PROCEEDING OF THE 1ST REGIONAL WORKSHOP ON

SAFETY AT SEA FOR SMALL FISHING BOATS

TRAINING DEPARTMENT, 17-19 DECEMBER 2003

SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER

Proceedings of the 1st Regional Workshop on Safety at Sea for Small Fishing Boats

17-19 December 2003
Thailand

Organized by
Training Department (TD)
Southeast Asian Fisheries Development Center (SEAFDEC)

in Collaboration with
The Government of Japan
(Under the special 5-year Program on Responsible Fishing Technologies and Practices)

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PREFACE

For the Southeast Asian Fisheries Development Center (SEAFDEC), Safety at Sea for Small Fishing Boats is only recently explored area in the wide range of their fisheries activities, however, having developed the Regional Guidelines for Responsible Fisheries, the safety of small boats at sea is a corollary to, and a logical development of responsible fishing practices. Until now no guidelines had been developed and no standards defined for safety equipment that should be carried on board. The following pages and papers reflect the serious consideration that is being given to this subject in the region and the workshop recommendations show a logical sequence of activities that should be implemented to achieve the safety of life at sea for small scale fishers. The development of standards for boat design, loading and equipment to be carried are vital.

SEAFDEC, as an organization, has a mandate to recommend, but no mandate to command, thus the recommendation made by the participants of this workshop are submitted to the regional executive authority that is vested in ASEAN for ratification and for endorsement, this has been done and endorsement secured.

One of the greatest enemies of safety at sea is born out of complacency and the belief among fishers that "it can never happen to me, I am too experienced", therein lies the seeds of disaster. It is a prevalent view among fishermen that it is difficult enough to make a living by fishing without having to spend money on equipment that may never be used, but sooner or later the difficult situation will arise while at sea. However, it is equally useless to have safety equipment on board if there is no marine surveillance service in place to monitor disaster and provide rescue services, but the implementation of such systems is not within the SEAFDEC purview. It is equally vital that human resource development programs be introduced to ensure that the safety systems implemented are understood and familiar to the end users – the fishers together with the implementing authorities and all stakeholders, this workshop maybe the beginning of an expert network on small-boat safety.

The fact of marine and personal disaster is recognized by fishers, but is never admitted except in the fact that many small boats carry either a religious symbol or a good-luck artifact to protect them against danger. However, the efficacy of these, including confidence in the prevalence of mermaids is probably misplaced, thus it is important that weather lore and the use of the weather forecasting services should be employed. The greatest value of good boat design lies not in the boat's everyday use, but in offsetting dangerous conditions, should they occur. At best fishers can only make a poor living and this increases the pressure to fish as much as possible and weighs heavily in the balance of pressure to go out fishing whatever the weather or danger.

In closing these comments I should like to pay tribute to the presenters at this workshop and to commend all who contributed and participated in the discussions and clarifications of the issues. One overriding criteria that is implied, if not stated, in these proceedings is that while lost boats can be replaced, lost lives cannot.

This is the first workshop of this nature organized by SEAFDEC/TD, however, I don't think it will be the last, this will not end our interest in safety at sea because it is our mandate to support the fishers and responsible fishing technologies and practices in the most practical ways possible this workshop is another aspect of that work.

Niwes Ruangpanit
Secretary-General and
Chief of the Training Department
SEAFDEC

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Report of the Workshop

Report of The Regional Workshop on Safety at Sea for Small Fishing Boats

INTRODUCTION

1. The Regional Workshop on Safety at Sea for Small Fishing Boats organized by the Southeast Asian Fisheries Development Center was conducted at the SEAFDEC Training Department in Samut Prakan, Thailand, from 17th-19th December 2003.

2. The Workshop was convened as a part of the SEAFDEC 5-year project on Responsible Fishing Technology and Practices, that has been implemented by the SEAFDEC Training Department.

3. The Workshop Resource Persons were both regional and International coming from SSPA Sweden, The Australian Maritime College, Kagoshima University, University of the Philippines, The Marine Department of Thailand, The SEAFDEC Secretariat and the Training Department. Representatives attending the workshop came from Cambodia, Indonesia, Malaysia, Myanmar, Thailand, and Vietnam. The list of participants appears in Appendix A.

1.1 Opening Ceremony

4. The project manager, Mr. Bundit Chokesanguan, gave a report of the background and purposes of the workshop. He placed emphasis on the importance of the workshop as part of the Regional Guidelines for Responsible Fisheries in Southeast Asia, Volume 1 Responsible Fishing Operations section 8.1.5 quotes that "states should ensure that health and safety standards are adopted for everyone employed in fishing operations. Such standards should be no less than the minimum requirements of relevant international agreements on conditions of work and service." The report concluded by outlining the objectives of the workshop, and invited Mr. Niwes Ruangpanit, the Secretary-General of SEAFDEC to inaugurate the event.

5. The SEAFDEC Secretary–General, Mr. Niwes Ruangpanit welcomed the representatives and resource persons to the workshop stressing the significance of collaboration. He then declared the Workshop open (Appendix C).

1.2 Adoption of the Agenda

6. The agenda of the Workshop was adopted (Appendix B).

REVIEW ON SEAFDEC ACTIVITIES IN RELATION TO SAFETY AT SEA

7. Mr. Bundit Chokesanguan presented a general overview of the SEAFDEC Training Department emphasizing the involvement TD has in regard to safety at sea training in relative to TDs the ship board training courses.

8. He then discussed the fishery statistical bulletin and how it contains data on fishing boats, catch and effort. He concluded by referring to the regional guidelines for responsible fisheries in Southeast Asia with emphasis on the safety at sea section.

9. Dr. Yasuhisa Kato a special advisor for SEAFDEC spoke in relation to the development of the regional guidelines for responsible fisheries in Southeast Asia from the FAOs code of conduct. Discussing the process where ASEAN reviewed the code of conduct taking into account three aspects, these being; socio-economics, the regional fisheries structure and tropical ecosystems. He continued by explaining that ASEAN experts discussed every paragraph with four fundamental points in mind. These points were the applicability of the code to small-scale multi species fisheries, determining whether parts of the code of conduct are unrelated to the region, further clarification through more information for a regional perspective and identifying any missing areas of the code of conduct. Dr. Kato then explained the reasons for regionalizing the code of conduct as it would encourage sustainable fisheries in member countries.

10. Dr. Kato then discussed the seminar on ASAN-Japan cooperation for sustainable fisheries through SEAFDEC, he discussed the adoption of the vision that ASEAN countries place grater focus on small-scale fisheries. He hopes that this workshop will be a successful starting point for this vision.

11. Mr. Aussanee Munprasit the Technical Assistant of the Training Department Chief commented that TD ensures that the vessels are maintained to a high standard and that the greatest care is taken to ensure participant and crew safety.

12. Dr. Yuttana Theparoonrat Adminis trative Division Head of the Training Department then informed the Workshop about the simulator equipment at TD.

13. Mr. Bundit Chokesanguan then discussed the three VCDs produced by TD on Fishing Boats in Southeast Asia and concluded by showing the VCD from the Philippines.

■ REVIEW WORKS ON THE CURRENT SITUATION OF SAFETY AT SEA IN THE SOUTHEAST ASIAN REGION

Review work of Cambodia

14. The representative from Cambodia presented the paper "Safety at Sea for Small Fishing Boats" (see CP 01). He gave an overview on Cambodia's fishing area, catch, and small scale Fishers. He explained the status of marine fishing boats and patrol boats in Kampot Province, Sihahoukville Province, Koh Kong Province, and Kep Municipality.

15. He concluded by stating that "patrol boats in Cambodia are ill-equipped, that there is not a program established to collect accident rates, that fishers are of a low education in regards to safety at sea and that fisheries officers still have a limited knowledge on sea safety."

Review work of Indonesia

16. The representative from Indonesia presented "Current situation on safety at sea for small fishing boats in Indonesia" (see CP 02). In this presentation the presenter discussed of capture fisheries including production, households, Fishers and fishing boats. The presentation continued by focusing on small-scale fishing boat sea worthiness identifying the causes of accidents at sea and the rules and regulations on fishing boats (a national and international perspective). He concluded with an explanation on suitable fishing conditions for small fishing boats.

Review work of Malaysia

17. The representative from Malaysia presented "Safety at sea for Small Fishing Boats: Malaysian Perspective" (see CP 03). The presenter provided an overview of fisheries in Malaysia including fishing area, fish zones, regulation, production, fishing gears, and the number of licensed fishing vessels. The presentation concluded by focusing on safety precautions in Malaysia discussing the rules and regulations, education training programs and safety campaigns that are designed to increase safety at sea standards.

Review work of Myanmar

18. The representative from Myanmar presented "Small-scale Fisheries in Myanmar" (see CP 04). He introduced the presentation with an overview of Myanmar's coastal jurisdiction and environmental conditions, continuing the presentation by discussing the need for regional estimations of marine resources to ensure that over investment is not an issue for the industry.

19. Marine capture fisheries was then discussed in terms of in-shore and off-shore fisheries, focusing on the status of small-scale fisheries, the license system, and closed seasons. The presentation was concluded with an explanation on safety issues for small fishing boats in Myanmar.

Review work of Philippines

20. The resource person from Philippines presented "Fishing Vessel incidents and safety in the Philippines" In this presentation an explanation on the Philippine boats in regard to vessel composition, classification and number was considered. Statistics on the distribution of commercial boats were then referred to together with personal loss, types, causes, and location of incidents.

21. The presentation concluded with five points these being "the majority of incidents in the Philippines involve fishing vessels, Weather plays a significant role in incidents, Capsizing and sinking are the most common. Management of safety needs to be improved and that investigation into the nature of incidents and Characteristics of boats and fishing operations is required."

Review work of Thailand

22. The representative from Thailand presented "Safety at sea for small fishing boats in Thailand" (see CP 05). This presentation commenced with an overview of coastal areas, the climate, and the classification of fishing vessels. The presentation then focused on the communication of fishers as well as the collaboration between the department of fisheries, the Royal Thai Navy, Marine Police and Custom Patrol in regard to the saving of Fisher's lives and the salvage of fishing boats (this viewed through a VDO presentation).

Review work of Vietnam

23. The representative from Vietnam presented "Status of accident of fishing boats in Vietnam" (see CP 06) summarizing the status of fishing boats in Vietnam including the number of fishing boats, percentage of powered boats by size and power, fishing labors and quality of fishing boats, equipment and navigation aids. The focus of the presentation moved to the status and cause of fishing boat accidents and government management in regard to safety at sea. The presentation was concluded with six recommendations that would help improve sea safety for fishers.

■ SAFETY AT SEA IN SMALL-SCALE FISHERIES

Small Fishing Vessel Safety and Sustainable Coastal Development

24. Mr. Jim Sandkvist the resource person from SSPA Sweden presented "Small Fishing Vessel Safety and Sustainable Coastal Development" In his presentation Mr. Jim Sandkvist gave an overview of SSPA, their expertise and current projects. He discussed stability, deign and operation of vessels drawing upon SSPAs experience from a Canadian project. He followed this by an overview of Sida's International Training Programs on Maritime Safety Management/Sustainable Coastal Development emphasizing the importance of educating the trainers as this knowledge will be passed on. Furthermore he emphasized that trainers should represent the community as it gives greater insight into local perspectives. The presentation concluded with current research projects on Small Vessel Safety in Developing countries including the formal safety assessment guidelines.

25. Dr. Kato commented that small-scale fisheries have a tendency to be community based thus both sustainable coastal management and vessel safety could be integrated deriving greater overall benefit.

Current Initiative to Address Small Boat Safety in Australia

26. The resource person from Australian Maritime College, Mr. Ian Miller presented "Current Initiatives to Address Small Boat Safety in Australia"(see EP 01). The topic was introduced with an overview of Australia's Fishing Industry and Australian Fisheries Natural Resources. Followed on by an explanation on Australia's Fishing Incidents including the mechanism and circumstances of fatal incidents and the recurring factors that were involved in these incidents. Mr. Ian Miller then discussed the Australian National Standard for Commercial Vessels (NSCV) providing background information, objectives and approaches including the necessary training. The NSCV was then discussed in regards to implementing these standards.

27. Occupational Health and Safety (OH&S) was discussed in regards to duty of care and the framework to reduce incident, including; OH&S training, Policy and Procedures Manuals & Safety Management System, Implementation of a vessel induction process and safety equipment.

28. Mr. Ian Miller concluded by discussing education initiatives including the Marine Studies Programs in High Schools and the Australian/New Zealand Safe Boating Education Group (ANZSBEG).

Guideline on Future Works of Standard for Small Fishing Boats

29. The resource person from Kagoshima University, Japan, Assoc Prof. Dr.Ritsuo Shigehiro presented "Guideline on Future Works of Small Fishing Boats". Discussing the Cooperation Program between Kagoshima University and University of the Philippines in regard to Fishing Vessels, mentioning that further research will soon be conducted on standards for small fishing boats which include model tests, simulation studies on survival conditions, sea trials and surveys. Furthermore, an explanation on the plan, do, check act cycle was discussed. The presentation was concluded by the following recommendations of improved communication skills between the Government and Fishers, greater support, and improved standards.

An Approach to Standard Development for Fishing Vessel Safety: the Philippine Experience

30. The resource person Dr Glenn D. Aguilar from University of Philippines presented "An Approach to Standard Development for Fishing Vessel Safety: the Philippine experience" (see EP 02 and 03). The presentation commenced with a review of research work conducted on outrigger boats in the Philippines and the construction process of these boats. In the presentation it was mentioned that these boats are made from logs, this has become a problem as it has recently become illegal to log and fishers have been forced to use recycle logs or alternative materials.

31. Experience from research was drawn upon to make a recommended approach to fishing vessel safety development. Fishing Vessel Safety was then discussed using two models, a framework model and a model which represented the diversity of the industry and the different requirements.

32. The presentation concluded by the following points "A comprehensive approach to safety is needed, Development of standards is not that simple, Definition of basic responsibilities is essential."

Thai Safety Regulations for Small Fishing Vessel

33. The resource person from the Marine Department, Thailand, Mr. Narayu Pittaya-preechanon presented "Thai Safety Regulations for Small Fishing Vessels" He presented an overview of the Marine department and its involvement with safety at sea. He then reviewed current regulations and acts and explained the classification for fishing vessels, their navigational equipment, life saving appliance, fire safety equipment and manning. Marine department orders were then discussed concluding with the difficulties of enforcement.

Practical Survival at Sea

34. The resource person from the SEAFDEC Training Department, Mr. Rupert Elstow presented "Practical Survival at Sea" (see EP 04). The resource person opened his presentation by emphasizing the importance of unregulated boats being equipped with appropriate safety gear. This often being a problem as fishers have the "it won't happen to me attitude". He stressed the key to survival is to see and be seen with orange being the most visible color when at sea. It was also emphasized that life lines should be stored on board for all crew members. He then suggested that emergency packs should be stored in all unregulated vessels and that they should contain a torch with charged batteries, a reflector, a whistle, where possible a radio and receiver, fluorescent floating dyestuff, fishing lines, hooks, foil (to act as a lure), clothes to offer protection from the sun, and flares.

35. The presentation was concluded by a recommendation to install smartcards on vessels, as this has the ability to determine if a vessel is having problems providing the exact location of that vessel whilst acting as a compliance measure.

■ RECOMMENDATIONS ON SAFETY AT SEA FOR SMALL FISHING BOATS IN SOUTHEAST ASIA

36. On the occasion of the Regional Workshop on Safety at Sea for Small Fishing Boats at the SEAFDEC Training Department in Samut Prakan, Thailand from17 – 19 December 2003, the participants agreed to the following recommendations as a basis for formulating a comprehensive framework on the program to promote the issue of safety at sea for small fishing boats.

1. Leave the definition of 'small fishing boat' and 'operational range' up to individual countries.

2. Promote the registration of small fishing boats.

3. Promote coordination between concerned authorities on monitoring and control of small fishing boat safety as well as socio-economic considerations.

4. Strengthen local authorities and promote policies of safety at sea within the coastal communities.

5. Promote technical and financial support from authorities, including subsidies, at all levels for issues of safety at sea.

6. Identify and promote basic requirements for safety at sea in the areas of;
   - research on the design and construction of small scale boats including the modification of traditional type boats
   - safety equipment including fire fighting and life-saving appliances
   - regular boat inspection systems.

7. Implement training & education programs for all stakeholders including fishers and boat builders, for the basic requirements of:
   - boat design and construction
   - equipment and its correct use
   - search & rescue
   - occupational health and safety awareness, including the avoidance of dangerous fishing practices
   - awareness of environmental factors.

8. Develop and promote the use of appropriate communication systems for;
   - weather forecasting information
   - search & rescue systems

9. Development of appropriate incident reporting and investigation systems for the purpose of improving safety at sea.

CLOSING OF THE WORKSHOP

37. The Project manager, Mr. Bundit Chokesanguan reported on the positive outcomes of the workshop.

38. The Deputy Secretary-General of SEAFDEC, Mr. Junichiro Okamoto expressed his appreciation for all valuable inputs, which has made the Workshop success. He then gave a closing speech declaring the workshop closed.

List of Participants

RESOURCE PERSONS

Associate Prof. Dr. Glenn D. Aguilar
Institute of Marine Fisheries and Oceanology,
College of Fisheries and Ocean Sciences,
University of the Philippines in the Visayas,
Miagao, Iloilo, Philippines
Tel./Fax. : (63) 33-315-8137
E-mail : gdaguilar@yahoo.com,
gdaguilar@up.edu.ph

Associate Professor Ritsuo Shigehiro
Kagoshima University, Faculty Fisheries,
4-50-20 Shimoarata,
Kagoshima 890-0056, Japan
Tel. : (81) 99-286-4261
Fax. : (81) 99-286-4015
E-mail : shige@fish.kagoshima-u.ac.jp

Mr. Ian Miller
Vessel Operations Manager
Australian Maritime College,
P.O. Box 21, Beaconsfield,
Tasmania, Australia 7270
Tel. : (61) 36-335-4452
Fax. : (61) 36-383-4766
E-mail : I.Miller@fme.amc.edu.au

Mr. Narayu Pittayapreechanon
Ship Survey Division, Marine Department,
1278 Yotha Road, Talard noi,
Samphanthawong, Bangkok 10100, Thailand
Tel. : (66) 2236-6678
Fax. : (66) 2236-6678
E-mail : narayu@yahoo.com

Mr. Jim Sandkvist
Vice President
SSPA Sweden AB Head,
Infrastructure Development,
P.O. Box 24001,
400 22 Goteborg, Sweden
Tel. : (46) 31-772-9000
Fax. : (46) 31-772-9124
E-mail: jim..sandkvist@sspa.se

PARTICIPANTS

Cambodia

Mr. Chhan Sokha
Vice Chief of Exploration Bureau
Department of Fisheries,
#186 Norodom Blvd, P.O. Box 835,
Phnom Penh, Cambodia
Tel. : (855) 2321-0565
Fax. : (855) 2321-0565
E-mail : smallfish@online.com.kh,
maric@online.com.kh

Mr. Kao Monirith
Officer, Marine Fisheries Inspection Unit,
Department of Fisheries,
#186 Norodom Blvd., P.O. Box 835,
Phnom Penh, Cambodia
Tel : (855) 2321-0565
Fax : (855) 23210565
E-mail : maric@online.com.kh

Indonesia

Mr. Widodo Sumiyanto
Ministry of Marine Affairs and Fisheries,
Directorate General of Capture Fisheries,
Jl. Medan Merdeka Timur 16,
12nd Floor, Gambir,
Jakarta, Indonesia
Tel. : (62) 21-351-9131
Fax. : (62) 21-352-1781
E-mail : wsumiyanto@yahoo.com

Mr. Yeppi Sudarja
Ministry of Marine Affairs and Fisheries,
Directorate General of Capture Fisheries,
Jl. Medan Merdeka Timur No. 16, Lt. 12,
Jakarta, Indonesia
Tel : (62) 21-352-0276
Fax : (62) 21-352-0276
E-mail : yeppisudarja@yahoo.com,
yeppisudarja@lycos.com

Malaysia

Mr. Mohd. Sufian Sulaiman
Fisheries Officer
Department of Fishries,
9th Floor, Wisma Tani,
Resource & Management Division,
Jalan Sultan Salahudin, 50628,
Kuala Lumpur, Malaysia
Tel. : (60) 32-698-2920
Fax. : (60) 32-691-0305
E-mail : sufian_3@hotmail.com
sufsul01@dof.moa.my

