's small-scale fisheries. FAO has already accumulated some related information and experience [Gallene 1995, 1997; Houehou 1993; Johnson and Toure 1994]. With respect to reviewing warning systems, regional international cooperation should be encouraged and, if necessary, coordinated by the Working Group. Regional storm warning systems should be looked at from two points of view: forecasting and monitoring, and broadcasting. The next step should be to seek, promote, and support solutions.

TRAINING IN ACCIDENT PREVENTION, BEHAVIOR IN EMERGENCIES, AND SURVIVAL AT SEA

The Working Group would review the level of training and know-how in areas with high casualty records, and initiate and promote training activities as those described below. Again, where governments are unable or unwilling to take proper care of these aspects, the program should seek international and NGO support.

STRATEGIC PRIORITIES

Because the safety situation in small-scale fisheries worldwide is so bad, even modest improvements would result in substantial reduction of the casualty rate. Two basic strategies are possible: (1) injury prevention; and (2) reducing human and material casualties resulting of accidents. Depending on specific, local conditions, both strategies can be applied separately, consecutively, or simultaneously.

The first strategy encompasses improvements in boats' design and construction, particularly paying attention to stability, weather warning systems, storm shelters for vulnerable coastal populations, and compulsory training and licensing of skippers and crews in safety of both navigation and on-board procedures. Additional priorities consist in integrating safety issues in fishery management and eco-labeling schemes, and, where feasible, reduction and elimination of financial and fishery management-induced incentives to take risks, as well as in legislation and insurance that stipulate safety measures.

The second strategy involves attention to SAR, safety, first aid, and survival equipment on board, emergency communication and tele-location systems and skipper and crew expertise and performance in emergencies, and related training.

The rest of this paper will outline specific model standards that could be implemented by the aforementioned Working Group, that address the two strategic priorities.

MODEL STANDARDS FOR PREVENTION AND TRAINING

The Working Group should promote the following policies for managed fisheries:

Set the days for short-opening fisheries to avoid days of particularly bad weather.

Cut out periods of bad weather when applying seasonal or other short closures.

Apply mandatory closures at times of bad weather for fisheries supported by boats of comparable seaworthiness.

Introduce mandatory insurance stipulating seaworthiness tests and equipment inspections as a condition for the allocation of fishing licenses, quotas, and other fishing rights.

Safety-at-sea laws and rules should allow mandatory equipment to be considered tax- and duty-free, and allow for economic means to allow for seaworthiness inspections of fishing craft, crew and skipper certifications, and inspections.

The Working Group should promote legislation and enforcement of rules preventing inhumane and unjust treatment of artisanal crews employed with their craft by "motherships". Proposed training and certification standards are described below.

CERTIFICATION

Fisherman in charge of fishing craft carrying at least one additional crewmember should be certified. Initially, experienced "old-hands" could be grand fathered. Syllabi for certificates should fit local conditions, type and size of boat, educational levels of fishermen, and include local navigational methods, rules of the road, basic first-aid knowledge, and behavior and management of emergencies.

PROPOSED TRAINING AND PUBLICATIONS STANDARDS

The Working Group should promote training courses, crash-courses, workshops, seminars, etc. in two main categories: training of trainers and educators; and training of fishermen. Educational efforts may be needed where local beliefs impact behavior, e.g., fishermen do not trust modern weather forecasting. Governments should be encouraged to organize courses and workshops, and where needed, itinerant training units, [Ben-Yami 1999; McCoy 1991].

PROPOSED TRAINING STANDARDS FOR TRAINERS

Trainers themselves should be experienced seamen or fishermen, especially for training in survival, emergency management, and use of safety equipment.

Other trainers needed include extension workers for voluntary SAR groups; first-aid paramedics; mechanics-instructors; boat building instructors; and instructors in emergency use of sails.

It is important to train staff of first-aid units to recognize symptoms of decompression sickness in diving fishermen, and realize the urgency of speedy transportation of the casualty to a recompression chamber [Berkow et al 1997].

Training programs should involve teaching prevention and management of marine accidents. This would involve teaching scenarios addressing stability, overloading, and "top-heavy" situations, including capsizings and handling of holes and leakages. Training, education, and examinations [Rayment and Fossi 1994] should cover survival at sea, handling boats in currents, rough weather, tall waves, surf, and management over shallows and water spouts. These curricula should cover "man overboard" and "abandon ship" routines, groundings, and ways to refloat vessels before major damage occurs. The curricula should also cover Rules of the Road and recognition and avoidance of collision courses, and precautionary behavior and procedures on board in worsening weather [Gulbrandsen 1998]. Training and certification of SCUBA divers is another critical issue.

PROPOSED TRAINING STANDARDS FISHING CREW MEMBERS

Curricula should be prepared and instructors selected according to specific, local needs. Curricula for crew members should include: "Abandon ship" practice; rapid donning of immersion suits; first aid, including recognizing symptoms of, and dealing with hypothermia; and survival in water in the presence of sharks.

Proposed Standards for Safety Publications for use on vessels should promote the following concepts or standards:

Encourage regulating bodies to produce easy-to-use, waterproof and small-size maps charting dangerous spots and areas, and safe routes.

Encourage regulating bodies to prepare popular, well-illustrated pocket guides/ manuals on accidents prevention and safety at sea for artisanal fisheries,

translated into relevant languages and distributed to governments and programs dealing with safety at sea. [FAO/ILO/IMO 1988; Gulbrandsen and Pajot 1993; Marine Safety Agency et al 2000; Safety Committee 1972; Safety Liaison Working Group 1997]. Guidance on how to react to accidents and management of emergencies should be included in new or reprinted manuals.

Produce or reproduce and distribute a series of guides aimed at boatbuilders without formal training in the construction of seaworthy and reliable small-scale fishing craft. [Coackley 1991; Fyson 1980, 1985; Mutton 1982; Gulbrandsen 1992; Gulbrandsen and Pajot 1993; IMCO,1976 a, b; Reinhart 1975; Riley and Turner 1995; J.Turner; K.Codel priv.comm.].

PROPOSED INTERNATIONAL DESIGN AND CONSTRUCTION STANDARDS FOR SMALL-SCALE FISHING CRAFT

A team of experts should identify and formulate international and regional standards for small-scale fishing craft design and construction that can be used as a basis for regulation and enforcement. The standards must address fishing, environmental, socioeconomic and cultural conditions, as well as general technological level and infrastructure in different parts of the world, and recommend existing and new designs which would be safer, and contribute to better working and living conditions on board, more efficient fishing operation, including fuel economy.

PROPOSED SAFETY IMPROVEMENTS TO ARTISANAL BOATS

Improvements can be introduced to traditional craft while maintaining its character, such, as buoyancy after capsizing or flooding; improvements to increase the ability to right the boat up by swimming crew; plastic-foam buoyancy blocks fitted in appropriate spaces; material changes, such as the use of bolts, instead of nails, and use of better tools; improvements that contribute to watertight integrity, freeboard, stability, performance in waves and in surf, etc. [Ben-Yami 1999; Gulbrandsen 1992].

PROPOSED STABILITY STANDARDS FOR FISHING VESSELS

The special conditions of operation of fishing vessels, especially double-rigged trawling boats and small-scale purse seiners, require special consideration of stability, due to external pulls. [Coackley 1991; Fyson 1980, 1985; Gulbrandsen and Pajot 1993; Mutton 1982; Riley and Turner 1995]. Where necessary, vessel manufacturers should provide "weak-link" elements in the rigging or the fishing gear that could break off when pulls raise to dangerous levels [Ben-Yami 1999].

PROPOSED STANDARDS FOR PREVENTION AND TREATMENT OF STINGS, VENOMS, AND POISONS

Fishermen are prone to painful and even fatal injuries by venomous and poisonous marine animals. The Working Group should promote improving the availability of anti-venoms and related medicines to fishermen, especially in Third World fisheries; research and development of anti-venoms and immunization against venoms, and poisons such as ciguatera, and of simple ciguatera presence tests [Berkow et al 1997; Williamson et al 1996]. The Working Group should require mobile first-aid units, where wading, swimming, and diving fishing activities are frequent [Berkow et al 1997; Williamson et al 1996.]. It should promote regulations and recommendations related to minimum first-aid responses and list drugs against venoms and poisoning to be carried by such units and on board small fishing craft.