Mr. Adnan bin Hussain
Fisheries Officer
Department of Fisheries,
Tingkat 8 & 9, Wisma Tani,
Jalan Sultan Salahuddin,
50628 Kuala Lumpur, Malaysia
Tel. : (60) 32-617-5576
Fax. : (60) 32-694-2984
E-mail : adnhus01@dof.moa.my

Myanmar

Mr. Thein Hlaing
Fisheries Officer
Department of Fisheries,
Sinmin Street, Ahlone Township,
Yangon, Myanmar
Tel. : (95)122-0609
E-mail : dof@mptmail.net.mm

Mr. Aung Htay Oo
SEAFDEC Secretariat,
P.O. Box 1046,
Kasetsart Post Office,
Bangkok 10903, Thailand
Tel. : (66) 2955-1602
Fax. : (66) 2940-6336
E-mail : htayoo@seafdec.org

Thailand

Mr. Sakorn Pundisto
Deep Sea Fisheries Technology
and Development Institute
Department of Fisheries,
Kasetsart University, Phaholyothin Road,
Bangkok 10900, Thailand
Tel. : (66) 2940-6130 to 45
Fax. : (66) 2562-0533
E-mail : sakornp@fisheries.go.th

Mr. Prasart Wongthongkum
Fishing Vessel Development Section,
Marine Fisheries Technology Research
and Development Institute,
Department of Fishries,
Kasetsart University, Phaholyothin Road,
Bangkok 10900, Thailand
Tel. : (66) 2940-6130 to 45 Ext. 4605
Fax. : (66) 2562-0543
E-mail : prasartw@fisheries.go.th

Mr. Teerayut Srikum
Eastern Marine Fisheries Research and
Development Center,
Phe, Rayong 21160, Thailand
Tel. : (66) 3865-1764
Fax. : (66) 3865-1763
E-mail : EMDEC2003@yahoo.com

Mr. Gorragot Pareepat
2/6 Moo 1, T. Ratsada, A. Muang,
Phuket Province, Thailand
Tel. :(66) 1936-1746, 7621-1699
Fax. : (66) 7621-1699

Vietnam

Mr. Le Tran Nguyen Hung
Expert in Division of management of
exploitation and fishing port,
National Directorate of Exploitation and
Aquatic Resources Protection,
Ministry of Fisheries,
10 Nguyen Cong Hoan, Ba Dinh,
Hanoi, Vietnam
Tel. : (84) 4771-4238
Fax. : (84) 4835-3363
E-mail : lenguyenhung@mofi.gov.vn
ltnguyenhung@hotmail.com

SEAFDEC/Secretariat

Dr. Yasuhisa Kato
SEAFDEC Secretariat,
P.O. Box 1046,
Kasetsart Post Office,
Bangkok 10903, Thailand
Tel. : (66) 2940-6326
Fax. : (66) 2940-6336
E-mail : kato@seafdec.org

SEAFDEC/TD

Mr. Bundit Chokesanguan
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : bundit@seafdec.org

Dr. Yuttana Theparoonrat
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : yuttana@seafdec.org

Mr. Aussanee Munprasit
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : aussanee@seafdec.org

Mr. Suppachai Ananpongsuk
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : suppachai@seafdec.org

Dr. Somboon Siriraksophon
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : somboon@seafdec.org

Mr. Sonchai Bumrasarinpai
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : sonchai@seafdec.org

SECRETARIAT OF THE MEETING

Mr. Rupert Elstow
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : rupert@seafdec.org

Dr. Theo Ebbers
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : ebbers@seafdec.org

Ms. Panitnard Weerawat
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : panitnard@seafdec.org

Ms. Apiradee Kulthai
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : apiradee@seafdec.org

Ms. Benjapan Kwan-on
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : benjapan@seafdec.org

Ms. Nathacha Sornvaree
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : natcha@seafdec.org

Mr. Udomsak Bhatiyasevi
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : udomsak@seafdec.org

Mr. Pongchaiwat Bamrajarinpai
Training Department,
P.O. Box 97, Phrasamutchedi,
Samut Prakan, 10290, Thailand
Tel : (66) 2425-6100
Fax : (66) 2425-6110 to 1
E-mail : pongchaiwat@seafdec.org

PROVISIONAL AGENDA AND TIMETABLE

Introduction

Fishing at sea is certainly one of the most dangerous occupations in the world. FAO estimates that of the 36 million engaged in fishing and fish-farming, roughly 15 million fishers are employed on decked and undecked fishing vessels operating in marine capture fisheries, of whom more than 90 percent are working on small inshore fishing vessels.

In the Southeast Asian Region, based upon SEAFDEC fisheries statistics of 1997 it is indicated that 96% (or about 804,000) of all the fishing boats that are registered are categorized as small-scale fishing boats both non-powered and powered are of less than 10 tons, (data does not include Myanmar and Vietnam). Every day hundreds of thousands of fishermen embark on fishing trips to earn their livelihood. All face the same chance of being lost. The suffering and uncertainty their families face when they are missing, can well be imagined. Fishermen who die at sea, may leave wives and children almost destitute overnight?

What is behind this human disaster is well known as over-confidence and a poor standard of sea safety in artisanal and small-scale fishing boats. The government, the boat owners, the fishermen, are all to be blamed equally for this state of affairs. Simple safety and communication equipment on board could save many of the lives lost at sea.

Many seas in the region are rough for almost half the year. Much cyclonic activity in the Andaman Sea and fishermen in the South China Sea and western Pacific are subject to typhoons. Monsoon winds increase the dangers of fishing at sea. Artisanal and small-scale fishing boats are ill unequipped to meet these challenges. The small vessels in the region are best suited for fishing in near-shore waters. With resources in coastal waters dwindling, of necessity, fishermen are venturing into deeper waters, but being seaman they are not oblivious to the risk. However, overconfidence leads to disaster, which is the same as many of us driving without seat belts.

A lot of effort and perhaps a long-term program will be needed to make sea safety a habit among fishermen and reduce loss of life and misery.

The Regional Guidelines for Responsible Fisheries in the Southeast Asian Region warns that "States should ensure that health and safety standards are adopted for everyone employed in fishing operations". With this in mind, SEAFDEC as an autonomous intergovernmental body to promote fisheries development in Southeast Asian Countries would support the states to urgently formulate such standards for small fishing boats in the Region. For this reason, SEAFDEC/TD proposes to organize a Regional Workshop on Safety At Sea for Small Fishing Boats. The aim of this workshop is to formulate guidelines/standards for Safety at Sea of small fishing boats in the region and to discuss the minimum requirements in relevant international agreements including IMO & SOLAS, which is only applicable to vessels with lengths greater than 24 m.

Objectives

1. To discuss and formulate such guidelines/standards for safety at sea of small fishing boats in the region,
2. To discuss the minimum requirements for safety at sea of small fishing boats,
3. To discuss/collect the present situation of safety at sea for small fishing boats in the region.

Expect outputs

It is envisaged that the meeting will conclude guidelines/standards for safety at sea of small fishing boats in the Southeast Asian Region. This will help support member countries in the formulation of national standards for small fishing boats.

Workshop Programme

DATE/TIME	PROGRAMME
16 December 2003 (Tuesday)	Arrival of participats and resource persons
17 December 2003 (Wednesday)	
08:30 – 08:45	Registration
08:45 – 09:00	Arrival of guests and participants
09:00 – 09:20	**AGENDA 1** • Opening address by the SG/TDC • Adoption of the Agenda by chairperson
09:20 – 09:45	Introduction of the project proposal by SEAFDEC/TD
09:45 – 10:10	Group Photo Coffee break
10:10 – 10:45	**AGENDA 2** • Review on SEAFDEC activities in relation to safety at sea
11:45 – 12:00	**AGENDA 3** • Reviewed works on the current situation of safety at sea issues in the Southeast Asian Region ❖ Cambodia ❖ Indonesia
12:00 – 13:30	Lunch break
13:30 – 15:10	continued **AGENDA 3** • Reviewed works on the current situation of safety at sea issues in the Southeast Asian Region ❖ Malaysia ❖ Myanmar
15:10 – 15:30	Coffee break
15:30 – 16:45	continued **AGENDA 3** • Reviewed works on the current situation of safety at sea issues in the Southeast Asian Region ❖ Thailand ❖ Vietnam • Discussion and conclusion
18:30 – 20:30	Welcome dinner hosted by SG/TDC

DATE/TIME	PROGRAMME
18 December 2003	**(Thursday)**
09:00-09:30	**AGENDA 4: Safety at sea in small-scale fisheries** Presentation on Maritime Safety Management & Safety at Sea for Small Fishing Vessel (Mr. Jim Sandkvist)
09:30-10:00	Presentation on Current Initiative to Address Small Boat Safety in Australia (Ian Miller)
10:00-10:20	Coffee break
10:20-10:50	Presentation on Guideline on Future Works of Standard for Small Fishing Boats (A.Prof Ritsuo Shigehiro)
10:50-11:20	Presentation on an Approach to Standard Developments for Fishing Vessel Safety: the Philippine experience (A. Prof. Dr. Glenn D. Aguilar)
11:20-11:50	Presentation on Thai Safety Regulation for Small Fishing Vessel (Mr. Narayu Pittayapreechanon)
11:50-12:20	Special Presentation on Practical Survival at Sea (Mr. Rupert Elstow)
12:20-13:30	Lunch break
13:30-15:30	**AGENDA 5: Group Work: Recommendations on Safety at Sea for Small Fishing Boats in Southeast Asia**
15:30-15:50	Coffee break
15:50-16:20	Continued **AGENDA 5 Group work: Recommendations**
19 December 2003 (Friday)	
09:00-10:00	Continued **AGENDA 5 Group work:**
10:00-10:20	Coffee break
10:20-12:00	**AGENDA 6: Group presentation and discussion** • Recommendations on the minimum requirement for safety at sea of small fishing boats
12:00-14:00	Lunch break
14:00-16:00	Continued **AGENDA 6** • Conclusion and adoption of recommendations for safety at sea of small fishing boats
16:00-16:20	**AGENDA 7** • Closing Session by DSG/DTDC
18:30-20:00	• Dinner Party

OPENING ADDRESS

MR. NIWES RUANGPANIT
Secretary-General and
Chief of the Training Department
Southeast Asian Fisheries Development Center (SEAFDEC)

Distinguished guess, participants, observers, ladies and Gentlemen, Good morning to you all.

There are almost one million registered fishing boats plying their trade in this region and that represents a high risk factor as fishing is considered to be a dangerous occupation. Fishermen are through their nature and experience very skillful and accomplished sailors who possess a great amount of weather and sea-going knowledge. Nevertheless, accidents still happen and the cyclone and typhoon conditions that prevail in our seas claim lives each year. As in any profession when experience is gained, so is over-confidence, but accidents can happen anyway through unforeseen circumstances, a drifting log, entanglement of the propeller in lost or abandoned nets or rope, or even through physical injury.

While accidents will still happen, with a little forethought it is possible to limit the damage and reduce the consequences. This does not need to be an expensive exercise and a little forethought can save a lot of grief. The prevention of accidents does not need to be costly, it does however require a little planning and an orderliness of thought.

During this workshop we have an ideal opportunity to share our experiences and we would very much welcome all information on what has been done in other countries in the region. The sharing of ideas is a viable way of advancing the development, not only of our fishing, but also improving the safety of our fishing operations.

This is the first time we have held a workshop of this nature and we are developing means to assist the fishermen in the most practical terms. This will not end our association with safety at sea and our work must continue to support the responsible fishing practices and this is yet another aspect of that work.

There are several good speakers waiting to talk to you and I know that they will pass on their knowledge and experience in this issue.

I take great pleasure in declaring this important workshop open. Although it may not be possible for me to attend the whole of the workshop, I very much look forward to the reports and comments.

CLOSING ADDRESS

MR. JUNICHIRO OKAMOTO
Deputy Secretary-General and
Deputy Chief of the Training Department
Southeast Asian Fisheries Development Center (SEAFDEC)

Distinguished guess, participants, observers, ladies and Gentlemen, Good afternoon to you all.

Over these last two days the SEAFDEC Training Department has broken new ground and we have successfully completed our first workshop on Safety at Sea for Small Fishing Boats. From the number of participants attending this is a subject of some interest.

Throughout history and certainly beyond recorded history men have gone down to the sea in ships and have wrestled with the worst that nature can throw at them. We have learned many tricks to keep our vessels afloat and to win the fish from the sea to feed our nations. It is a dangerous work but it has been shown over the period of this workshop that there are ways to make the work safer and more secure. With close to 1,000,000 fishing boats in the region there will always be a proportion of accident but by thinking ahead and recognizing that however careful we are it can happen to us.

I am most happy to take this opportunity to thank the resource persons who have in many cases come great distances to be with us and to share with us the wisdom in seafaring that comes from other countries. Not all the methods are the same but they are linked together through the central theme of safety at sea. It is in the nature of accidents that damage occurs to boats, but damage can be repaired when life is lost, it is gone forever. So if you have found the content of the discussions fruitful, take the ideas home with you and transfer the knowledge to the people concerned in your own countries.

Talking of home countries, it is time for me to officially close this workshop and wish you all a safe and speedy journey back to your homes and your families. I hope that we shall see you here again and as this activity has taken place at a special time of year then I wish you all a most successful and prosperous New Year from the SEAFDEC Training Department.

LIST OF DOCUMENTS

Country papers

SEAFDEC/SAS-1/CP 01	Safety at Sea for Small Fishing Boats in Cambodia (Chhan Sokha and Koa Monirith)
SEAFDEC/SAS-1/CP 02	Safety at Sea for Small Fishing Boats in Indonesia (Yeppi Sudarja and Widodo Sumiyanto)
SEAFDEC/SAS-1/CP 03	Safety at Sea for Small Fishing Boasts Malaysian Perspective (Mohd. Sufian Sulaiman and Adnan bin Hussain)
SEAFDEC/SAS-1/CP 04	Small Scale Fisheries in Myanmar (Thein Htay and Aung Htay Oo)
SEAFDEC/SAS-1/CP 05	Safety at Sea for Small Fishing Boats in Thailand (Sakorn Pundisto, Prasart W., Teerayut S., and Gorragot P.)
SEAFDEC/SAS-1/CP 06	Status of Safety of Fishing Boats at Sea in Vietnam (Le Tran Nguyen Hung)

Experience Papers

SEAFDEC/SAS-1/EP 01	Current Initiaives to Address Small Fishing Vessel Safety in Australia (Ian Miller)
SEAFDEC/SAS-1/EP 02	Characteristics of Maneuvering Motions of Philippines Outrigger Craft in Wind (Ritsuo S., Glenn D.A., Takako K., and Harald E.K.)
SEAFDEC/SAS-1/EP 03	Characteristics of Seakeeping Performance of Philippines Outrigger Craft (Ritsuo S., Takako K., Glenn D.A. and Toru K.)
SEAFDEC/SAS-1/EP 04	Introduction of Safety at Sea for Small Boats (W.R.B. Elstow)

Country papers

SAFETY AT SEA FOR SMALL FISHING BOATS IN CAMBODIA

Chhan Sokha* and **Koa Monirith****
* Vice Chief of Exploration Bureau, Department of Fisheries, Cambodia
** Officer, Marine fisheries Inspection Unit, Department of Fisheries, Cambodia

INTRODUCTION

Cambodia marine water is small if compared with the fresh water. The coast extends from Thailand border in the north to the Vietnamese border in the south, a distance of 435 kilometers.

The total coastal population is about 1 million, comprising of fulltime fishers 40%, part-time fishers 30%, and Government officers and business people 30%. This represents about 5% of the total population in Cambodia. The coastal area covers two Provinces; Kok Kong and Kampot, and two municipalities; Sihahoukville and Kep.

The marine capture fisheries in Cambodia are small compared to the capture of aquatic species in freshwater areas. The total quantity of fish taken in the coastal capture fisheries was 45,850 tons in 2002. The levels of capture have steadily increased over the past few years, largely due to the shift in fishing effort from small family vessels to investment in large motorized vessels with the capacities of catch more fish, better gear technology and more participants. The marine sector represents about 30% of the total fish capture in Cambodia.

The marine capture fisheries activities mainly are small scale fishing gears, traditional and include purse seine, drag net, gillnet, longline and trap. Small-scale fishers generally work in inshore areas that are less than 20 meters in depth. They use fishing boats that are either not powered, or have engines with capacity less than 50HP.

The safeties during fishing operation in generally still use habituate for weather and sometime get the information from radio or news from the neighbor countries.

Lack of adequate law enforcement

The Department of Fisheries is unable to effectively enforce fishing laws. The Department of Fisheries has very few resources for patrols and very little capacity to patrol offshore. The size and quality of the Government vessels is inadequate. The new fisheries law have been drafted and submitted for the official uses.

Safety and Patrol Boats

Remarkable, the marine fishery of Cambodia is generally inshore, since most of the fishing vessels are small. All small fishing boats lack safety equipment such as radar, echo sounders, geographies position system (GPS), and long distance radio communication. However, many powerful and well-equipped fishing and transport vessels are found in the open water of Cambodia's territorial sea, but these are owned by Thai nationals' licenses as Cambodian vessels. For their safety when they have the incident in the sea the only one thing that the fishers use is radio communication to contact other fishermen for rescues or to save their life. On the other hand they can be save by Navy, Police, Military police and fishery inspection unit.

The numbers of patrol boats in Cambodia's water are very few and unequipped vessel, no standard and use for specifically to control all the illegal fishing activities in the coastal and marine fisheries resources.

The traditional and habituate are still use for their safety in the fishing operation on the sea, for example forecast before they leave fleet to the sea. The radio or other information about the weather has been use from the neighbor countries. The safety of small fishing boats are very difficult to control many local fishers were compelled to give up their vocation or change to near-shore fishing operation for security reason.

Activities have done

The departments of fisheries have done the following activities:

- Reviewed and drafted the fisheries law
- Trained the coastal and marine fisheries staffs on safety in fishing boats

■ CONCLUSION

- Patrol boats unequipped no international standard
- No accident rate and data have been recorded
- Fishermen are low education about sea safety
- Fisheries officer still limited knowledge on sea safety

Table 1. Number of marine fishing boats in Kampot Province

Year	Boats without engines & < 5T		Boats with engines							
			<10 HP		10-30 HP		30-50 HP		> 50 HP	
	Number	Stock	Unit	HP	Unit	HP	Unit	HP	Unit	HP
1992	200	-	-	-	227	-	-	-	-	-
1993	100	0.2-0.5	64	227	35	560	-	-	2	460
1994	110	-	60	-	23	-	-	-	-	-
1995	-	-			-	-	-	-	-	-
1996	100	-	50	-	30	-	25	-	-	-
1997	110		50	-	30	-	25	-	-	-
1998	110	110	119	810	102	1,408			-	
1999	120		67	392	111	1,471				
2000	136		67	392	111	1,471				
2001	133	66	151	852	252	3,379	1	40	12	1.154

(Source: DOF, 2002)

Table 2. Number of marine fishing boats in Sihahoukville

Year	Boats without engines & < 5T		Boats with engines							
			<10 HP		10-30 HP		30-50 HP		> 50 HP	
	Number	Stock	Unit	HP	Unit	HP	Unit	HP	Unit	HP
1992	432	-	-	-	720	-	187	-	-	-
1993	452	0.2-0.5			552	52,274	163	25,273	-	-
1994	391	-			656		177		-	-
1995	423	-	-	-	646	5,900	174	27,580	-	-
1996	180	-	-	-	692	6,720	167	26,211	-	-
1997	310		-	-	654	7,265	150	24,249	-	-
1998	237	47	198	1,208	467	6,043	23	875	162	26,630
1999					855	10,736	245	34,928		
2000			144	894	727	10,111	33	1,223	266	37,417
2001	286	57	167	1,054	809	11,503	33	1,223	269	37,415

(Source: DOF, 2002)

Table 3. Number of marine fishing boats in Koh Kong province

Year	Boats without engines & < 5T		Boats with engines							
			<10 HP		10-30 HP		30-50 HP		> 50 HP	
	Number	Stock	Unit	HP	Unit	HP	Unit	HP	Unit	HP
1992	-	-	-	-	215	1076	-	-	178	27-765
1993	330	0.2-0.5	1018	4120	14	348	87	6142	111	24551
1994	245	-	1207		26		96		182	60-200
1995	-	-	260	1820	12	237	71	5567	138	29752
1996	2932	-	282	2138	132	3460	8	356	156	26158
1997	71	-	2110	22495	311	6097	31	1275	140	18855
1998	71	-	2110	-	311	-	31	-	140	-
1999	-	-	1622	9759	562	9721	34	1240	225	35972
2000	19	-	2787	17902	406	5658	32	1410	271	31390
2001	71	-	2518	14723	597	8446	93	2920	217	25861

(Source: DOF, 2002)

Table 4. Number of marine fishing boats in Kep municipality

Year	Boats without engines & < 5T		Boats with engines							
			<10 HP		10-30 HP		30-50 HP		> 50 HP	
	Number	Stock	Unit	HP	Unit	HP	Unit	HP	Unit	HP
1996	100	-	60	320	-	--	-	-	-	
1997	110		60	-	-	--	-	-	-	
1998	110	110	61	305	8	116				
1999	120		60	300	4	60				
2000	136		135	675	58	870				
2001	133	66	140	700	52	780				

(Source: DOF, 2002)

SAFETY AT SEA FOR SMALL FISHING BOATS IN INDONESIA

Yeppi Sudarja and **Widodo Sumiyanto**
Ministry of Marine Affaire and Fisheries, Indonesia

■ CONDITION OF CAPTURE FISHERIES IN 2001

Production

Production of capture fisheries in 2001 is recorded 4,276,720 MT. This production is bigger 3.65% than production in 2000. Increasing of marine fisheries production is caused rising of fisheries production.