PROPOSED STANDARDS FOR WEATHER WARNINGS

The Working Group should promote reorientation of weather warning systems to serve small-scale fisheries.

DELIVERY OF WARNINGS: RADIO

The Working Group should promote policies obligating public and private radio stations, in areas prone to major storms and sudden weather changes, to transmit weather warnings as soon as received, without waiting for regular weather forecast times. Such procedures, where necessary, should be made compulsory by law. The Working Group should require all seagoing, fishermen,

including artisanal fishermen, to carry radio receivers able to receive such weather broadcasts [Anon. 1996, Calvert 1998].

DELIVERY OF WARNINGS: MILITARY FORCES

The Working Group should promote the use of military aircraft to alert fishermen at sea, on land close to shore, and on the beaches, on approach of dangerous weather.

PROPOSED FIRE PREVENTION STANDARDS

The Working Group should promote relevant regulation to address fire prevention, including, regulations stating that:

> "Small craft powered by petrol-driven outboard motors should carry additional fuel in extra outboard fuel tanks that allow for easy on/off attachment to fuel lines, and do not allow fuel to spill in the vessel. Spilled fuel can lead to fires aboard vessels, which can result in vessel loss, and/or injuries or death to crew. Small open boats should carry a bucket, and some sand in a container.
>
> Larger, decked small-scale fishing vessels must be designed with special consideration to water pumping systems, galleys, engine room and casing, and exhaust pipes, to minimize the risk of fire."

PROPOSED STANDARDS FOR PREVENTING COLLISIONS

The Working Group should require that all boats carry simple radar reflectors and exposed light during nighttime operations. Notwithstanding any electronics, a person must be on lookout whenever the boat is in motion. Crew members should demonstrate good knowledge of "Rules of the Road" and discernment of collision course prevention measures.

PREVENTING BEACHING ACCIDENTS

The Working Group should promote locally appropriate beaching installations and services; and promote land and sea anchoring of beacons, light and other beacons.

PROPOSED STANDARDS FOR OPERATIONS ON THE BEACH: DISASTER PREPAREDNESS; EVACUATION AND PROTECTION

The Working Group should promote policies addressing beach fishing activities including the introduction of visual warning means including flags hoisting, smoke signals, pyrotechnics, etc., warning techniques from the air, and the use of radio transistors. Where hurricane-force winds destroy dwellings and carry in their wake torrential rains and floods, the Working Group should promote the construction of safe storm refuges, such as, well constructed (e.g., reinforced concrete) houses, especially, schools, houses of worship, community centers, and, where necessary, raised flooring. One possibility is to construct low-cost community "survival platforms". These may consist of a concrete, well fenced floor set on a sufficient number of concrete pillars tall enough to keep the platform above any possible flood, with a minimum carrying strength of at least 300-400 kg/m^2, and wide gangways and stairs. Such structures can save large numbers of people and animals, while requiring minimum maintenance [Ben-Yami 1999; Turner J priv.comm.].

MODEL STANDARDS FOR MANAGEMENT OF INJURIES AND EMERGENCIES AT SEA

Existing guides and manuals do not adequately deal with many of the issues associated with fishing injuries and emergencies. The Working Group should promote activities that contribute to increased survivability.

PROPOSED STANDARDS TO PROMOTE SURVIVAL DURING AND AFTER VESSEL EVENTS

The Working Group should require that all fishing craft designed to remain buoyant upon capsizings should be fitted with hand ropes or other means by which people in water could hold onto the vessel, and right the craft up. The Working Group should require that every boat carry hooks and line for emergency fishing, some sort of signal pyrotechnics (desirably parachute flares), a transistor radio receiver, an electric torch with spare batteries, a cellular telephone (where feasible), a buoyant waterproof container for the above supplies, life jackets fitted with reflective tape or active lighting systems for all persons on board, a basic first-aid set, buoyant emergency water containers,

anchor and anchor rope, and a bucket or two. All small boats should carry paddles or oars, a mast and sail, and a lamp.