In 2001, the marine fisheries production was landed 7.22% in coastal of West Sumatera, 2.94% in coastal of South Java, 15.10% in coastal of Mallaca Strait, 9.01% in coastal of East Sumatera, 20.48% in coastal of North Java, 5.79% in coastal of Bali-Nusa Tenggara, 3.04 % in coastal of South-West Kalimantan, 4.59% in coastal of East Kalimantan, 11.75 in coastal of South Sulawesi, 7.21% in coastal of North Sulawesi and 12.87% in coastal of Maluku-Papua.

Capture Fisheries Household

The numbers of capture fisheries household increased from the number of household in 2001. The increasing of these households' numbers was 9.98%, i.e. from 781,965 units in 2001 to 860,044 units in 2001.

The numbers of marine capture fisheries households during 2000-2001 increased to 8.18% than the amount in the year before, i.e. from 475,392 units to 514,291 units. The majority marine capture fisheries household without boat were found in North Sulawesi area, majority marine capture fisheries household non-powered boat were found in Maluku – Papua area, majority marine capture fisheries households with outboard motor were found in Bali – Nusa Tenggara Sulawesi area, and majority marine capture fisheries households inboard motor were found in Mallaca Strait area.

Fisherman

Compare with data on 2000, the number of fishermen in 2001 increased 5.85%. In the same year, the number of marine fishermen is a full-time fisherman that is 1,250,200 persons or 48.7 % of total marine fishermen. There is a 37.23% or 954,081 person were major part-time fishermen and 13.99% or 358.664 person were minor part-time fishermen. The number of marine fishermen in North Java area recorded mostly, that is 26.72% of total number of the fishermen. The most of full-time fishermen were found in North Java, Mallaca Strait and North Sulawesi. The major part-time fishermen ere found in North Java, South Sulawesi and North Sulawesi area. While the most of minor part-time fishermen were found in North Java, Maluku – Papua and North Sulawesi area. There are 37.23% of marine fishermen are major part-time fishermen, 47.78% are full-time fishermen and 13.99% minor are part-timer fishermen.

Fishing Boats

The number of fishing boats in 2001 is 611,884 that are increase 5.59% than in 2000. In 2001, the number of marine fishing boats was 468,521 units.

The most of marine fishing boats are non-powered boat that is 51.59%. The number of non-powered boat in 2001 was 241,714 units. From that number, 41.60% boats were dug out boat, 26.93% were small plank built boat, 26.63% were medium plank built boat, and 4.84% were large plank built boat. While outboard motor and inboard motor were 25.62% and 22.79% from total numbers of marine fishing boats.

■ SMALL SCALE FISHING BOAT WORTHINESS

Small scale fishing boats with Gross tonnage 5 GT ~ 30 GT, is very low attention toward about operational safety at sea. These problems are making realize and need supporting to us for find the alternative solution. At the present, degree of fishermen death is very high, there are 584 fishing boat have accident with 1,678 fishermen; which 1,608 people still a live, and 75 people died.

Fishing activities are an effort activity, which have high dangerous risk, it could be accident caused by:

a. Mistake in design construction of fishing boat, because the boat built without not good planning and not good design construction.

b. The boats built by traditional made with design and construction boat not standard request of fishing boat worthiness.

c. Not completed by communication and navigation equipments, and equipment for operational safety on board.

d. The alertness from stakeholders and fishermen.

e. Not enough communication and information to fishermen about sea weather condition.In principles, the fishing boats have different function than others kinds boats. The main function of fishing boats as facility or carrying boat facility of yield production from fishing ground to landing port. Based on the function of fishing boats, therefore, each fishing boats, which built, have to comply of request of standard certainty of fishing boats worthiness.

In the future, the building of fishing boats, the aspect of operational safety boat have expected step by step and than it can comply of request of conditional. The conditional likes: materials, constructions, building, machinery and electricity, stability, code of conduct, and completely of safety and communication equipments. The certification of seaman skill must be appropriate with the regulation and certainly validity at fishing boats. For that, it needed to proof with certificate which base on from testing and inspection result.

The fishing boats declared with certificate of fishing vessels and worthiness if has been fulfilled of boat safety, preventing of sea pollution, meaning, maintenance, healthy and prosperity of crews member and availability of fishing gear and auxiliary fishing gears.

Conditional and rules of fishing boats reference to:

a. National legislation and regulations

- The Act of The Law of Trade
- The act No. 21, 1992 about Sailing
- Government Regulation No. 7, 2000 about Seamanship
- Government Regulation No. 51, 2002 about Shipping Matters
- Declare of Ministry of Communication No. KM. 41, 1990 about Indonesia Vessels measurement.
- Declare of Director General of Sea Communication No. PY.61/I/13-90 about Guidelines of KM. No. 41, 1990.

b. International Regulation

- United Nation Convention of The Law of the sea (UNCLOS) 1982
- Safety of Life At Sea Conventions (SOLAS) 1974/1978
- Marine Pollution Conventions (MARPOL) 1974/1978
- Collision Regulation Convention (COLREG) 1972
- Toremolinos Convention
- Standard Training Certification and Watch keeping for Seafarer's (SCTW) 1978/1995
- Tones Measurement Ship Conventions (TMS) 1969.

Fishing Suitable Condition of Fishing Boats

- Put to test and measurable based on recommendation of authority institution.
- Have a good lay out and not crowd for fishing operation (i.e. fish hold, ice, water, auxiliary fishing gears).
- Have a good drainage and sanitation facilities.
- Have stability, good for remove, and it can arrange to others places.
- Have a main engine, auxiliary engine and auxiliary fishing gears appropriate.
- Only used for fishing facility.
- The crew of fishing boats has to seamanship certificate that's appropriate with certainty from authority institution.

For requiring of monitoring and trial toward of fishing boats worthiness, Directorate General of Capture Fisheries, Ministry of Marine Affairs and Fisheries must be arrange and determine about particular regulation which include certainty and conditional about fishing boats worthiness (small scale).

SAFETY AT SEA FOR SMALL FISHING BOATS MALAYSIAN PERSPECTIVE

Mohd. Sufian Sulaiman and **Adnan bin Hussain**
Fisheries Officers, Department of Fisheries, Malaysia

INTRODUCTION

Malaysia is a coastal nation and has 13 state. Each of the states in Malaysia – Kedah, Perlis, Penang, Perak, Selangor, Malacca, Negeri Sembilan, Johore, Kelantan, Terengganu, Pahang, Sabah and Sarawak – has a significant number of fishermen in its population. With the declaration of the Exclusive Economic Zone (EEZ), Malaysia's maritime area has quadrupled to 160,000 km?. The country's population of 23 million (year 2002) and workforce of 8.2 million includes some 84,496 fishermen operating more than 31,780 boats. Most of the fishermen are traditional and operate traditional gear.

Fishing activities are governed by the Fisheries Act of 1985 which stipulates the management of fisheries (both capture fisheries and aquaculture). The fisheries sector in Malaysia plays an important role in providing fish as a source of food and protein. In 2001, it contributed about 1.54% to the national Gross Domestic Product (GDP)* and provided direct employment to 84,496 fishermen and 22,108 fish culturist. Over the years, the industry has succeeded in achieving a steady production from its marine inshore fisheries amounting to an average of 1.1 million tons annually. The Department of Fisheries Malaysia has successfully sustained this production level through continuous efforts in the management of the resources.

In 2001, the total production for the fisheries sector amounted to 1,408,308 tons valued at RM5.37 billion (approximately US$1.41 billion). By sector, production from marine capture fisheries contributed 1,231,289 tons or 87.4% of the nation's fish production fisheries remained the major contribution with a production of 1,063,363 tones valued at RM3.66 billion (approximately US$ 0.96 billion). A total of 31,787 fishing vessels were licensed in 2001 with the majority operating traditional gear (78.3%), such as drift net and trap.

The number of licensed fishing vessels in Malaysia stood at 31,787 units in 2001 as compared he 31,531 units in 2000, increasing by only 0.79%. Nevertheless, some of 80% of the registered fishing vessels operate traditional gear including gill nets, drift nets, hook and line, push nets and traps. The current fishing boat structure of licensed vessels in Malaysia can be separate as below:-

Fishing Vessel Type	Number of Vessel
Non Powered Vessels	2,693
Outboard powered Vessels	12,286
Inboard Powered vessels < 10 GRT	8,146
Inboard Powered vessels 10 – 69.9 GRT	8,058
Inboard powered vessels > 70 GRT	604
Total Vessels	**31,787**

Remark :*GRT = Length Of the vessel X Breadth of the vessel X Depth of the vessel X 0.283*

The majority of the fishing vessels operate in the coastal areas, which have been exploited at an optimum level. In line with the management policy, new licenses for fishing vessels are only issued for the deep-sea fishing sector, where the potential is more focused in East Malaysia.

SAFETY PRECAUTIONS

The sea along the Straits of Malacca in the west coast of Peninsular Malaysia is relatively calm. This is because it is protected from the rough weather of the Indian Ocean by the Indonesian island of Sumatra. The Straits of Malacca is also a busy shipping lane. It is estimated that more than 32,000 ships ply the route every year. This number is expected to be increased in the future. Despite this, fishing activities in both the Malaysian and Indonesian sides of the straits is carried out throughout the year. In contrast, the east coast Peninsular Malaysia (involving the states of Kelantan, Terengganu, Pahang, Eastern Johore, the coasts of Sarawak and Sabah) is exposed to the winds of the South China Sea.

The fishing season in these areas is restricted due to the weather. During the North East Monsoon Season, which begins in September and ends in March, the weather is rough and unpredictable. The winds may reach a speed of 80km/hour and the waves may rise up to 5 meters. These conditions are especially dangerous for small-scale fishermen.

Small-scale fishermen are in a predicament. They go out to the sea for their livelihood, so life must go on regardless of the season or weather conditions. In the year 2000, eight fishermen fell into the sea in the state of Terengganu when the boat capsized in bad weather. The lucky fishermen were rescued, while other fishermen lost their lives. In the year 2000, there were 11 accidents where some fisherman lost their lives or had gone missing, while 58 fishermen were rescued. Some of these accidents could have been prevented if proper safety precautions had been taken.

In Malaysia, the Maritime Rescue and Coordinating Centers (MRCC) under the Marine Department, Ministry of Transport, coordinates search and rescue (SAR) operations for disasters at sea. The MRCC are located in Port Klang, Peninsular Malaysia and Labuan in East Malaysia.

At present, there are five sub centers established in Penang, Johore, Terengganu, Kuching (Sarawak) and Sandakan (Sabah). The Maritime SAR provisions are provided for in the Merchant Shipping Ordinances of 1952 and 1960. Under these ordinances, the saving of lives, property and environment is a legal obligation within the Malaysian Maritime SAR regime.

The Safety of Life at Sea Convention (SOLAS) was ratified by Malaysia in 1983. It obligates Malaysia to provide maritime SAR facilities. The MRCC also co-operates with the other ASEAN counterpart, especially those of Singapore and Indonesia. Besides this agency, the Maritime Enforcement and Coordinating Center (MECC) under the Prime Minister's Department in Lumut Perak, monitors safety at sea. The MECC complements the work of MRCC in search and rescue and enforcement missions.

In the event of any accidents at sea, the fishermen, their associates or families may contact either MRCC, Department of Fisheries (DOF) or MECC which operates 24 hours a day. MRCC will react immediately by taking appropriate action. The MRCC is expected to deploy available facilities to aid person in distress at sea. Vessels and aircraft from government agencies may be deployed in maritime SAR operations. Some of the agencies involved are the Royal Malaysian Navy, the Police, DOF, the Department of Civil Aviation, Merchant ships and fishing vessels within the vicinity of the incident may also be deployed.

In terms of safety measures, the fisheries regulation under the Fisheries Act 1985 states that every fishing vessel should show proof that it has adequate safety equipment such as life jackets before a license is renewed. This requirement is stated under the Merchant Shipping Ordinance 1952. Besides that the owner of a licensed fishing vessel shall immediately report to the fisheries Officer at the nearest police Station any death or accident caused by his vessel of a member of the crew in his vessel.

In Malaysia, fishing vessels are also not allowed to carry passengers or cargo. This is in line with the Fisheries (Maritime) (Licensing of Local Fishing Vessels), Regulation 1985. An individual fisherman is also required to take personal accident insurance. However, vessel insurance is not compulsory for the purpose of annual license renewal. As a result most fishermen do not insure their vessels.

Manning Regulations are currently at the planning stage to facilitate licensing and certification of operator. The Department of Fisheries aims to have all fishermen certified in accordance with the STCW – F by year 2010.

Fisheries education and training is provided at the university level and also through the Malaysian Fisheries Training Institute run by the Extension and Training Division of the Department of Fisheries. Training is carried out by Extension Officers that comprises a well-development network through which to design and deliver sea safety related training.

The Department of Fisheries in Malaysia regularly carries out safety campaigns. Posters and pamphlets are distributed to inform fishermen about safety at sea. Every year the DOF and MECC organize dialogues between fishermen and officers of maritime enforcement agencies. During these dialogues, briefings related to safety at sea are also held by the agencies. The Marine Department gives talks on safety precautions and SAR procedures. The Air Wing of the Police gives demonstrations on how fishermen and Air Surveillance Aircraft should communicate with each other at sea in case of any accident at sea.

Fishermen in Malaysia are advised to take the following precautions during the monsoon:

- They are advised to listen to radio/ TV weather reports or get the latest weather reports from DOF. Forecast are prepared twice daily, providing wind speed and direction as well as projected wave height. Forecast are sent by fax to regional offices of Fisheries Development Authority as well as being broadcast by radio and television. It wasreported that all small-scale fishermen have access to weather forecasts and few weather related fatalities accur.
- Fishermen should ensure that boats are in good conditions before going out to sea.
- They should ensure that safety and communication equipment are in good operating condition. Prior to registration and renewal of licenses , an inspection team is established comprising representatives from Resource Management and Protection Branch and Engineering and Logistics Branch to address the safety of vessel, equipment and crew.
- They should ensure that their personal accident insurance are valid.
- They should inform their families and associates about their fishing program. An important contributor to coastal resource utilization and management has been the work of the Malaysia Fisheries development Authority which was established in 1971 with the mandate to develop the capacity of coastal communities in an intergrated manner.
- They are advised to go in a group when fishing.
- They should move to safe or protected areas such as island when the weather starts to go bad.

As a general rule, fishermen are advised to be extra-cautious whenever at sea, because accidents can occur without warning. The families of fishermen should keep important telephone number handy with them, in the event of any accident. These number should include the MRCC, the Department of Fisheries Operation Room (PUKAOP), the Fisheries District Office and the nearest police station. Finally, as a word of caution. "Prevention is better than cure".

as well as projected wave height. Forecasts are sent by fax to regional offices of Fisheries Development Authority as well as being broadcast by radio and television. In [illegible]

[illegible]

In Malaysia, fishing vessels are also [illegible]

[illegible]

SMALL-SCALE FISHERIES IN MYANMAR

THEIN HTAY* AND **AUNG HTAY OO****
*FISHERIES OFFICER, DEPARTMENT OF FISHERIES, MYANMAR
** SEAFDEC SECRETARIAT, THAILAND

INTRODUCTION

The Union of Myanmar has a long coastline of 2832 kilometers on the India Ocean, and shares common maritime boundaries with Bangladesh and India in the Bay of Bengal and with India and Thailand in the Andaman Sea. The continental shelf covers an area of230, 000 square kilometers with a relatively wider portion in the central and southern parts. Myanmar marine fisheries waters include territorial sea, and exclusive economic zone (EEZ). The territorial sea of Myanmar extends 12 nautical miles from the baseline towards the sea and Exclusive Economic Zone (EEZ) is the area, which covers all areas of the territorial sea and extends 200 nautical miles from the baselines. The total areas of Myanmar fisheries waters, including exclusive economic zone is 486,000 square kilometers.

Myanmar's coastline can be divided into three coastal regions: they are the Rakhine coastal region, the Ayeyarwady or Gulf of Mottama region (the Delta zone) and the Taninthayi coastal region.

The Rakhine coastal region stretches 740 km from the Naaf river to Mawdin point and covers an areas of 367 780 sq km. Bordering the bay of Bengal with a narrow shelf and few islands. The upper part of the coastline is shallow and deltaic. The southern part is more or less rocky.

The Ayeyarwady delta zone lies between Mawdin point and the Gulf of Mottama. Ayeyarwady River enters the Andaman Sea by nine principal mouths together with Sittaung and Thanlwin rivers. The delta zone situates at the center of the coastal zone with an area of 35,138 sq km. The Delta region is a flat alluvial plain with a network of tributaries of the Ayeyarwady River.

The Tanintharyi coastal zone covers an area south of Mottama up to the mouth of Pakchan River and includes Myeik Archipelago and the Andaman Sea. The length of the mainland coast is about 1,200 km, and the total land area is about 43,344 sq.km, with the narrow coastal plain. Myeik Archipelago extends from Mali Island to Simila Islands and contains about 800 islands covering an area of about 34,340 sq.km.

The total area of swamp along the coastal is about (0.5) millions hectare that perform the function as spawning, nursery and feeding grounds for aquatic organism of near shore and brackish water fauna.

Marine living organism depends entirely on the sustainability of the coastal mangrove and other forest resources. These resources serve as breeding ground, nursery ground, shelter and also a source of detritus for living organism. In the whole coastal region of Myanmar, extent of mangrove forest is about 382,032 hectares, out of which 274,795 ha can be found in the Ayeyarwady delta, 140024 ha in the Taninthayi, and 64752 ha in the Rakhine.

Coral reef is abundantly found in the islands of Myeik Archipelago, and also in Rakhine coast.

Marine Fisheries resources.

Since the total investment in the marine fisheries sector were considered, it was felt that at least the first rough estimate of marine fisheries resources should be obtained, so that the risk of over investment and consequent financial failure could avoided.

With a view to identification of new fishing grounds, stock and efficient means of the exploitation "Marine Fisheries Resources Survey and Exploratory Fishing Project" was carried out with the assistance of FAO during 1979-83 Project activities consisted of acoustic experimental fishing surveys with R. V. Dr. Fridtjof Nansan and trawl survey with M. F. V 525 and others vessels from Myanmar contribution.

According to surveys undertaken in marine fisheries, it was noted that about 1.0 million metric ton of pelagic fish and 0.8 million metric tons of demersal fish are exists as biomass in Myanmar marine fishery waters. Out of the total biomass, 0.5 million metric tons of pelagic fish and 0.55 million metric tons of demersal fish, totaling 1.05 million metric ton of marine fish is marked as maximum sustainable yield (MSY).

It is to be mentioned that the survey was conducted only within 200-meter depth and more survey are needed to cover the whole area within the E.E.Z.

Marine Capture Fisheries

Myanmar's marine capture fisheries can be classified as in-shore fishery and off-shore fisher.