Magnetic compasses should be carried in all boats fishing at a distance exceeding 1 to 2 nm offshore [Gulbrandsen 1992 & 1998; Gulbrandsen and Pajot 1993]. Decked small-scale vessels larger than 7 to 8-m length should be equipped with standard navigation lights, hand and mechanical bilge pumps, fire extinguishers, and carry additional equipment, such as a small life raft (if boat not buoyant), light and smoke signals, and a light-buoy with radar reflector. EPIRB buoys and personal survival suits should be required in cold-water areas.

PROPOSED STANDARDS TO PROMOTE SURVIVAL IN WATER

The Working Group should require that all survival equipment be well stowed and maintained and in case of sinking, easily or self-detachable and seaworthy. All boats should carry sufficient number of life jackets, and if necessary, should be assisted in their acquisition and distribution.

PROPOSED STANDARDS TO PROMOTE SURVIVAL DURING FISHING OPERATIONS

Fishermen should be informed that injuries are caused from contact with winches and line and net-haulers, running gear (cables, wires, nets, and longlines being set and hauled), fish hooks, and heavy weights overhead, as well as with thrashing and dead fish. The Working Group should require vessels to have first aid at hand at all times; discontinue fishing when external medical assistance is urgently needed; keep sharp knives, axes, and/or other cutting devices nearby, in the event that crew members get caught by running lines, ropes, or cables.

PROPOSED STANDARDS TO PROMOTE SURVIVAL WHILE DIVING AND OTHERWISE FISHING IN WATER

The Working Group should require local authorities to:

Provide emergency recompression chambers where large numbers of fishermen are employed in commercial SCUBA diving; and

Ban SCUBA fishing in deep water if safety oversight is not available.

PROPOSED STANDARDS TO PROMOTE SURVIVAL IN BAD WEATHER

Fishermen should be informed that sudden gales, major storms and heavy fog frequently cause small boat capsizings, grounding, losing way, and collisions, as well as casualties. Successful weathering of a storm requires thorough preparation of the boat in the harbor, or when the weather starts to deteriorate. The Working Group should enact policies that require fishermen to ensure that the deck is tight, all hatches shut and secured, and all weights, containers, and fishing and other equipment safely lashed down. The fishermen should stretch manropes where people must move, e.g., between forecastle, engine hatch, and the wheelhouse.

PROPOSED MODEL STANDARDS USEFUL ESPECIALLY FOR DECKED BOATS IN THE 8-12 M RANGE, ARE LISTED BELOW:

Follow stability rules;

Don't overload the vessel with excessive equipment or catch;

Mind stability when making changes to vessels or equipment;

Make sure all hatches, weather deck and watertight openings are in good condition with gaskets;

Keep bilges free of excess water;

Frequently check all void spaces for water; and

Ensure that the bilge-pumping system is operational.

To maintain boat's bow into the weather, fishermen should be required to keep on board a sea-anchor (that may be replaced by wise use of fishing gear, especially in trawls), and a small gaff sail (trysail) that can be set over the boat's stern.

PROPOSED STANDARDS RELATING TO SEARCH-AND-RESCUE (SAR) SERVICES AND SMALL-SCALE FISHERIES

Wherever necessary, the Working Group would promote strengthening or establishment of SAR services. Most, if not all coastal industrial countries have SAR services. In such countries, small-scale fisheries should reach the level of training and equipment comparable to that practiced in the larger-scale fishing fleets, for example, introduction of real time vessel monitoring system (VMS), automatic emergency and position calls from vessels in danger, and wider use of EPIRBs.

Three basic types of SAR services are relevant to small-scale fisheries: (1) voluntary civilian forces; (2) state-run: naval, air force, coast guard, and police; and (3) community self-help SAR groups. Fishermen in trouble are mostly found and rescued by other fishermen. Therefore, visual or other contact among small fishing boats is important.