(a) In-shore fishery - In-shore fishery means fishery carried out in the area five nautical miles away from shore in Rakhine ten nautical miles in Ayeyarwady and Tanintharyi coast respectively. The fishing is done by passive fishing gears (e.g. gill nets, drift nets, long line, trap) without boat or non-mechanized boat. If the boats are mechanized to assist moving fishing gears the engine should not be more than 12 horse power and the over all length of the boats should not be more than 30 feet. State and Division-wise of Department of Fisheries permitted 12,043-12846 mechanized boats and 11,191-13253 non-mechanized in the year 1999-2000 and 2000-2001 fiscal years for this fishing activities

(b) Off-shore fishery - Off-shore fishery means the capture fishery being operated active fishing gears (e.g. trawl nets, purse seine nets, etc,) with fishing vessels more than thirty feet in over all length and engine power more than 12 H.P. The off-shore fishery fishing ground are from outer area of demarcated in-shore fishery areas to end of EEZ. The main fishing gears, used for this fishery are bottom trawl, purse seine, surrounding net, drift net, long line. Department of Fisheries permitted 2032 vessels (national) which included 899 (Trawl), 83 (Purse seine), 990 (Drift net), 25 (Long line) respectively and 639 vessels (foreign) in 1999-2000. In 2000-2001 (967 Trawl), (77 Purse seine), (778 Drift net) and (114 Longline) all are national fishing vessels, the numbers of foreign fishing vessels permitted by DOF were 32.

Status of Small-scale fisheries

As Myanmar has already categorized as two, one is Coastal fisheries (Small-scale fisheries) and Industrial Fisheries as (Large-scale Fisheries) in Regional guideline for responsible fisheries in Southeast Asia, Responsible fishing Operation.

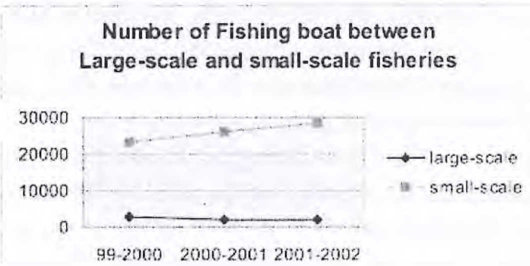
The fishers using boats of less than 30 feet or using less than 12 HP engine operating in Zone 1 is categorized as Small-scale fisheries.

The production comparison between large scale and small scale fisheries, the production of the large-scale fisheries is decreasing after 1999-2000, at the same time the production of the small fisheries is gradually increasing, And also from 1999-2000 to 2001-2002, in three fiscal years, the number of fishing boats are increasing. Because some of the large-scale fishers are try to involve the small-scale fisheries.

Marine Catches **(in Metric Ton)**

	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001
Small-scale fisheries	113,923	170,541	190,758	212,843	251,198	279,220
Large-scal fisheries	341,767	461,093	490,520	547,312	645,936	475,430
Total	455,690	631,634	681,278	760,155	897,134	754,650

And also we can compare the number of non-power boats and powered boats, which are operating in small-scale fisheries



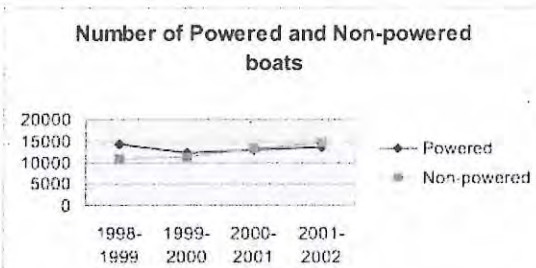
Small-scale fishing boats in States and Divisions

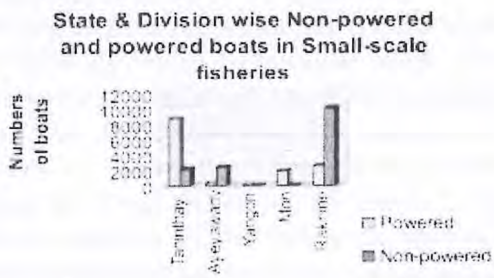
years	Small fishing boats	
	Powered	Non-powered
1998-1999	14245	10720
1999-2000	12043	11191
2000-2001	12846	13253
2001-2002	13591	14649

Small-scale fishing boats in States and Divisions wise (2001-2002)

States and Divisions	Small fishing boats	
	Powered	**Non-powered**
Taninthayi Division	8731	2102
Ayeyawady Division	350	2414
Yangon Division	70	0
Mon State	1847	19
Rakhine State	2593	10114
Total	**13591**	**14649**

It can be easily seen the large number of powered fishing boats (64.24%) are operating in Taninthayi Division (the lower coastal region) and also the large number of non-powered fishing boats (69.04%) are operating in Rakhine Region (the upper coastal region).





The numbers of powered boats in coastal water are decreasing year by year because of highest operating costs, fuel, ice, foods and so on, but non-powered fishing boats are increasing to engage the coastal small-scale fisheries under supervision of respective States and Divisions, Districts, and Township level fisheries officers through licensing, the improvement of the vessel registration systems.

License System

As the major portion of marine product came from artisinal fishermen, it is important to fulfil needs of small scale and indigenous fishermen by increasing the income, improving their lives and those of their families, as well as their environment. Accordingly, this zoning of fishing is entirely based on policy of protecting our local fisheries. Under these circumstances the Department of Fisheries gives first priority to local fishermen by permitting them to operate in all zones. In addition to this and as declared in the Territorial Sea and Maritime Zone Law the waters between the baseline and the coast are reserved entirely for local fishermen.

The rapid increases in demand for quality marine products significantly accelerated momentum on shrimp and other demersal resources exploitation, resulting in resource use conflict and violence between trawlers and small-scale fishermen. To ensure a more equitable exploitation and distribution of resources and to support the sustainability of small scale artisanal fisheries, efforts have been made by DOF by limiting the size and engine power of fishing boats in inshore areas. For effective management and control the DOF also determines the type of fishery, volume of business method of fishing, species of fish permitted to exploit, size of fish, fishing implement and fishing ground and these condition are attached to all fishing licenses.

Minimum mesh size and minimum catch able size for main economic fish species have been established based on Rule of expansion and protection of fishery resources. For instance, the mesh size on fish trawl cod ends is not allowed smaller than 2.5 inches and 2 inches for the shrimp trawl cod ends. The large mesh drift net, the minimum mesh size shall be 8 inches and for small mesh drift net are 3.5 inches mesh size.

For management there are three fishing zones. They cover the Rakhine Fishing Grounds, Ayeyarwady Fishing Grounds and the Thanintharyi Fishing Grounds in the extreme south of the country. These areas are further divided into 140 statistical areas for licensing and monitoring of catches. A five nautical mile coastal area further divides the overall fishing zone for artisanal fishers in the northern areas and a 10 nautical mile coastal area in the south. These latter divisions roughly correspond to the 20m-depth line inside which trawlers are prohibited.

Closed Season

June, July and August, the three months are closed season. That season most of the juveniles come back to the mangrove area (feeding ground). The fishing boats must stoop fishing operation

Safety for small fishing boat

To ensure Sea Safety System in Myanmar, fishing boat registration system at the specific checkpoints has already implemented for checking fishing boat lost or damage in the sea. Broadcasting of weather report are also undertaking by government radio station. Instead of using life jacket, life raft and modernized equipment, most of the artisinal fishermen from the coastal areas are still using home made life raft, such as plastic container, drums, etc due to lack of awareness and financial problem. For their healthiness, they are more preferred to use traditional medicines then western medicines, which are more expensive. To install modernized radio telecommunication system on the boat is also very costly and it is impossible for the poor fishermen. In this connection, we should say that the radio telecommunication system in the small-scale fishing boat is also very limited and weak in our country. For this reason, Myanmar navy is one of the most responsible arm forces to safeguard our fishermen from bad weather and illegal fishing boats.

Nearly all fishing boats and fishermen exist in the remote areas and the level of knowledge and awareness on safety at sea are very low. It is urgently needed to give appropriate training on how to make precautionary approach to minimize the accident at the sea. To up grade the knowledge of fishing technology for the small-scale fishermen are also necessary to ensure their livelihood. Coordination and cooperation of the international and regional organizations are needed to solve the existing problems and issues.

SAFETY AT SEA FOR SMALL FISHING BOATS IN THAILAND

Sakorn Pundisto*, Prasart Wongthongkum*, Teerayut Srikum* and Gorragot Pareepat**
* Department of Fisheries, Thailand
**Fishing Market Organization, Thailand

INTRODUCTION

Thailand is situated between 5° - 21° N, 95° - 106° E in the Southeast Asian Peninsula. It covers a terrestrial area of 513,115 km^2, bordering Myanmar to the West and Northwest, Laos to the North and Northeast, Cambodia to the East, and Malaysia to the South. The country has an extensive inland water surface area of 5,300 km^2 and a shoreline of 2,614 km, 1,874 km of which borders the northern and western reaches of the Gulf of Thailand, whereas 740 km face the Andaman Sea making 420,280 km^2 of coastal areas.

The Gulf of Thailand can be classified as a shallow semi-enclosed sea with limited, wind-driven water circulation and a low rate of exchange with the adjacent South China Sea. Its average depth is 45 m with a maximum depth of 85 m located in a central basin. The fishing area is about 252,000 km^2. The Andaman Sea is located on western coast of Southern Thailand. It is an open area adjacent to deep oceanic waters of the Indian Ocean. The Andaman Sea of Thailand provides about 126,000 km^2 fishing area for Thai fishermen.

Thailand comprises four regions, 76 provinces and 787 districts for administrative division. The total area of brackish waters in Thailand is approximately 259 km^2 of mangrove swamps, tidal land and lagoon, most of them are suitable for brackish water fish culture. There are 24 coastal provinces that can be divided into 5 fishing zones. The Eastern Gulf covers 3 provinces (Area I), the Inner Gulf covers 7 provinces located around Bangkok (Area II), the Central Gulf covers 3 provinces (Area III), the Southern Gulf covers 5 provinces (Area IV), and the 6 provinces facing the Andaman Sea Coast (Area V).

The climate of Thailand is influenced by tropical monsoons that are clearly defined the wet and dry seasons. During May to September, the Southwest Monsoon brings heavy rainfalls to the country. Typhoons and depressions sometimes occur during this period. The Northeast Monsoon starts in November and lasts until February bringing low moisture, cooler winds over the country, featuring the cool season.

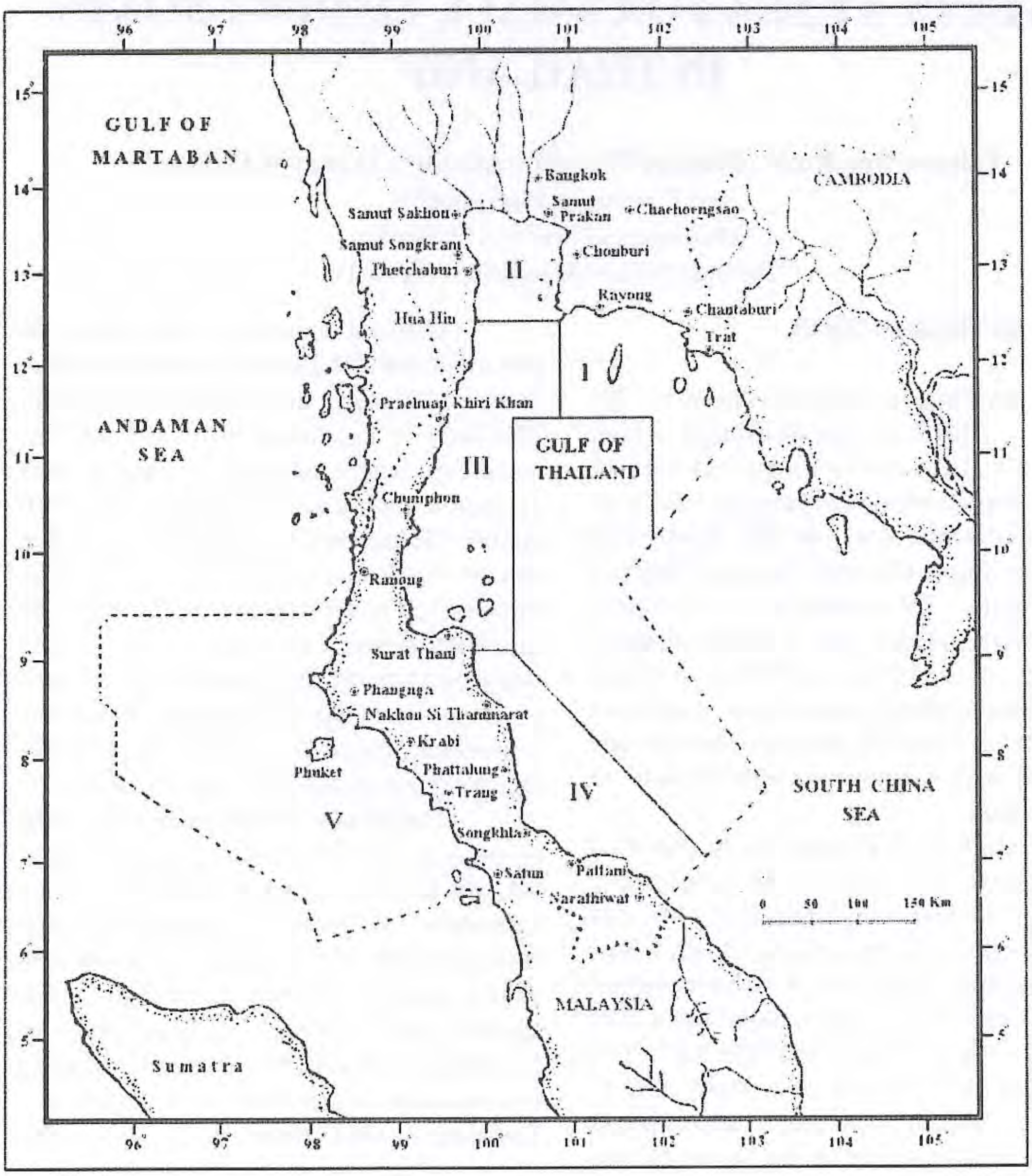


Fig. 1 Coastal areas of Thailand and limits of fishing areas (—) and the Thai EEZ (Economical Exclusive Zone) (-----)

Area I Eastern Gulf:	Trat, Chantaburi, Rayong
Area II Inner Gulf:	Chonburi, Chachoengsao, Samut Prakan, Bangkok, Samut Songkram, Samut Sakhon, Phetchaburi
Area III Central Gulf:	Prachaup Khiri Khan, Chumphon, Surat Thani
Area IV Southern Gulf:	Nakhon Si Thammarat, Phattalung, Songkhla, Phattani, Narathiwat
Area V Andaman Sea:	Ranong, Phangnga, Phuket, Krabi, Trang, Satun

FISHING BOATS AND ENGINES

Fishing boats in Thailand can be classified into 3 types, as follow:

1. Boats without engines
2. Boats with external engines (longtails)
3. Boats with internal engines

According to the Thai Fishing Vessels Statistics registered in 2001, issued by the Fishery Statistics Analysis and Research Group, Fishery Information Technology Center, Department of Fisheries, Ministry of Agriculture and Cooperatives, there were 15,945 fishing vessels, which were classified by fishing gears as follow:

Table 1. Number of fishing vessels classified by fishing gears:

Fishing gears	No. of Vessels	%
Trawl nets	6,689	41.9
Gillnets and Entangling Nets	3,924	24.6
Falling Nets	2,788	17.5
Surrounding Nets	1,449	9.1
Push Nets	651	4.1
Lift Nets	369	2.3
Longline	58	0.4
Others	17	0.1
Total	15,945	100.0

Fishing vessels classified by size

1. **Small-sized fishing vessels:** Fishing vessels with a total length less than 14 meters are considered small-sized. Most of them are used for squid falling-nets (19.7 %), then otter-board trawls (19.0 %) and crab gillnets (17.0 %), respectively.

2. **Medium-sized fishing vessels:** Fishing vessels with a total length between 14-18 meters are considered medium-sized. Most of them are used for otter-board trawls (44.6 %), then squid falling-nets (11.1 %) and paired-trawls (11.0 %), respectively.

3. **Large-sized fishing vessels:** Fishing vessels with a total length more than 19 meters are considered large-sized. Most of them are used for otter-board trawls (40.9 %),

Engines for Fishing Vessels

Engines implemented to fishing vessels are separated into 2 types; they are the benzene and the diesel. The benzene engines are used with small vessels whose power not more than 15 hp. The diesel engines are much more popular that they can be used from 3-hp to 1,700-hp vessels. The diesel engines are separated into 2 types, the marine and truck engines. The former design is directly used with boats, but the latter is modified from used truck engines, that are less expensive but more popular among the local fishermen. Common marine engine makes are the Caterpillar, Yanmar, Diya, Cummin, Volvo-penta and Gartner, and common truck engines are Nisson and Hino.

CURRENT SECURITY AT SEA FOR SMALL FISHING VESSELS

Fishing operations in Thailand could be categorized by size of gears and vessels, they are:

1. **Commercial Fishing Gears** (>14 m. fishing vessels)

The commercial fisheries are conducted with large fishing gears and large fishing vessels that need a lot of manpower to accomplish their operations. Such gears are including the purse seines, the pair-trawls and the otter-board trawls.

2. **Small-scale Fishing Gears** (< 7 m. fishing vessels)

The small-scale fisheries are conducted with small fishing gears and small fishing vessels or the longtails that need only family manpower to accomplish the work. Such gears are including gillnets or entangled nets, traps, hooks.

Nowadays, only medium, small and local fishing vessels are present in Thai waters. Yet there are neither laws nor regulations for security or safety of life and property during working in the sea. Implementation of such facilities is needed and should be practiced in nearest future.

Table 2. Number of fishing vessels classified by ton gross:

Province	Total		<10 ton gross		10-49 ton gross		> 50 ton gross	
	No.	%	No.	%	No.	%	No.	%
Total	15,945	100	5,938	37.2	6,858	43.0	3,149	19.8
Chonburi	1,396	100	875	62.7	436	31.2	85	6.1
Songkhla	1,290	100	530	41.1	652	50.5	108	8.4
Samut Prakarn	1,199	100	239	19.9	426	35.5	534	44.6
Other provinces	12,060	100	4,294	35.6	5,344	44.3	2,422	20.1

Consider the numbers of vessels in each province, most fishing vessels are registered in Chonburi Province (8.8 %), then Songkhla (8.1 %), and Samut Prakarn (7.5 %), respectively. Most of fishing vessels in Chonburi are considerably small (62.7%). Most of medium-sized fishing vessels are found in Songkhla (50.5%). Large fishing vessels are found in Samut Prakarn (44.6%).

STATUS OF SAFETY OF FISHING BOATS AT SEA IN VIETNAM

LE TRAN NGUYEN HUNG
Expert in fishing management,
National Directorate of Exploitation and Aquatic Resources Protection, Vietnam

■ FISHING BOATS

Number of fishing boats

The 2002 Marine Fishery statistic result revealed that the total number of fishing boat in Vietnam is made up of an estimated 126,000 fishing boats as follows: (i) artisanal fishing crafts, not powered, 44,800 units; (ii) motorized local vessels, 81,800 units, powered by a total of 4,000,000 hp (horse power:hp); (iii) deep sea fishing vessels: about 6000 units.

As shown in figure 3, the second largest group was powered boats accounting for 65%, non-powered fishing boats was the very big group in the country with 35%.

Figure 1: Total of number fishing boats

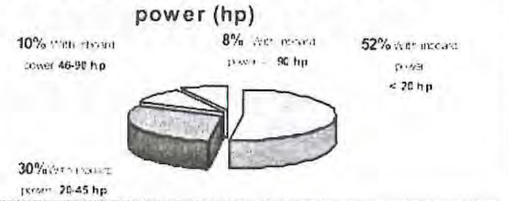
The artisan fishing fleet only exploit ate in coastal areas, near-shore resources that are within easy reach of small vessels. Passive fishing gears, net, lines, traps and hooks are used. The productivity of these vessels and the income of fishermen working on these vessels are low.

The government encourages fisheries to invest larger boats capable of operating offshore, while some provinces do not permit construction of boats with engines of less than 33 hp.

Number of powered boats by size of boat

The 81,800 powered boats of the country (28 coastal provinces) in Figure 2 indicate that the total number of small size of powered with less than 20 hp was the largest group accounted for 52%. This was flowered by the larger size of fishing boats with 20-45 hp, (30%). The medium size of fishing boats with 45-90 hp accounted for 10% and the largest size fishing boats with over 90 hp was 6000 units, 8%.

Figure 2: Percentage of powered boats establishment by size of horse power (hp)



The mechanized off-shore fishing fleets have developed to take advantage of more modern fishing gears, trawling, gillnetting, and longing. These vessels are made of wood and from 20 to 40 HP inboard engines generally between 10 and 20 meters in length, power them. The mechanized vessels exploit in-shore of fishing grounds of Vietnam.