Where governments are not effective, the Working Group should identify local, traditional and/or new institutions and leaders, and help them organize their own SAR and related activities. SAR groups may construct and install simple radar reflectors on canoes and sailing rafts, and/or equip them with radar-reflector buoys or beacons marking dangerous reefs and rocks, lights or fires on beaches and at shelter entries to mark night passage of fishing craft through surf or narrow passages, beacons. The Working Group should require the installation and operation of beaching installations, etc. Local groups can also handle simple weather-warning systems, such as using mosques' loud speakers, hoisting warning flags, generating smoke signals, etc., to alert the fishermen working inshore.

ACKNOWLEDGMENTS

Author's thanks are extended to FAO's Fishery Industry Division for sponsoring the preparation and presentation of this paper at the IFISH Conference, and to ILO for sponsoring my working paper "Risk and Dangers in Small-Scale Fisheries – an Overview", wherefrom most of the ideas and suggestions in the present paper have been taken. Special thanks are due to "World Fishing" monthly, "Samudra" quarterly, and the "Fishfolk" internet discussion list for enabling me again and again to plead the cause and voice the plight of small-scale fishing folk.

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Photograph and caption by Earl Dotter

The caption reads; "These lads have joined the silent majority and here lie in peace where no wind can disturb their rest. Charmed by the sea, they fought many a gale with a courage and fortitude typical of Gloucester fishermen." One has only to walk to Gloucester's Beechbrook Cemetary to feel the burden this community has shouldered.

A SNAPSHOT IN TIME OF NORTHEAST FISHSTORY

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Ted has worked for the United States Coast Guard for the past twenty-three years in the Marine Safety Field. He spent ten years in the field inspecting passenger, cargo and other commercial vessels as well as conducting hundreds of marine casualty investigations. For the past ten years Ted has been the First Coast Guard District's Fishing Vessel Safety Coordinator and has provided the F/V Safety training for at sea boarding officers on Coast Guard Cutters and Stations along the coast from the Maine/Canada border to New Jersey.

The focus and intent of this paper is to organize historic casualty information and present it in a form consistent with present day statistics. We researched fishing vessel casualties by extracting contemporaneous reports published in the past 200 years and compared older information with current data used to describe F/V safety trends. We were assisted in this research by the First Coast Guard District, which has maintained a fishing vessel casualty database since the inception of the F/V Safety Regulations.

It's interesting to note that today's fishermen faced the same challenging external factors as their forefathers. Fish population declines, taxation and low prices constantly affected the health of the industry. The fisherman's work has been of interest to writers throughout American history: an article in the New Bedford Mercury in 1833 placed the number of fishermen prior to the American Revolution at 4,000. (The population of the country then was approximately four million people.) In 1848, another article put the number of whaling fishermen in New Bedford/Cape Cod area at 18,000 fishermen based on 25 men per vessel in a fleet of 875 vessels. The Gloucester and northern region's fleet was comprised of smaller schooners with 12 men per vessel. References to Gloucester and surrounding cities placed the number of fishermen at 8,000. With other New England ports, there were an estimated 35,000 fishermen in the area during the mid 1800s. While the number of active fishermen is constantly

changing, the fishing population of today has not changed much proportionately from other periods in history. These estimates allow the possibility of making rudimentary assessments of casualty trends over a longer period of time.

The dominant fisheries in New England in the first half of the 19th century were the whaling industry and a growing groundfish fleet on the Banks. Fish were abundant and could be caught within sight of land. As fishing became very profitable the number of fishermen increased, as did their methods. Soon, cod and whales began to disappear, which required fishermen to venture further from shore. This increased the risk by exposing the crews to more days at sea, more severe weather and in vessels not properly designed or equipped for the area of operation.

There were approximately 700 barks and brigs in the New England whaling industry and approximately 2,000 schooners on the banks by the mid 1800s. Vessel design capability, poor maintenance, lack of survival equipment, no communication and virtually no rescue resources doomed the vast majority of vessels lost at sea.

Whaling barks carried three to five whaleboats that were launched to harpoon whales and return them to the mother vessel. Each boat had a crew of three to five men led by the harpooner. Hundreds of fishermen died when struck or pulled over the side by whales. Many more were lost at sea. With the technological advance of the whale gun in 1847 there was no reason to deploy whaleboats and the death rate decreased accordingly.