Fishing labors

The total of labors in fisheries is 3.5 million people, of which, the number of fishermen is about 500,000. Most of them are low - educated and fishermen and captains of fishing boats are insufficiency of knowledge on navigation safety.

Quality of fishing boats and equipments and navigation aids on fishing boat

1. Quality of fishing boats: All most of fishing boats are made of wood and there are some of them that are made of steel.

2. Equipments and navigation aids on fishing boats:

Equipments and navigation aids of fishing boats are still simple and backward, and almost fishing devices were manually operated by. The fishing boats with over 45 hp are equipped navigation aids following: GPS: 33, 2%, Fish finder: 21.1%, communication devices: 62.9%, compasses: 100 % respectively compare with of number of fishing boats. The fishing boats in large have life buoy and almost of the other are insufficiency life buoy, navigation safety devices.

STATUS OF SAFETY OF FISHING BOATS AT SEA

Accident of fishing boats in Vietnam from 1980 – 1989

The captain and fishermen didn't obeyed rules on equipping of safety navigation devices on sea. The weather conditions always happen in season typhoons and the captains of fishing boats are not trained knowledge of navigation safety. Therefore, accidents of fishing boats always come to coastal areas, especially, fishing boats in small scale.

The result of an investigation the status of accident of fishing boats in Vietnam from 1980 - 1989 will show in Table 1

Status of accident of fishing boats at sea from 1996 – 2002 (the major due to weather)

In near years, there are approximately 1000 accidents which nearly make the death of 700 fishermen caused loss hundred billions Vietnam dong per year. The main reason of these accidents is because typhoons, cyclonic, flood. It affected livelihood of many fishermen and inhabitants in coastal areas. The summary

MANAGEMENT GOVERNMENT ON STATUS OF SAFETY OF FISHING BOATS ON SEA

In the last years, Ministry of fisheries have issued many law documents, standards for , checking, registering, rules of requirement for equipment of fishing boats aimed guarantee safety for fishermen and fishing boats exploit on sea. There are following:

1. Decree of Government for safety guarantee for fishermen and fishing boats operating on sea such as: Conditions for fishermen, fishing boats and responsibility of them.

2. Decision of issuing standards for requirement for safety equipment towards fishing boats in small scale from 8 – 20 meter in length.

3. Decision of issuing rules for checking safety technique to fishing boats in small scale.

4. Decision of Ministry of fisheries for issuing regulations of registering fishing boat and fishermen.

However, there annually is 70% of registered fishing boats, the rest of them are not register. This affected management of fishing boat. There yearly are approximately 1000 accidents which make loss damage to live hood, social economy of inhabitant in coastal areas.

CONCLUSION

Accidents of fishing boat increase year after year.

1. To need review, supplement all law-documents, standards, rules to guarantee for fishing boats safety at sea, especially small fishing boats.

2. To need disseminate law-documents, enhance awareness of knowledge of marine safety for fishermen. Simultaneously, we have to standardize all captains of fishing boats.

3. Improve training captain, chief of machine, training course of navigation safety.

4. To research, modernize designing, construction fishing boat.

5. To modernize search and rescue systems from center to local. We make system of statistical accident fishing boat, simultaneously, to analyze all the cause of accident aim management, designing and construction fishing boats to be better.

6. Control licensing of personal.

Table 1 The result of an investigation the status of accident of fishing boats in Vietnam from 1980 - 1989

Year	Type of accident							Total
	Crashing	Becaught in a shal	Sink	Accident of weather	Damaged machine	During fishing	Burn explode	
1980	110	36	8	34	24	3	3	218
1981	104	37	13	23	15	11		203
1982	91	34	17	18	17	16		193
1983	95	36	14	541	24	4		714
1984	125	52	22	23	25	20		267
1985	123	39	18	719	28	23	2	952
1986	152	40	24	34	28	12		290
1987	167	60	51	130	37	32	2	479
1988	243	63	53	362	104	37		862
1989	275	88	56	1058	149	44	2	1672
Total	**1485**	**485**	**276**	**2942**	**451**	**202**	**9**	**5850**
%	**25.38%**	**8.3%**	**4.7%**	**50.3%**	**7.7%**	**3.5%**	**0.15%**	**100%**

Remarks

1. The type of accident was happened by weather with probabilities appear is biggest which estimated 50.3% of total of accidents from 1980 - 1989. The major of accident due to typhoon in 1985 and 1989.
2. The type of accident was happened by crash with 25.38% of the sum of the accidents. However, it is very popular and happens during the years.

The main reason of this accidents is, almost captains of fishing boats haven't been trained sufficient knowledge of marine.

Table 2 The table of summary damage

	1996	1997	1998	1999	2000	2001	2002	Total
Number of death	250	3070	78	54	17	32	46	3547
Number of Fishing boat	100	3733	451	1501	107	760	126	6778

Remarks

The causes head accidents due to:

1. Captains and fishermen on boats are not in responsibility, insufficient professional experience and knowledge of marine safety.
2. Equipments and fishing boats are not guarantee safety on technique follow rules, regulation, especially fishing boats in small scale.
3. The changing in weather such as: typhoon, whirlwind, flood.
4. The management of government: The system of search and rescue accidents have established from centre to local. However, it is weak such as equipments, marine law, disseminating information, statistics, research.....

Experience papers

CURRENT INITIATIVES TO ADDRESS SMALL FISHING VESSEL SAFETY IN AUSTRALIA

Ian Miller

Vessel Operations Manager, Australia Maritime College, Austraria

AUSTRALIAN FISHING INDUSTRY

The fishing industry includes any industry or activity conducted in or from Australia concerned with taking, culturing, processing, preserving, storing, transporting, marketing or selling fish or fish products. There are three principal industry sectors:

The **commercial sector** comprises enterprises and individuals associated with wild-catch or aquaculture resources and the various transformations of those resources into products for sale. It is also referred to as the "seafood industry", although non-food items such as pearls are included among its products.

The **recreational sector** comprises enterprises and individuals associated for the purpose of recreation, sport or sustenance with fisheries resources from which products are derived that are not for sale.

The **traditional sector** comprises enterprises and individuals associated with fisheries resources from which Aboriginal and Torres Strait Islander people derive products in accordance with their traditions.

Australian Fisheries Natural Resources

Australia's exclusive economic zone, which extends 200 nautical miles from the baseline of our continent and our island territories, is the third-largest in the world, covering about 11 million square kilometres: one-and-a-half times the area of Australia's land mass.

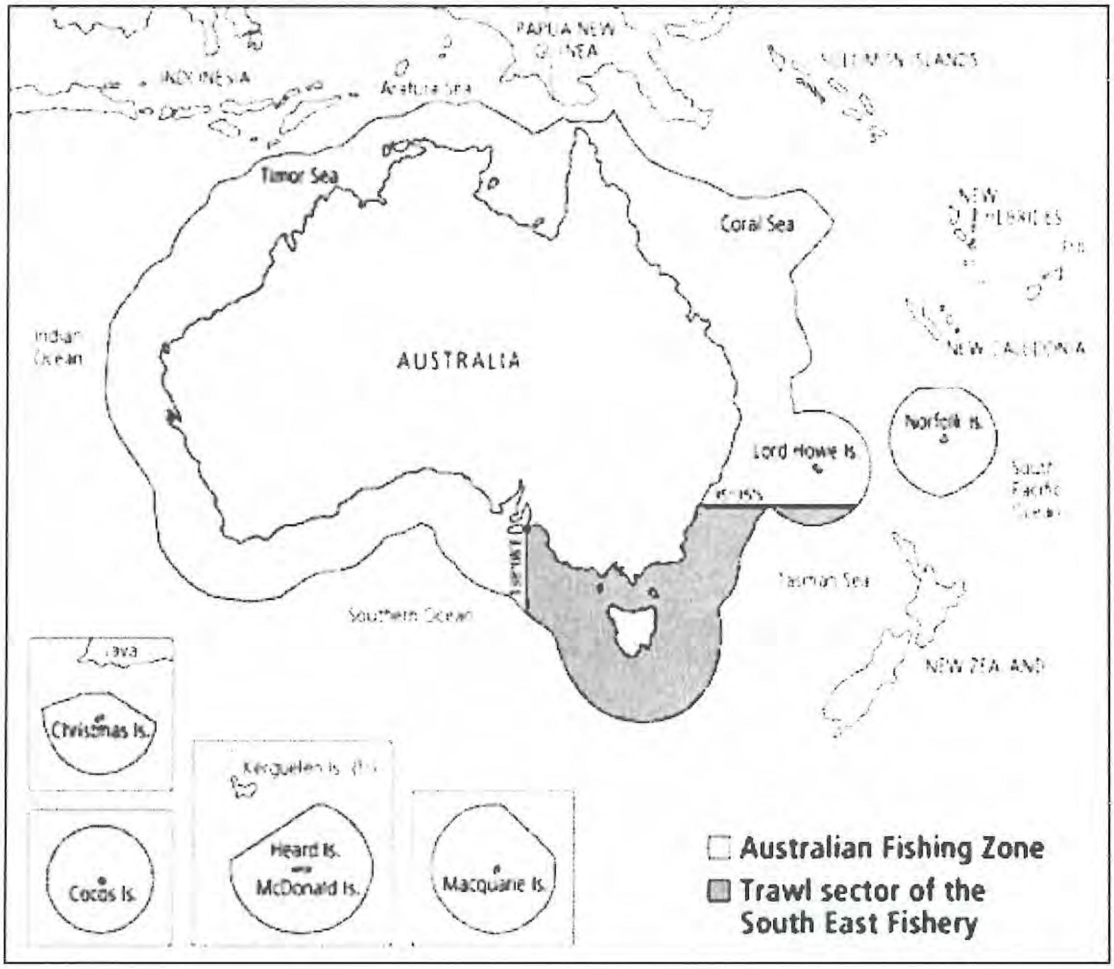
It contains a diverse range of aquatic species — about 4500 known species of finfish (in addition to perhaps tens of thousands of invertebrate species) — most of which occur in relatively small volumes. About 600 marine and freshwater seafood species are caught and sold in Australia (under about 300 marketing names) for local and overseas consumption. Most known species are at or near full exploitation; several have been over-exploited.

Although Australian waters are particularly rich in invertebrate species, including Crustacea, the nutrients and plankton produced in Australian ocean waters do not support high-tonnage finfish catches. Consequently, Australia's commercial catch ranks 52nd in the world, representing only 0.2 per cent of world tonnage.

One fishery — the South East Fishery — consistently has relatively high tonnages. However, it is very small by world standards. In 1998–99, it produced about 29 000 tonnes, including 5000 tonnes from blue grenadier. By contrast, the New Zealand catch of the same species (called hoki) was 245 000 tonnes.

The low production capabilities of Australia's wild fisheries give little opportunity to increase tonnages, yet local and international demand for seafood is set to grow substantially — particularly as larger overseas fisheries are over-exploited and supply is reduced. This situation underlies the strategic directions for Australia's fishing industry, and the commercial sector in particular.

Figure 1 Australian Fishing Zone



Commercial Sector

The commercial sector of the fishing industry comprises wild-catch, aquaculture, processing, storing, transporting, marketing and selling activities.

The sector is a very large business that supports many people's livelihoods and lifestyles. Australian seafood is an integral component of our international image as a clean and environmentally responsible country with an enjoyable climate, innovative cuisine and cosmopolitan culture. Many rural and regional communities depend partly, substantially or even wholly for their economic viability on prosperous commercial fishing enterprises.

The commercial sector of the fishing industry is Australia's fourth most valuable food-based primary industry - after beef, wheat and milk. In 1998–99 it produced about 228 000 tonnes of produce, worth nearly $2.04 billion ("landed value" — that is, before value-adding) or about 6 per cent of the gross value of all farm and fisheries production.

Commercial wild-catch fishing

Commercial wild-catch fishing activities take many forms, as reflected in **table 1**, and in many places. In rural and coastal communities they are a major source of employment and often provide robustness to communities whose economic prosperity would otherwise be in question. The landed value of the commercial wild catch increased from $1.1 billion in 1989–1990 to nearly $2.4 billion in 1999–2000.

Table 1: The main Australian commercial wild-catch fishery types

Fishery type (major method)	Target species
Finfish trawling / Danish seining	Multi-species
Prawn / scallop trawling	Single species and/or groups of species
Scallop dredging	Single species
Purse seining	Single species and/or groups of species
Net hauling	Multi-species or single species
Meshing	Multi-species
Line fishing	Single species or multi-species
Trapping	Multi-species
Potting	Largely single species (e.g. lobsters, crabs)
Hand gathering	Usually single species (e.g. abalone)
Mixed (no single clear method)	Multi-species
Developmental	Single or multi-species

Source: Australia-New Zealand Standing Committee on Fisheries and Aquaculture, March 2000

Although the tonnage of fish produced by the Australian commercial sector is small by international standards, the sector produces a wide range of high-quality products.

FISHING INCIDENTS

Fifty-five people employed in the fishing industry died in work-related incidents between 1989 and 1992 in Australia.

This means there were 89 deaths per 100,000 workers per year in the fishing industry. This figure is 16 times higher than the all industry rate of 5.5 deaths per 100,000 workers per year.

Mechanism and circumstances of the fatal incidents

The vast majority of workers drowned (82%). The other fatal incidents occurred when workers:

- had contact with carbon monoxide whilst diving 6%
- were hit by falling objects (in both cases the lid of a brine tank) 4%
- were hit and cut by a stingray barb 2%
- were dragged into the cradle of a winch drum when clothing was caught in incoming nets 2%
- were hit by a tow rope that snapped 2%
- were burnt in a fire 2%

Occupation

Occupations of workers receiving fatal injuries included:

- deckhands 36%
- fisherpersons 29%
- master fisherpersons 18%

Location

Common locations of the fatal incident included vessels which were:

- traveling in open water 55%
- anchored in sheltered water 15%
- anchored in open water 11%
- docked 9%

Recurring factors

Examples where similar combinations of factors led to work-related deaths in the fishing industry included:

- vessels capsizing in rough weather and heavy seas (14 incidents, resulting in 23 deaths)
- a crew member, or a lone fishermen (often in rough weather and heavy seas) falling overboard and drowning. The workers were usually not wearing a life jacket (13 deaths)
- crew members swimming during a work break and getting into difficulties and drowning (4 deaths)

- crew members becoming entangled in fishing nets, or cray pot ropes, and being dragged overboard (3 deaths) and
- the air intake hose of a diver being situated too close to the exhaust of an air compressor and carbon monoxide fumes entering the diver's air hose (3 deaths).

Traditional Sector

Aboriginal and Torres Strait Islander people have developed a close, interdependent relationship with the land, water and living resources of Australia through traditional fishing practices over tens of thousands of years. That relationship includes customary rights and responsibilities of particular indigenous groups to particular areas of land, water and resources. Some of these customary rights and responsibilities are now recognised in Australian common law and through native title legislation.

Commercialisation of fisheries and expansion of recreational fishing have affected some traditional fishing. For example, commercialisation of intertidal molluscs in the 1970s, on top of their heavy harvesting by recreational gatherers in some areas, led to restrictions being imposed on what had been an Aboriginal subsistence fishery for thousands of years. Expensive commercial licences and strict recreational bag limits have made it difficult for some Aboriginal fishers to continue their traditional fishing.

Social factors relating to the traditional sector

Many Aboriginal and Torres Strait Islander people share traditional marine and freshwater foods among extended families. This practice helps to continue the customary relationship between indigenous people and their environments, and to strengthen their ties of kinship.

Traditional fishing is increasingly being addressed in fisheries management plans. Fisheries legislation provides varying recognition of native title fishing rights, in many cases without specifying what those rights may be.

In some Australian jurisdictions, Aboriginal and Torres Strait Islander fishers are exempt from fisheries regulations when they fish according to customary laws and traditions. These exemptions typically apply only to subsistence fishing.

Since the 1992 decision by the High Court of Australia in the Mabo Case, which recognised the existence of native title in Australia, there has been increasing impetus for implementation of indigenous access to fisheries. The *Native Title Act 1993* provides for the possibility of native title in the sea, while confirming government ownership of water and minerals and restricting native title rights to non-commercial, subsistence use of living resources. The courts have decided that non-exclusive right can be claimed over parts of the sea and that this right includes hunting living marine resources according to local customary laws and traditions.

Further, a 1999 High Court decision (the Yanner Decision) confirmed that Aboriginal and Torres Strait Islander people may claim a right under native title to hunt living resources according to local customary law. This decision has implications for recognition of indigenous people's rights and interests in fisheries management.

Australian Transport Council
National Standard for Commercial Vessels (NSCV)

The National Standard for Commercial Vessels has been developed following a review of the Uniform Shipping Laws Code (USL Code). The National Standard for Commercial Vessels (NSCV) replaces the USL Code as the current standard for commercial vessels. It provides a common national standard for the design, construction, crewing and operation of vessels.

BACKGROUND

The Australian Transport Council (ATC) established the National Marine Safety Committee (NMSC) in 1997 under an Intergovernmental Agreement to promote a uniform national approach to marine safety in Australia through the implementation of the ATC's draft National Marine Safety Strategy.

The Strategy, as published in 1998, identified a number of strategic actions necessary to achieve and sustain a uniform national approach to marine safety, including the following:

a) Develop and promulgate standards based on recognised and approved national and international standards for the design and construction of vessels.

b) Encourage the development of professional competence in vessel design, construction and survey.

c) Introduce and support performance -based standards as an alternative to prescriptive standards.

d) Establish practices for assessing new technologies or operations in a timely manner and facilitate rapid transfer into standards.

e) Incorporate occupational health and safety (OH&S) principles into design and construction standards.

f) Establish standards for crew levels and qualifications.

g) Encourage the incorporation of OH&S concepts and practices in marine training programs and in determining crew levels of fishing vessels.

h) Encourage vessel operators to recognise their duty of care to employees and passengers.

These strategic actions shaped the review of the USL Code and are reflected in the content and format of the NSCV.

OBJECTIVES

The objectives of the NSCV are to

a) protect the health and safety of persons from hazards arising from the operation of commercial vessels;

b) protect the environment from hazards arising from the operation of commercial vessels in the marine environment; and

c) facilitate the transfer of vessels and the recognition of crew qualifications between Australian States and Territories.

APPROACH

The NSCV promotes a uniform national approach to the safety of commercial vessels and the protection of the environment by

a) providing information on the safety obligations and responsibilities of people who design, build, operate and otherwise exercise control over the safety of commercial vessels;

b) specifying nationally agreed standards for vessel design, construction and equipment for the issue of Certificates of Survey;

Vessel Construction

All commercial vessels must undergo survey

- Fire-fighting appliances
- Lifesaving appliances
- Rigging equipment
- Periodic survey for remainder of vessels operational life

} Annually

---

c) specifying nationally agreed standards for the issue of Certificates of Competency; and

d) specifying nationally agreed standards for the operation and crewing of vessels.

Training

Masters (all commercial vessels)

- Compulsory training & Assessment for Certificate of Competency

  - navigation/nautical knowledge/ marine radio/OH&S

- Validated sea-time to ensure practical experience in nautical knowledge and watch-keeping duties

- Health & eyesight standards

- Revalidation of Certificate every 5 years

Deckhands

Training not compulsory, but OH&S Act places a duty of care on owners/skippers to be specifically responsible for;

- providing a safe workplace
- providing training and supervision for employees

HOW THE STANDARD IS IMPLEMENTED

The NSCV has been written to allow flexibility in application while maintaining consistency. It does this by specifying performance in the form of required outcomes. While the required outcomes are mandatory, the means of satisfying those required outcomes are not fixed. Solutions may be either deemed-to-satisfy prescriptive solutions that are specified within the NSCV, or equivalent performance-based solutions that are proposed by the applicant.

Figure 2 illustrates the approach and the options available to users of the NSCV.

Deemed-to-satisfy solutions

Compliance with these prescriptive solutions is deemed-to satisfy the required outcomes.The benefit of adopting a deemed-to-satisfy solution is that there is no onus on the applicant to prove compliance with the corresponding performance standard. The convenience of this option comes at a cost in that flexibility in the solution is limited

Equivalent solutions

Equivalent solutions are solutions that achieve the required outcomes by means other than that which is deemed-to-satisfy. An equivalent solution must be "proven to satisfy" the required outcomes, either directly or by showing its performance is at least equivalent to that of the deemed-to satisfy solution.

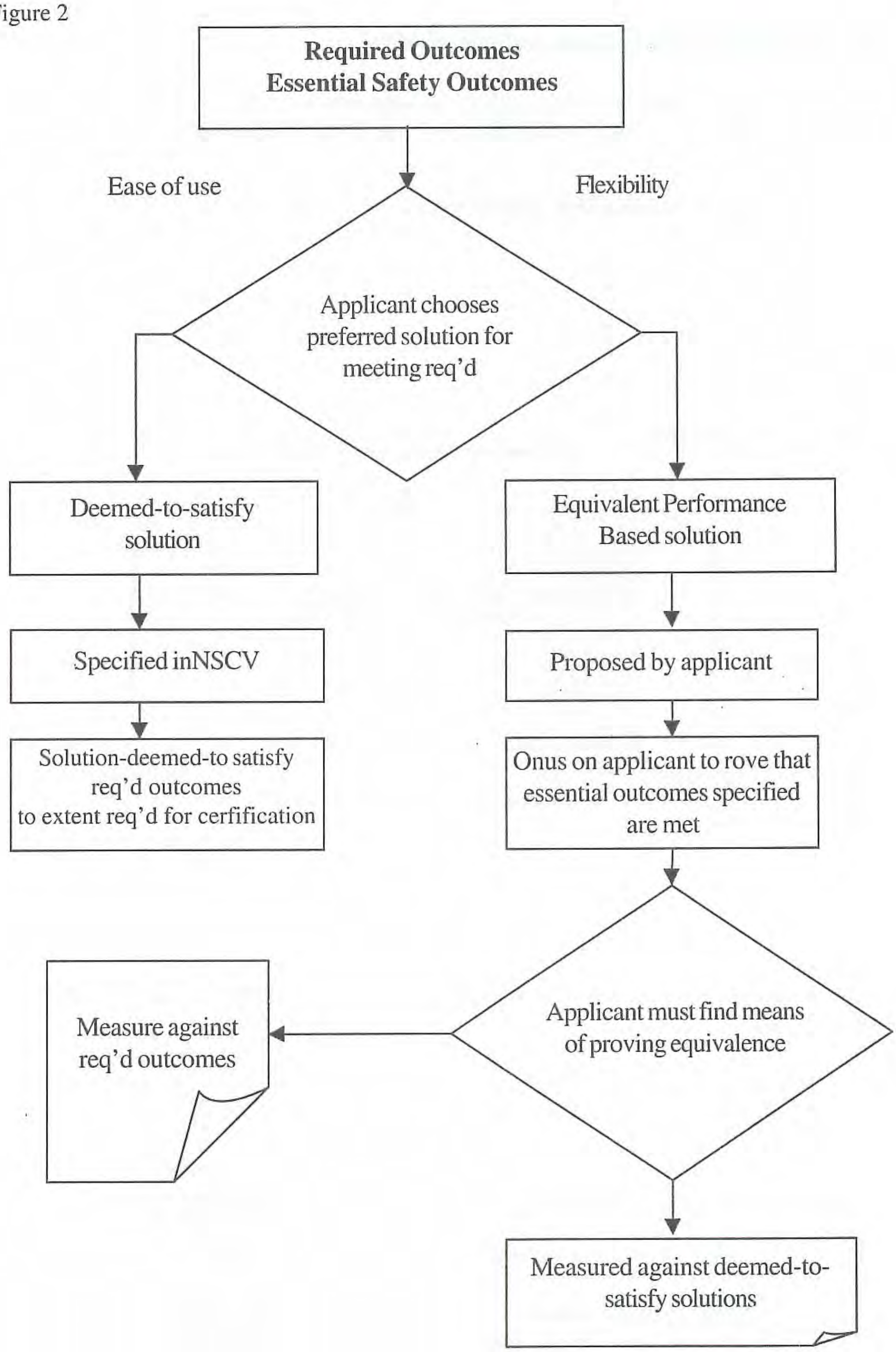
The benefit of using an equivalent solution is that it greatly increases the options available for achieving the required outcome, allowing for innovation and the adoption of new technology. However, in adopting an equivalent solution, the applicant must bear the cost of proving that the equivalent solution meets the applicable required outcomes.

The deemed-to-satisfy solutions specified within the NSCV provide an integrated safety system that combines a vessel's technical characteristics, operator competencies and safety management procedures to control risk. In formulating an equivalent solution, elements of the safety system should not be altered without considering the potential impact on the effectiveness of the safety system as a whole.

FOCUS OF ATTENTION

- Provision and use of safety equipment
- Work practices, procedures and work organisation
- Design and use of equipment
- Information and awareness
- Training and qualifications
- Risk assessment practices

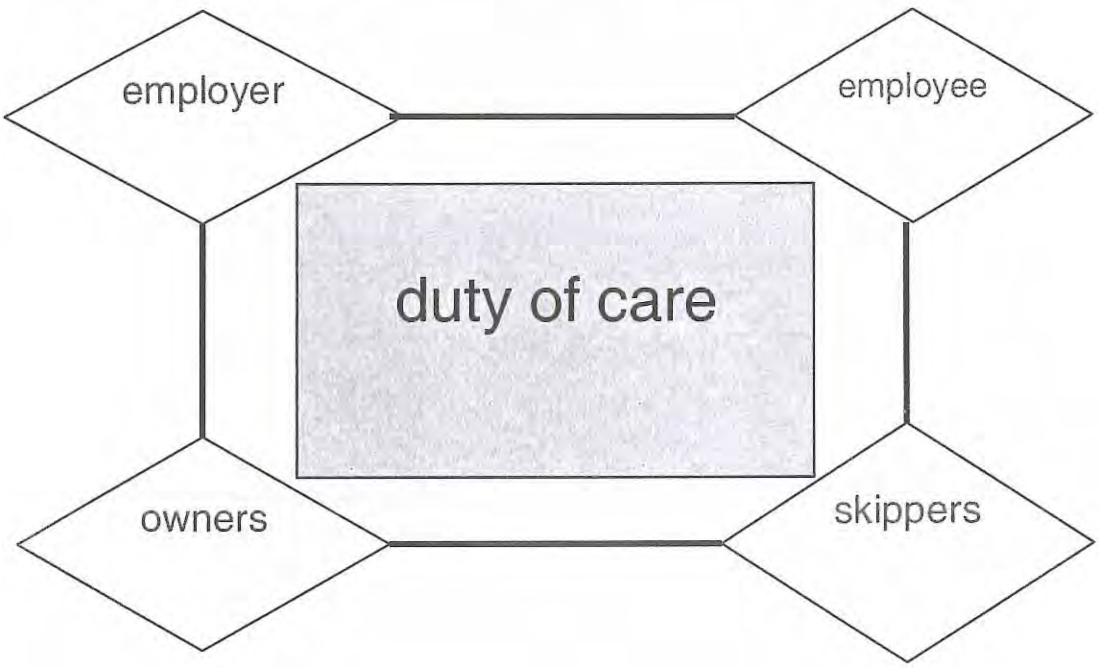
Figure 2


Required Outcomes
Essential Safety Outcomes
Ease of use
Flexibility
Applicant chooses preferred solution for meeting req'd
Deemed-to-satisfy solution
Equivalent Performance Based solution
Specified inNSCV
Proposed by applicant
Solution-deemed-to satisfy req'd outcomes to extent req'd for cerfification
Onus on applicant to rove that essential outcomes specified are met
Applicant must find means of proving equivalence
Measure against req'd outcomes
Measured against deemed-to-satisfy solutions

OCCUPATIONAL HEALTH & SAFETY (OH&S)

"The fishing industry has one of the highest incidence rates of death, with this rate being 16 times higher than the average for all industries" (NOHSC, 1998)

OCCUPATIONAL HEALTH & SAFETY ACT



Owners/skippers are specifically responsible for;

1. providing a safe workplace
2. providing training and supervision for employees

Method of Achieving Desired Outcomes

1. Ensuring all crew have OH&S at Sea Training
2. Develop a generic industry;
   - policy and Procedures manuals
   - Vessel Safety Management *or* Operations Manual
3. Implementation of a vessel induction process

1. ***OH&S at Sea Training;***
   - OH&S
   - Survival at sea
   - Fire-fighting aboard ships
   - First Aid

2. ***Policy and Procedures Manuals & Safety Management System***

Company & Vessel Safety Policies

- pre sailing checks
- safety on decks
- watchkeeping procedures
- machinery checks
- loading and unloading procedures

3. Implementation of a vessel induction process

Emergency procedures
- going aground
- collision
- man overboard
- fire

Safety equipment and its use

Safety Equipment

Depends on the vessel's;
- Classification
- Operating area
- Measured length

Safety equipment must be stowed, marked and of type stated in USL Code

Ships less than 7m may be operated without lifebuoys

All vessels operating beyond smooth or partially smooth waters must carry an Emergency Position Indicating Radio Beacon (EPIRB)

Vessel Induction Examples

1. South Australian Rock Lobster Industry "Clean Green Project"
2. West Australian Fishing Industry Safety Video

OTHER INITIATIVES

Marine Studies Programs in High Schools

- Development of skills that enable human interactions with the marine environment to be carried out safely and intelligently
- Promote opportunities for employment and that enhance recreational benefits
- Encourages the consideration of issues relating to conservation of the marine environment
- Makes use of scientific knowledge and of ocean / coastal processes.
- Provide vocational competencies leading to nationally recognised qualifications.

Australian New Zealand Safe Boating Education Group (ANZSBEG)

Objective is to identify national safe boating issues, address them through coordinated public education strategies and provide a forum for the exchange of ideas and knowledge

Training of Indigenous People

Skills based training addressing vessel operations and OH&S issues specific to regional requirements

Vessel Training
- specific to vessel being used for fishing operations
- reassessment every 12 months
- new vessel type requiring new training regime

OH&S
- hazard analysis of specific fishing operations
- training to address those hazard

Australian Southern Rocklobster clean. green.

SAFETY CARD FOR VESSEL BROJAK
PORT MACDONNELL, CALL SIGN VXRT32,

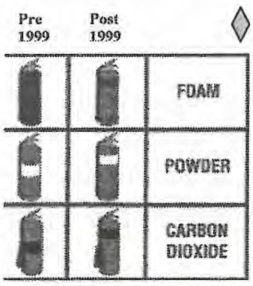
Skipper: BARRY WILLIAMS

Commercial fishing can be dangerous. This card will tell you what you need to know about at sea safety.

The skipper will take all reasonable steps to secure your health and safety while on-board. Your duty is to follow all reasonable instructions and take care. If you are a deckhand, you have a duty to work safely, follow instructions and not put others at risk.

The skipper will record the induction of visitors and crew and any serious incidents or accidents in the ship's log.

FIRE EXTINGUISHERS

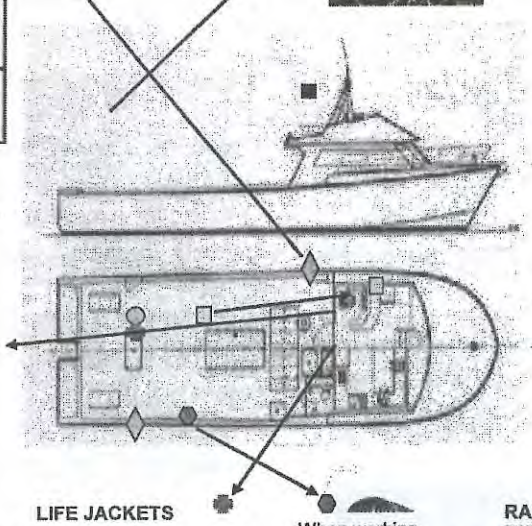


FOAM: wood & flammable liquid fires.
CO_2: electrical fires, limited use for wood, & flammable liquids
POWER: all types of fires.

INSTRUCTIONS ARE ON THE FLARE

NEVER UNDERESTIMATE THE POWER OF THE SEA

LIFE RAFTS



How to launch and inflate a life raft:

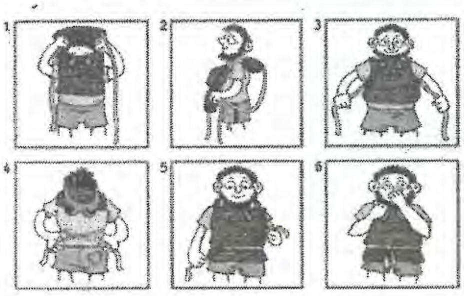
1. Fasten painter (the rope) to the boat
2. Manually discharge hydrostatic release
3. Check all clear in water
4. Throw raft overboard
5. Pull the painter (rope) to inflate.
6. Pull alongside main vessel

EPIRB: Emergency Position Indicating Radio Beacon

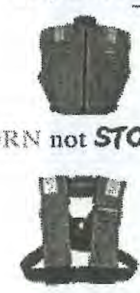
1. Extend aerial (if necessary)
2. Switch on
3. Place in the water
4. Attach to a safe spot (you, life raft)

LIFE JACKETS

IF YOU HAVE TO ABANDON SHIP PUT ON AS MUCH CLOTHING AS POSSIBLE. THEN PUT A LIFE JACKET ON AS SHOWN BELOW:



When working on the deck wear a **stormy inflatable PFD**



WORN not ***STOWED!***

RADIO DISTRESS CALLING- Use only if in grave or imminent danger

Turn your radio to a distress channel and send radiotelephony alarm signal (if fitted), then the following message:

- **MAYDAY, MAYDAY, MAYDAY**
- **THIS IS**
- BROJAK VXRT32, BROJAK VXRT32, BROJAK VXRT32
- **MAYDAY**
- BROJAK VXRT32
- State your position
- State your problem
- State number of persons on board

MAN OVERBOARD SCENARIO

BOATS ACTIONS

1. Turn towards the side the person fell (to keep the stern away)
2. Hit Man Over Board (MOB) button on GPS or mark your waypoint
3. Raise the alarm
4. Throw a rescue aid
5. Keep Visual lookout
6. Approach MOB from down wind

PERSONS ACTIONS

1. Remain Calm
2. Don't try to swim
3. Wait until the boat retrieves you
4. Attract attention

PROPER LIFTING

- Use your legs.
- Bend your knees.
- Hug the load.
- Don't twist.
- Keep your feet, knees and body pointed in the same direction when lifting.
- Don't lift heavy things above your shoulders.

HAZARDS ON THIS VESSEL

KEEP AWAY FROM OPEN HATCHES, ROPES AND WINCHES. STAND BACK WHEN POTS SNAG.

WATCH THE SEA. KEEP A CONSTANT LOOKOUT- keep an eye on the GPS, radar, engine gauges & barometer

EMERGENCY RESUSCITATION: DR. ABC

DANGER: Check for danger to your self, bystanders & the patient. Only continue if it is safe.

RESPONSE: Call the person's name, shake them gently. If no response, move on to the ABC

AIRWAY: Place them in the **coma position**. Make sure the airway is clear. Check for breathing (**Look, Listen & Feel**).

Coma position

a. Mouth to mouth Resuscitation

b. Mouth to nose resuscitation

BREATHING: Are they breathing? If they are not, lie them on their back and give 5 full quick breaths (*Mouth-to-Mouth*), check breathing & circulation

If pulse is present but no breathing, give 1 breath every 4 seconds. Check after a minute. If not breathing repeat and check every 2 minutes.

CIRCULATION

Check carotid pulse. If pulse absent: **15** heart compressions, followed by **2** quick breaths = **1 cycle** = 15 seconds. Complete **4** cycles in **1** minute. Check pulse & breathing after the first minute and then every 2 minutes.

No pulse = Keep going
Pulse, no breathing = go back to *Mouth-to-Mouth* until breathing returns.

CHARACTERISTICS OF MANEUVERING MOTIONS OF PHILIPPINE OUTRIGGER CRAFT IN WIND

Ritsuo Shigehiro*, Glenn D. Agular, Takako Kuroda*** and Harald E. Kagaruki***

* Faculty of Fisheries, Kagoshima University, Japan
** University of Philippines in the Visayas, Philippines
*** Faculty of Fisheries, Hokkaido University, Japan

ABSTRACT

Most fishing craft of the Philippines are constructed in the double outrigger form with a main hull and floats at both sides. Generally, a flat and its beam are made of bamboo. The craft has met with a sea accident such as a collision or aground in a strong seasonal wind. A great deal effort has been made on the issue, little is known about maneuverability under the wind forces for the craft.

In this paper, a prediction method of the maneuverability for the craft is proposed to investigate the maneuvering motions under the wind forces. The point about the development of this method is divided into different parts of the hull and the outriggers. Furthermore, the model of hydrodynamics forces on outriggers is described as a simple mathematical formula. The accuracy of the method is checked by model tests. From these simulation studeies, a safer and more efficient craft could be designed.

INTRODUCTION

When considering the maneuvering motions of outrigger craft under the wind forces, field survey provides a starting-point. Aguilar (1997) has conducted field surveys to measure and record the technical characteristics of the craft and to build a database that can be used for analyses. Furthermore, Aguilar and Shigehiro (2002) have conducted the sea trials of an outrigger craft to investigate the ship's speed and turning ability in the Philippines. However, there is not enough data to apply the other outrigger craft in generally. From these remarks, it is clear that the simulation study is useful method to improve the performance for the craft. As the craft is constructed in the double outrigger form, it is important to take account into the effect of hydrodynamics forces on outriggers.

The purpose of the studies are to develop a prediction method to estimate the maneuvering motions and to clarify the effect of outriggers and wind forces on maneuvering motions for the craft. In this prediction method, the mathematical model of hydrodynamics forces is divided into different part of the hull and the outriggers. Firstly, the accuracy of the method is checked by comparing between the results of numerical simulation and turning motions of model tests in a clam condition. Secondly, the simulation studies are applied to investigate the maneuvering motions for the craft under the wind forces. From these simulation studies, the effects of outriggers and the wind forces for the craft are able to discuss quantitatively.

PREDICTION METHOD

The prediction method of maneuvering motions for the craft is based on numerical simulation. The mathematical model for the simulation is the typical modular type that is called MMG model in Japan, and it is described as follows:

$$\begin{aligned} m(\dot{u}-vr) &= X_H + X_P + X_R + X_E \\ m(\dot{v}+ur) &= Y_H + Y_P + Y_R + Y_E \quad (1) \\ I_{zz}\,\dot{r} &= N_H + N_P + N_R + N_E \end{aligned}$$

where m : mass of the craft, I_{zz} : moment of inertia at the center of gravity of the craft, u, v: velocity of x-direction and y-direction and r: angular velocity of yawing. The notation of X, Y and N represent the hydrodynamics forces and moments acting on the center gravity of the craft.

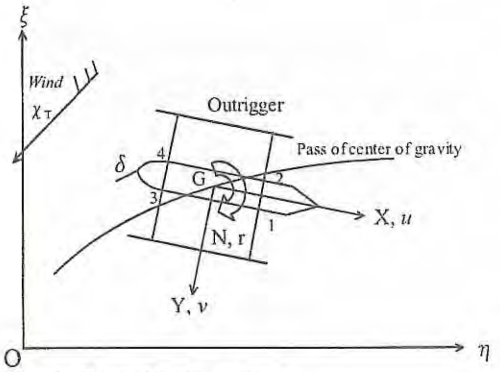


Fig. 1. Co-ordinate systems.

The subscripts of *H,P, R* and *E* refer to the hull, the propeller, the rudder and the external forces, respectively. The co-ordinate systems are shown in Fig. 1.

Mathematical Model of Forces and Moments Acting on the Hull

X_H, Y_H *and* N_H include the effect of outriggers and are expressed by the following polynomials of u′, v′ and r′.

$$
\begin{aligned}
X_H &= \frac{1}{2}\rho L d U^2\{X'_u + X'_{vv}v'^2 + (X'_{vr} + m'_y)v'r' \\
&\quad + X'_{rr}r'^2 - m'_x\dot{u}'\} \\
Y_H &= \frac{1}{2}\rho L d U^2\{Y'_v v' + (Y'_r - m'_x u')r' + Y'_{vvv}v'^3 \\
&\quad + Y'_{vvr}v'^2 r' + Y'_{vrr}v'r'^2 + Y'_{rrr}r'^3 - m'_y\dot{v}'\} \\
N_H &= \frac{1}{2}\rho L^2 d U^2\{N'_v v' + N'_r r' + N'_{vvv}v'^3 + N'_{vvr}v'^2 r' \\
&\quad + N'_{vrr}v'r'^2 + N'_{rrr}r'^3 - J'_{zz}\dot{r}'\}
\end{aligned}
\tag{2}
$$

where ρ: density of water, L: length between perpendiculars, d: the mean draft and U: resultant velocity of u and v. $v' = v/U \cong -\beta$, $r' = r(L/U)$.