What kinds of events led to casualties in the past? Older records tend to list vessel equipment and design as factors leading to injuries and deaths in the New England fishing fleet.

Sailing schooners dotted the coasts of Massachusetts and Maine. These vessels journeyed to the Banks and stayed for weeks and months at a time. However, in winter, the Banks were frequently the scene of treacherous storms. As technological advances were made, the frequency of casualty type that resulted in death underwent major changes. In the 1800s, almost 90% of all deaths were attributed to vessels capsizing or sinking. (In contrast, by the late 1900s, the major type of death in the industry was man overboard.) Fishing was done from dories that were launched over the side from larger vessels. Two to three men would hand-fish for the day, sometimes 10 or more miles from

their vessel. These small dories and whaleboats accounted for the deaths of hundreds of fishermen.

During the first half of the 19th century, sinking and capsizing accounted for 52% of all deaths. Illness resulted in 19% of casualties. This included island fever, scurvy, pneumonia, consumption and various other illnesses. Many whale men contracted malaria while stopping at islands for supplies. 14% died at the hands of natives on uncharted islands or were killed in various ways by whales. The main risk factors during this period were vessel and equipment design, medical deficiencies and lack of geographical knowledge.

In the second half of the 19th century, offshore fisheries were predominate and this was reflected in the casualty statistics. Sinking and capsizing accounted for almost 75% of all casualties. Fishermen plied their trade further from shore and for longer periods creating more risk from weather and ill designed vessels. Medical advances reduced illness-related deaths from 19% to 1%.

During this later period, technology outstripped the need for whale oil. Colonel Edwin Drake developed the first oil drilling well in Pennsylvania in 1859 and soon whaling was an obsolete activity. The rapid demise of the industry resulted in a corresponding drop in fishing-related fatalities: the fatality rate in this later period was reduced from 14% to 1%. Man overboard accounted for 13% of all deaths.

No mention of maritime history in the New England area can be complete without discussing the role that weather has played in this industry. In 1851 alone, over 75 vessels and close to 200 fishermen were lost in one day. The papers of the day advised the fleet "in the future" to carry Admiral Farragut's new marine barometer to help forecast weather. (The National Weather service was formed as a result of these casualties, helping to mitigate the ongoing risk that weather posed to New England fishermen.) Technological advances like the marine barometer were perhaps the biggest contributors to F/V Safety in the 1800s.

As the 20th Century was ushered in, whaling as a major fishery was almost extinct. Rescue services were established and communication technology was rapidly developing. Ship building techniques and new fishing methods were reflected in the design, construction, and operation of modern fishing vessels. Hydraulic power was now used to operate deck gear through remote

workstations. Net drums and hydraulics eliminated the need to launch dories, eliminating a major cause of fishing casualties. Electronic navigation and communications equipment were common on bridges by the 1960s.

As technological advances were made, the frequency of casualty type that resulted in death underwent major changes. In the 1800s, almost 90% of all deaths were attributed to vessels capsizing or sinking. In contrast, by the late 1900s, the major type of death in the industry was man overboard. Human factors comprise the biggest risk factor for the vast majority of recent deaths to fishermen in the New England area.

After the Fishing Vessel Safety Act of 1991 there began a steady decline in number of fatalities in the Northeast. From an average of 46 during the 70s and 80s, deaths were reduced to 20 in 1993, 15 in 94 and 9 in 1995. In the years 1996-1998 there were 10 deaths.

It appears current regulations may be as effective as possible. Technological advances have had a dramatic effect on the casualty rate in the industry. The risk associated with **vessel design and equipment** has been effectively reduced. Advanced communications and weather forecasting have reduced the risk associated with **weather**. That leaves the vessel's **crew** as the biggest risk. Of seven deaths taking place recently in the New England area, human factors were implicated in all these events.

The most effective initiative that can be undertaken to improve safety is to address human factors. Any new regulation must involve professional competency that encompasses fishing, nautical and safety skills. Non-regulatory initiatives should promote safety as a total concept, building awareness of lessons-learned both nationally and internationally. Technology has changed but people have remained basically the same. We must find effective ways to modify the behavior of fishermen that is both practical and realistic.