A thing worth of note is that the derivatives of the craft are largely different from those of a mono-hull ship. Detailed account of the influence of outriggers is given in the next section.

Propeller

X_p, Y_p *and* N_p are expressed by the following formulas:

$$
\begin{aligned}
X_p &= (1-t)\rho n^2 D_p^4 K_T \\
Y_p &= \frac{1}{2}\rho u_p^2 \frac{\pi}{4} D_p^2 \frac{C_T}{\sqrt{1+C_T}}\beta_p \cong 0 \\
N_p &= x_p \cdot Y_p
\end{aligned}
\tag{3}
$$

where

$$
\begin{aligned}
C_T &= \frac{8K_T}{\pi J_s^2} \\
\beta_p &= \beta - x'_p r' \\
J_s &= \frac{u_p}{nD_p} \\
u_p &= (1-w_p)u \\
w_p &= w_o e^{c\beta_p^2} \quad (c = -4.0)
\end{aligned}
\tag{4}
$$

and where t: coefficient of thrust reduction, n: speed of rotation per seconds, D_p: diameter of the propeller, K_T: coefficient of thrust, x_p: location of the propeller ($x'_p = x_p / L$) and w_o: hull wake fraction in straight motion.

Rudder

X_R, Y_R and N_R are expressed by the following formulas:

$$
\begin{aligned}
X_R &= -(1-t_R)F_N \sin\delta \\
Y_R &= -(1+a_H)F_N \cos\delta \\
N_R &= -(x_R + a_H x_H)F_N \cos\delta \\
&\cong -(1+a_H)x_R F_N \cos\delta
\end{aligned}
\tag{5}
$$

where δ is the rudder angles, x_R represents the location of the rudder and t_R, a_H are interactive coefficients among the hull, the propeller and the rudder. F_N is the rudder normal force and is expressed by the following forms:

$$
\begin{aligned}
F_N &= \frac{1}{2}\rho f_\alpha A_R u_R^2 \sin\alpha_R \\
\alpha_R &= \delta - \delta_o + \gamma_R(v' + \ell_R r')/u'_R \\
f_\alpha &= \frac{6.13\Lambda}{2.25+\Lambda} \\
u_R &= \varepsilon u_p \sqrt{1 + \kappa 8K_T / \pi J_s^2}
\end{aligned}
\tag{6}
$$

where δ_o: neutral angles of the rudder, γ_R: flow straightening factor around the rudder, Λ: aspect ratio of the rudder, A_R: movable area of the rudder and ℓ_R, ε, κ are interactive coefficients among the hull, the propeller and the rudder.

External Force

As for external force, the wind force is considered in this study. X_E, Y_E and N_E are expressed as follows:

$$X_E = C_X(\chi_a)\frac{1}{2}\rho_a A_X U_a^2$$
$$Y_E = -\mathrm{sgn}\{\chi_a\} C_Y(\chi_a)\frac{1}{2}\rho_a A_Y U_a^2 \quad (7)$$
$$N_E = -\mathrm{sgn}\{\chi_a\} C_N(\chi_a)\frac{1}{2}\rho_a A_Y L U_a^2$$

where $\mathrm{sgn}\{\chi_a\} = \begin{cases} 1 & (\chi_a \geq 0) \\ -1 & (\chi_a < 0) \end{cases}$ (8)

$$U_a^2 = W_T^2 + U^2 + 2W_T U \cos(\beta + \chi_T - \psi) \quad (9)$$

$$\chi_a = \begin{cases} \sin^{-1}\left\{\frac{W_T}{U_a}\sin(\beta + \chi_T - \psi)\right\} - \beta & (U_a \neq 0) \\ \pi - \beta & (U_a = 0) \end{cases} \quad (10)$$

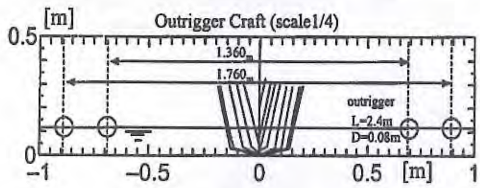


Fig. 2 Body plan of model.

■ INFLUENCE OF OUTRIGGERS

As mentioned above, outriggers are so slender and these are located a far distance from the hull to maintain the transverse stability. It seems to be a very little interacted force between the hull and outriggers in maneuvering motion. On this assumption, the derivatives of the hydrodynamics forces due to outriggers could be described as follows:

$$F(y) = F_H + \Delta F + \Delta f \cdot \left\{\frac{y}{L} - \frac{1}{4}\right\} \quad , y \geq \frac{B_H}{2} \quad (11)$$

where F_H : effect of the hull, ΔF : effect of the outriggers and Δf : effect of the distance between outriggers.

Circular Motion Test (CMT) was conducted to investigate the effect on these terms in the National Research Institute of Fisheries Engineering (NRIFE), using a 1/4 scale model as shown in Fig. 2. Type-H is a hull without outriggers. Type-A is a standard type in the Philippines, and distance between outriggers is about half ship's length. Type-C is a wide model to examine the effect of the distance between outriggers. The model arrangements of the craft are shown in Fig. 3, and its principal dimensions are shown in Table 1.

Table 1. Principle dimensions

Items		Ship	Model
Scale		1	1/4
L_{pp}	(m)	10.940	2.735
B_H	(m)	1.260	0.315
d_m	(m)	0.468	0.117
W	(kg)	3702.4	57.850
$\otimes G$	(m)	aft 0.196	aft 0.049
K_{yy}/L_{pp}		0.242	0.242
$F_n\ (= V/\sqrt{L_{pp}g})$		0.298 (6.0 knots)	0.298 (1.543 m/s)

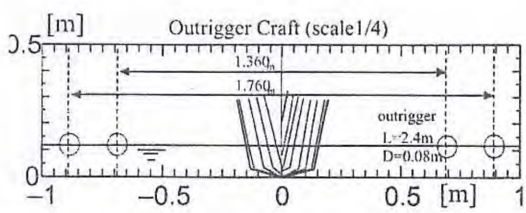


Fig. 2 Body plan of the outrigger craft

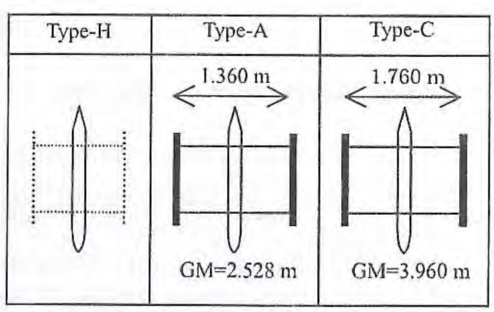


Fig. 3 Schematic illustration of model arrangements.

Resistance

The results of CMT are shown in Fig. 4. Futhermore, Fig. 5 shows the increased resistance due to the angular velocity of yawing. From these results, the increasing resistance due to outriggers can be observed, but the influence of the distance between outriggers is rather slight.

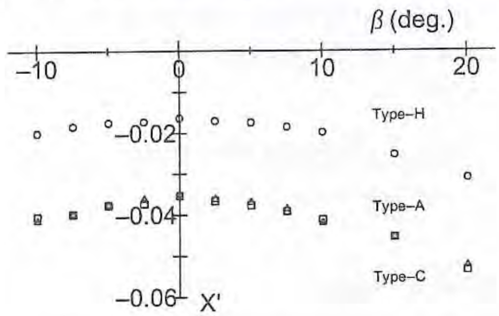


Fig. 4 Non-dimensional resistance acting on the outrigger craft.

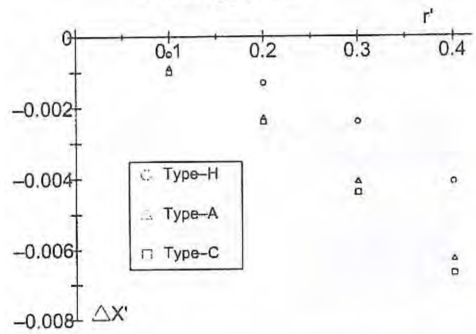


Fig. 5 Increased resistances due to the angular velocity of yawing.

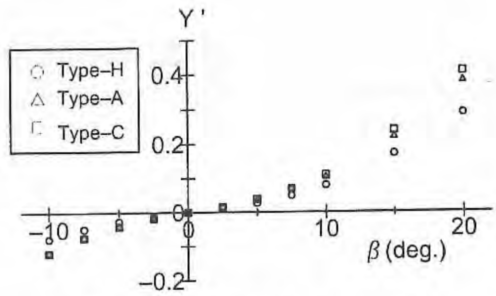


Fig. 6 Lateral forces of the outrigger craft due to oblique motions.

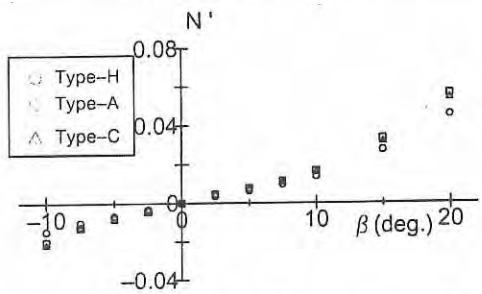


Fig. 7 Yaw moments of the outrigger craft due to oblique motions.

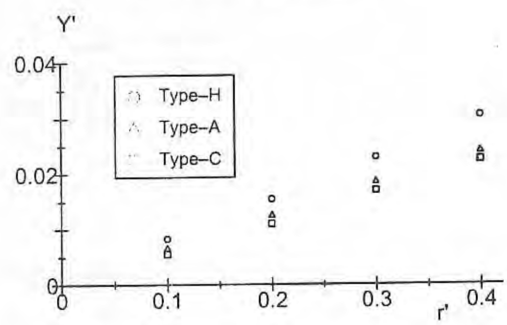


Fig. 8 Lateral forces of outrigger craft due to pure turning motions.

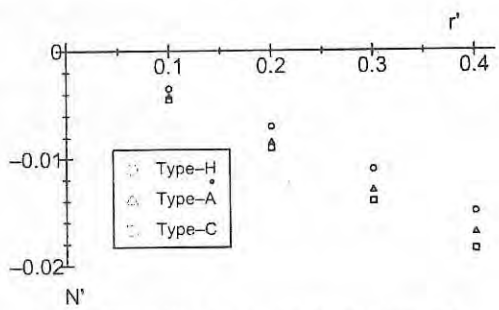


Fig. 9 Yaw moments of outrigger craft due to pure turning motions.

Lateral Forces and Yaw Moments

The results of the oblique tests on type-H, type-A and type-C are shown in Fig. 6 and Fig. 7. The hydrodynamic forces and moments on the craft have a non-linear effect in a large range of draft angles. In order to investigate the influence of the angular velocity of yawing, the hydrodynamic forces and moments are shown in Fig. 8 and Fig. 9. Hydrodynamic forces and moments due to pure yaw motions have a linear effect within the range of 0.4 ($r' = 0.4$).

Results and Discussion

The derivatives of hydrodynamic forces are obtained from fitting by polynomials of v' and r'. The derivatives of resistance are shown in Table 2. The static derivatives of lateral force and moment are shown in Table 3. The dynamic derivatives are shown in Table 4. Futhermore, the each vale of terms in formula (11) with respect to the linear derivatives is shown in Table 5. On the other hand, ℓ_v (N'_v/Y'_v) is representing the point of force due to the oblique motion from the center of gravity in the craft, and ℓ_v $(= N'_r/(Y'_r-(m'+m_x))$ is also representing the point force due to the pure turining motion. D $(=\ell_v-\ell_v)$ is the stability discriminate as shown in Table 6. If D would be positive $(D\geq 0)$, the craft would have a stable characteristic on course keeping ability. As can be seen, the craft is adequate to the course keeping ability (see Table 6).

Table 2 Derivatives of resistance

Type	X'_0	X'_{vv}	X'_{rr}	$X'_{vr}+m'_y$
H	-0.0163	-0.122	-0.028	0.059
A	-0.0350	-0.180	-0.045	0.059
C	-0.0353	-0.180	-0.045	0.059

Table 3 Static derivatives of lateral force and moment in oblique motions.

Type	Y'_v	Y'_{vv}	N'_v	N'_{vvv}
H	-0.315	-4.318	-0.068	-0.511
A	-0.458	-0.5271	-0.084	-0.573
C	-0.467	-5.893	-0.086	-0.614

Table 4 Dynamic derivatives of lateral force and moment in turning motions.

Type	Y'_r	Y'_{rr}	N'_r	N'_{rrr}
H	0.078	-	-0.038	-
A	0.061	-	-0.043	-
C	0.056	-	-0.045	-

Table 5 Effect of outriggers with respect to linear derivatives.

	F_H	ΔF	Δf
Y'_v	-0.315	-0.143	-0.126
Y'_r	0.078	-0.017	-0.070
N'_v	-0.068	-0.016	-0.028
N'_r	-0.038	-0.005	-0.028

Table 6 Stability discriminate.

Type	ℓ'_r	ℓ'_v	$D = \ell'_r-\ell'_v$
H	0.611	0.216	0.395
A	0.543	0.183	0.360
C	0.534	0.184	0.350

The derivatives of the hydrodynamics forces on a part of outrigger could be discussed in this study. As an outrigger is made of bamboo, its hydrodynamics derivative seems to be a little variation for most of fishing craft. In the near future, if the hydrodynamics derivatives of main hull could be built a database, the prediction method would be applied to a great many outrigger craft in the Philippines.

■ NUMERICAL SIMULATIONS

The main hull of the craft is so slender, and the propeller and the rudder are located far distance from the hull as shown in Photo1. It seems to be a little interaction among the hull, the propeller and the rudder. Accordingly, the interactive parameter of rudder (tR) is negligible, and the other interactive parameters are estimated from the published database as shown in Table 7. Meanwhile, the model of diameter of propeller is 0.150 m and the number of blade is 2. The rudder area is 0.015 m2 (AR/Ld=1/21.3) and the aspect ratio is 0.67

Table 7 Coefficients with respect to properller and rudder.

Propeller		Rudder	
t	0.100	γ_R	0.80
w_o	0.200	a_H	0.35
ε	1.000	ℓ_R	-1.00
κ	0.135	t_R	0.0

Photo 1 Rubber and propeller of outrigger craft

Photo 2 Outrigger craft in the Philippines

Accuracy

The accuracy of the prediction method is discussed by comparing the predicted motions with results of free running model tests in calm condition. The trajectories of turning motion of type-A and type-C are shown in Fig. 10 and Fig. 11, and compared with the measured results of free running model tests. The rudder angles are 35 degrees and 20 degrees. The results of the prediction agree well with the results of the measurements made at each rudder angles. The trajectories of type-A and type-C are almost equivalent. Accordingly, the influence of the distance between outriggers is slight in the turning motions.

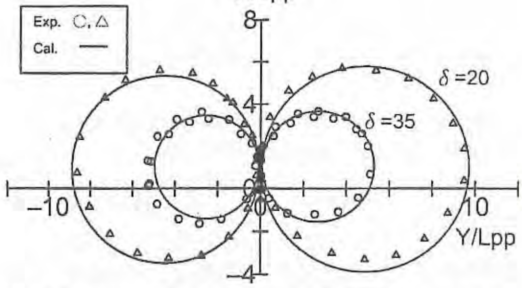


Fig. 11 Turning trajectories on the outrigger craft with a 1.76 m beam in length (Type-C)

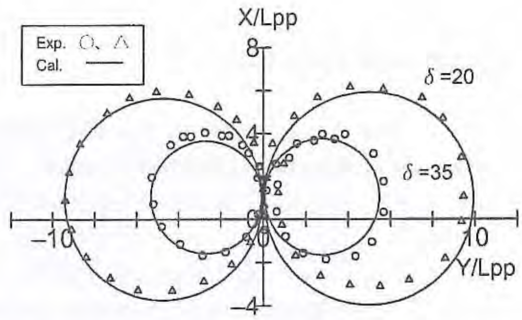


Fig. 11 Turning trajectories on the outrigger craft with a 1.76 m beam in length (Type-C).

Effect of Wind Force

In this study, because the superstructure of the craft is a simple shape as shown in Photo. 2, the coefficients of wind force and moment are obtained from database of Isherwood as shown in Fig. 12. The simulation studies are carried out to obtain the basic characteristic of maneuvering for the outrigger craft in wind. Accordingly, the turning and the zig-zag maneuver are selected for the simulation studies.

The effect of the wind force is a very large for the craft in the turning motions because of the draft is shallow. The maximum deviations (SD/Lpp) in the turning motions are shown in Fig. 13. SD is denoted the deviation from trajectory of calm condition as shown in Fig. 14. True wind direction is zero and the model is type-C in this simulation studies.

Also, example for simulation results, trajectories are shown in Fig. 14, and the time histories of ship's speed, yaw rate *u r* and drift angle are shown in Fig. 15. In this case, wind speed of the simulation is six times as large as ship's speed (WT/U=6) and the rudder angle is 35 degrees. As can be seen, the craft is pushed down the wind about two ship's length, also, yaw rate and drift angle are strongly influenced of wind force in turning motion. The effect of wind is getting more strongly as the rudder angles are less than 10 degrees.

On the other hand, the effect of wind is rather slight in 10-10 zig-zag maneuver as shown in Fig. 16. The main reason is that the craft has an excellent course keeping ability in the main because the hull is so slender, and the outriggers are large damping of yaw moment. Meanwhile, the true wind direction –90 degrees in this simulation studies.

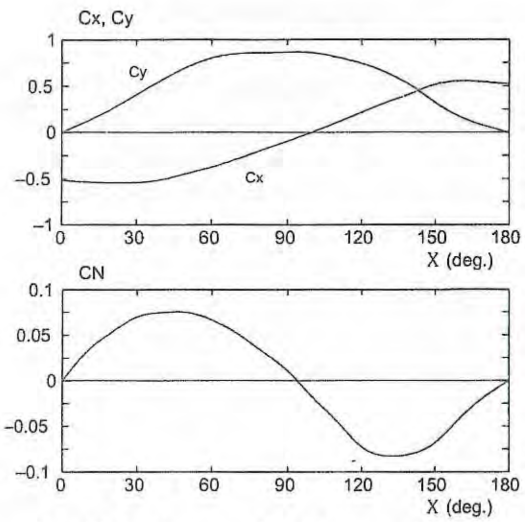


Fig. 12 Coefficients of wind force and moment.

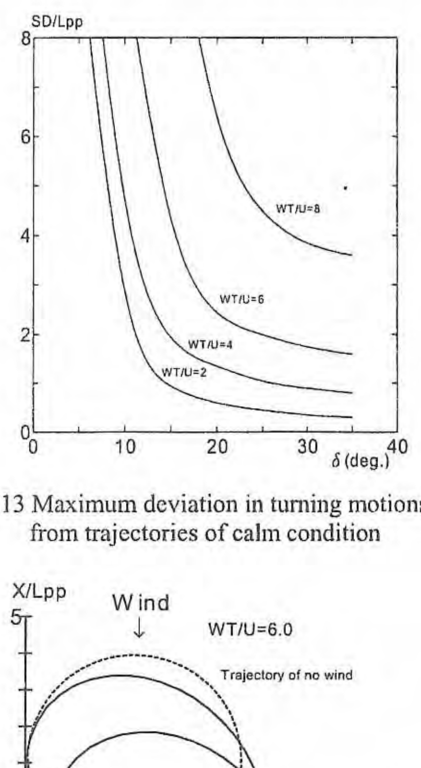


Fig. 13 Maximum deviation in turning motions from trajectories of calm condition

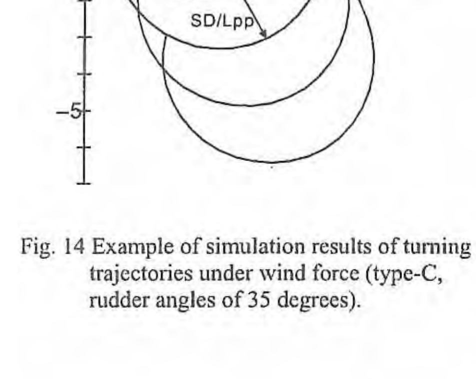


Fig. 14 Example of simulation results of turning trajectories under wind force (type-C, rudder angles of 35 degrees).

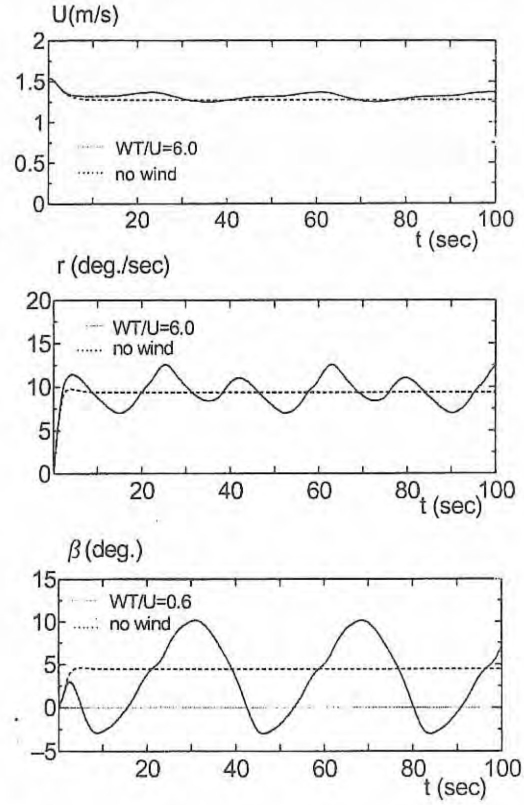


Fig. 15 Time histories of ship's speed u, yaw rate r and drift angle β in turning motion under wind force (type-C, rudder angles of 35 degrees).

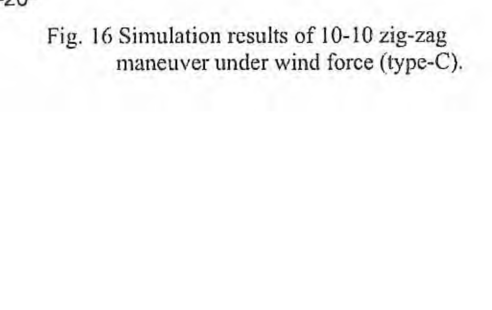


Fig. 16 Simulation results of 10-10 zig-zag maneuver under wind force (type-C).

CONCLUSIONS

On the basis of this simulation studies, the effects of wind force in maneuvering motion are discussed quantitatively for Philippine outrigger craft. Meanwhile, free running model tests were conducted to check the accuracy of the prediction method. The following conclusions are drawn:

1) The prediction method of maneuverability for Philippine outrigger craft is proposed, and the accuracy of the prediction method is adequate to consider safety of navigation.

2) The outriggers have influence on increasing resistance as much as resistance of a hull, but the influence of the distance between outriggers is rather slight.

3) The maximum deviations in the turning motions are quantitatively obtained from the simulation studies for the craft with wind conditions.

4) As the draft of outrigger craft is shallow, yaw rate and drift angle are strongly influenced of wind force in turning motion.

5) The hull of Philippine outrigger craft is so slender and outriggers are large damping of yaw moment. Accordingly the craft has an excellent course keeping ability.

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CHARACTERISTICS OF SEAKEEPING PERFORMANCE OF PHILIPPINE OUTRIGGER CRAFT

Ritsuo Shigehiro, Takako Kuroda, Glenn D. Agular and **Toru Katayama**

Abstract

The Core-University Scientific Corporation Program has started between Philippines and Japan from 1998. The project of fishing craft is conducted to improve the performance of Philippine outrigger craft. Most fishing craft of the Philippines are constructed in the double outrigger form with a main hull and floats at both sides. Generally, a float and its beam are made of bamboo.

In this paper, the characteristics of ship motions are experimentally investigated to clarify dangerous sea conditions for the craft in waves. A computer program has been developed to calculate ship motions of the craft. The accuracy of this computer program is checked by measurement of ship motions in waves. Furthermore, results of the calculation are in good agreement with the measured ones. From these results, the outriggers increase heaving and pitching motions in head seas at the short wave length, although significantly decrease heaving and rolling motions in beam seas.

■ INTRODUCTION

An outrigger craft is the most traditional and popular fishing craft in the Philippines. In resent years, many persons engaged for fishery working on such outrigger craft have died in sea disasters. The main cause of the accidents is regarded that supporting arms of the outriggers were damaged due to large load in severe seas. In order to prevent such accidents, it should be clarified the relation between wave conditions and maximum laod on the supporting arms. Aguilar (1997) measured and recorded the technical characteristics of the outrigger crafts and to build a database, which can be used for analysis and further studies. However, there are a few studies on seakeeping performance of the outrigger craft.

The purpose of this study are to develop a calculation method to estimate ship motions of the craft in waves and to clarify the characteristics of seakeeping performance of them. A computer program to calculate ship motions of the craft is developed based on a strip method (F. Tasai and M. Takagi. 1969), in which Froude Krylov force, hydrostatic forces and inertia forces acting on the developed computer program is checked by model experiments.

By using the computer program, the ship motions of the craft are compared with without outrigger's (called center-hull) ones. From these calculations, the influence of the outriggers on ship motions is discussed quantitatively.

■ CALCULATION PROGRAM OF SHIP MOTIONS OF OUTRIGGER CRAFT

Method of Calculation

A computer program is based on strip method that called Ordinary Strip Method (OSM), in which Froude-krylov force, hydrostatic forces and inertia forces acting on the outriggers are added[4], and the other forces are abbreviated on the assumption that they are negligible small. The point about the development of this program is taken into the effect of the outriggers. Fig. 1 shows the coordinate systems in this calculation program.

The formulas of these forces and moments are explained under the below

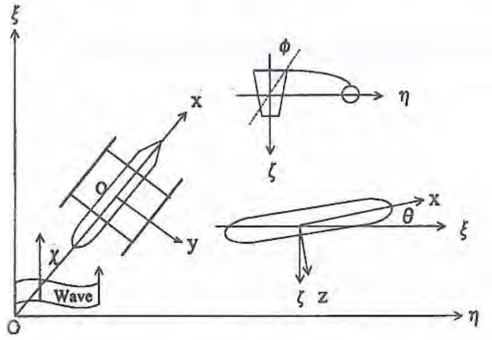

Fig. 1 Coordinate systems.

Vertical Forces of Outrigger

Froude-Krylov force

Froude-Krylov force means integrated value of hydrodynamic pressure acting on wetted surface induced by wave. The pressure is defined as follows:

$$p = \rho g \varsigma_w e^{-kz} \cos(k^* x - ky \sin\chi - \omega_e t) \qquad k^* = k\cos\chi \tag{1}$$

where ρ, g, ς_w, k, χ and ω_e are the density of fluid, acceleration of gravity, wave amplitude, wave number ($k = 2\pi/\lambda$), direction of incident wave and encounter frequency, respectively.

The sectional vertical force is obtained from integrating the vertical component of the pressure around the girth length of the section. The sectional vertical force and moment are described as follows:

$$\left.\begin{aligned} dF_h^w &= \rho g \varsigma_w e^{-kz}\left\{\int_{y_{in}}^{y_{out}} \cos(k^* x - ky\sin\chi - \omega_e t)dy + \int_{-y_{out}}^{-y_{in}} \cos(k^* - ky\sin\chi - \omega_e t)dy\right\}dx \\ &= 2\rho g \varsigma_w e^{-kz} \frac{\sin(ky_{out}\sin\chi) - \sin(ky_{in}\sin\chi)}{k\sin\chi} \\ &\quad (\cos k^* x \cos\omega_e t + \sin k^* x \sin\omega_e t)dx \\ dM_p^w &= -x_L dF_w dx \\ x_L &= x - x_G \end{aligned}\right\} \tag{2}$$

where y_{out}, y_{in} are distance between the center line of center-hull and the location of outside/inside of an outrigger. x_G is the location of the center of gravity. z equals to draft of the outrigger.

Hydrostatic force

Hydrostatic forces and moment of the outrigger can be defined as follows:

$$\left.\begin{aligned} dF_h^{\,b} &= -\rho g \int_L B(x)(\varsigma - x_L\theta)dx \\ &= -\rho g\left\{\varsigma \int_L B(x)dx + \theta \int_L B(x)x_L dx\right\} \\ dM_p^{\,b} &= -\rho g \int_L B(x)(x_L\varsigma - x_L^2\theta)dx \\ &= -\rho g\left\{\varsigma \int_L B(x)x_L dx + \theta \int_L B(x)x_L^2 dx\right\} \end{aligned}\right\} \tag{3}$$

where $B(x)$ is the function of the outrigger's section.

Inertia force

Inertia force associates with acceleration of the body mass. Inertia force of the outrigger can be defined as follows:

$$dF^I = -\frac{w(x)}{g}(\ddot{\varsigma} - x_L\ddot{\theta})dx \tag{4}$$

where $w(x)$ is the function of the outrigger's weight.

Transverse Forces of Outrigger

Lateral motion of the outrigger craft is calculated by the same method as vertical motion. Froude-Krylov force acting on the outriggers in transverse direction is integrated over the sections of the outrigger.

Hydrostatic forces and moments acting on the outriggers are defined as follows:

$$\begin{aligned} dF_y^h &= 0 \\ -dM_\phi^h &= w(x)GM\theta dx \end{aligned} \tag{5}$$

where GM is the transverse metacentric height.

Inertia force and moment acting on the outriggers are defined as follows:

$$\begin{aligned} -dF_y^I &= \frac{w(x)}{g}(\ddot{\eta} + x_L\ddot{\varphi})dx \\ -dM_\phi^I &= \frac{w(x)}{g}\kappa_{xx}\ddot{\phi}dx \end{aligned} \tag{6}$$

As mentioned above, the coefficient of each term can be added to corresponding the coefficient of hydrodynamics forces in the equation of ship motions in OSM.

Measurement of Ship Motions in Waves

In order to check the accuracy of the calculation method, the experiments were carried out at the model basin (60 m in length, 25 m in width, water depth 3.2 m) of the national Research institute of Fisheries Engineering in Hasaki. The model is a ?-scale, and its body plan and its principal particulars are shown in Fig. 2 and Table 1. The cross section of the outriggers is able to change from 1.36 m to 1.76 m as shown in Fig. 2.

Forward speed is Fn = 0.3 (6 knots for the full scale ship). The towing point is adjusted to the center of gravity of the model. In this speed condition, the model is free to heave, pitch and roll. Meanwhile, advance speed of zero is carried out to measure the rolling motion in beam seas. In this condition, the model is free to heave, pitch, roll and sway.

Wave slop is a constant of 1/30 ($H/\lambda = 1/30$) in this measurement. Wave lengths are changed systematically as shown in Table 2. Also the directions of incident wave are changed from 0 degree (following seas), 45 degrees, 90 degrees, 135 degrees and 180 degrees (head seas).

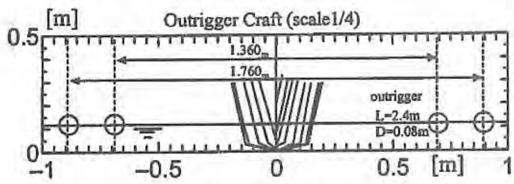

Fig. 2 Body

Table 1 Principle particulars of the model

Items	model
L_{OA} (m)	3.022
L_{PP} (m)	2.735
B (m)	0.314
d_m (m)	0.117
L_{CG} (m) (aft+)	-0.049
Distance between outriggers (m)	1.36, 1.76
Length of outrigger (m)	2.4
Diameter of outrigger (m)	0.08

Table 2 Experimental conditions

Forward speed: $F_n = U/\sqrt{gL_{pp}}$	0, 0.30
Wave slop: H/λ	1/30
Wave length: λ/L_{pp}	0.5 ~ 3.0
Direction of incident wave: χ (degrees)	0, 45, 90 135, 180

Comparison of Calculated Results with Experimental Results

The comparisons of heaving and pitching amplitude in head seas between the calculated and measured results are shown in Fig. 3 and Fig. 4. The heaving and rollin motions in beam seas are also shown in Fig. 5 and Fig. 6. As can be seen, the calculated results agree fairly well with the measured ones. In head seas, the influence of the distance between outriggers is rather slight in heaving and pitching motions.

On the other hand, in beam seas, the influence of it is observed in heaving amplitude. It should be noted that the calculated results of heaving amplitudes have a remarkable peak at the short wave length ($\lambda/L_{pp} = 0.3$). Meanwhile, $\lambda/L_{pp} = 0.3$ is nearly equal to the distance of between the center-hull and the outrigger. Accordingly, the center-hull and both outriggers are just on the peak of waves.

The comparisons of rolling amplitudes at $Fn = 0.0$ between the calculated and measured results are shown in Fig. 6. The roll amplitude gradually approach to the value of 1.0 in long wave length. Because the transverse metacentric height (GM) is very large for the outrigger craft, the wave length is very short to resonate with rolling motion. Moreover, the calculated results are in fairly good agreement with the results of measured.

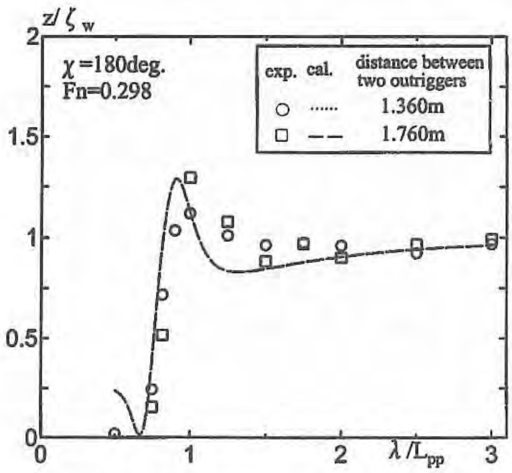

Fig. 3 Heaving amplitude in head seas.

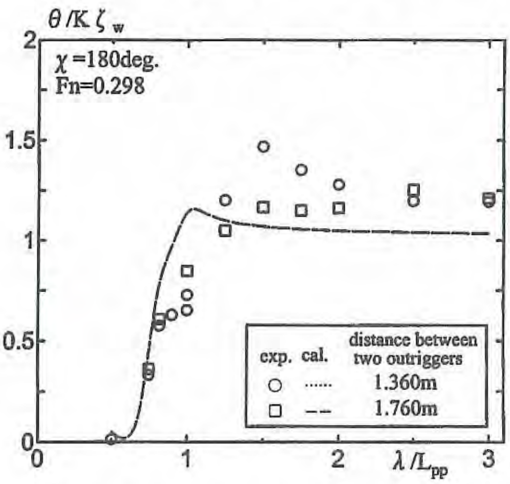

Fig. 4 Pitching amplitude in head seas.

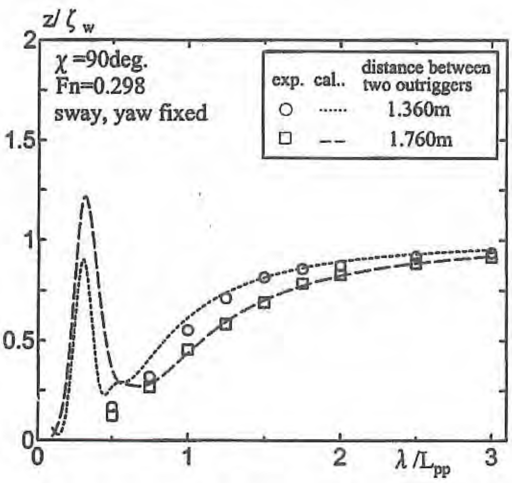

Fig. 5 Heaving amplitude in beam seas.

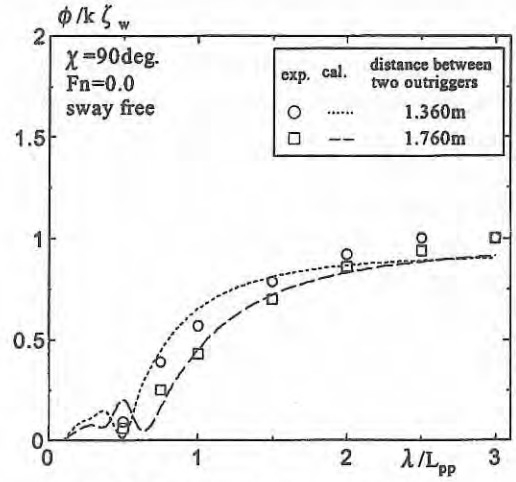

Fig. 6 Rolling amplitude in beam seas.

CHARACTERISTICS OF SHIP MOTIONS OF OUTRIGGER CRAFT

Ship Motions

The comparisons of calculated results between the center-hull and the craft with the outriggers of 1.76 m distance are shown in Figs. 7-10. The solid lines show the calculated results of center-hull by OSM, and the broken lines are also the outrigger craft. In calculation of the center-hull's condition, the position of the center of gravity is equal to the model's one, and pitching inertia moment is obtained from an empirical formula for a conventional mono-hull ship. In head seas, the outriggers make the peak of heaving and pitching motion shift to short wave length and increase heaving and pitching amplitudes at short wave length ($l/L_{pp} < 1.0$) as shown in Figs. 7, 8. In this wave condition, as the encounter frequencies of motion are so high frequencies, the inertia force is a dominant factor for the supporting arm. The heaving and the pitching amplitudes of the outrigger craft gradually approach the center-hull's ones in long wave length.

On the other hand, in beam seas, as mentioned in the previous chapter, heaving amplitudes of the outrigger craft have a remarkable peak at the short wave length and its values are larger than the center-hull's ones. However, the outrigger craft rapidly decrease heaving amplitudes after the peak as shown in Fig. 9. After that, heaving amplitudes of the outrigger craft gradually approach the center-hull's ones in long wave length. The outriggers considerably decrease heaving amplitudes at $0.5<l/L_{pp}<2.0$ in beam seas.

The calculated results of rolling amplitude in beam seas at $Fn = 0.0$ are shown in Fig. 10. In this calculation, the roll natural period T_R of the center-hull is assumed to be 1.84 seconds by a free decay test. The outriggers significantly decrease rolling amplitudes in beam seas. These outrigger craft's characteristics of rolling motion in beam seas can be explained two ways. One is that the roll damping moment of an outrigger craft is very large. Another is the roll natural period of an outrigger craft is very short because the outriggers increase the rolling restoring moment.

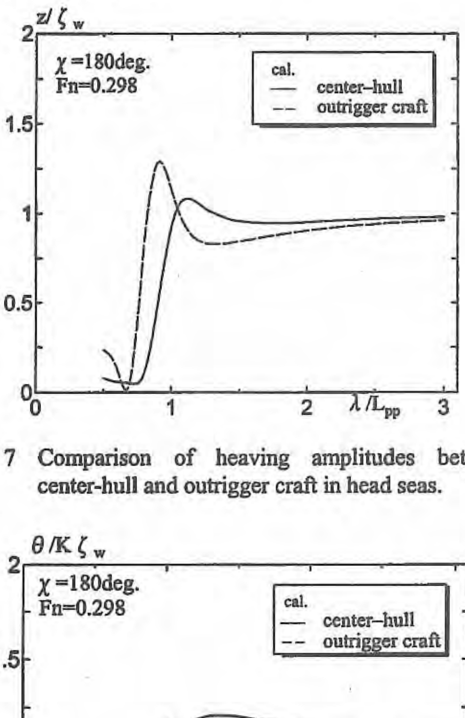

Fig. 7 Comparison of heaving amplitudes between center-hull and outrigger craft in head seas.

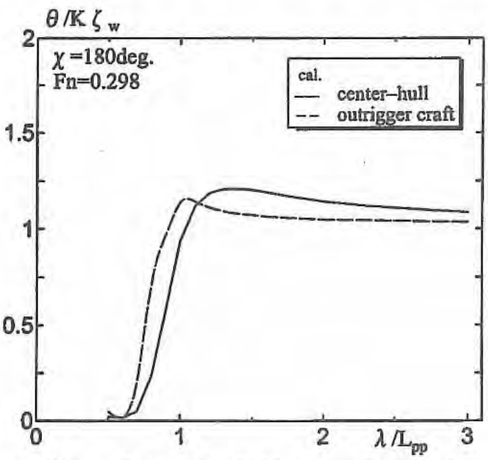

Fig. 8 Comparison of pitching amplitudes between center-hull and outrigger craft in head seas.

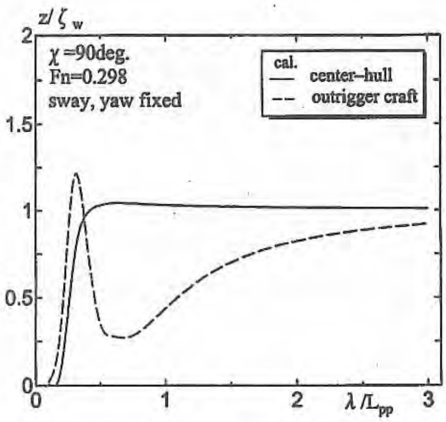

Fig. 9 Comparison of heaving amplitudes between center-hull and outrigger craft in beam seas.

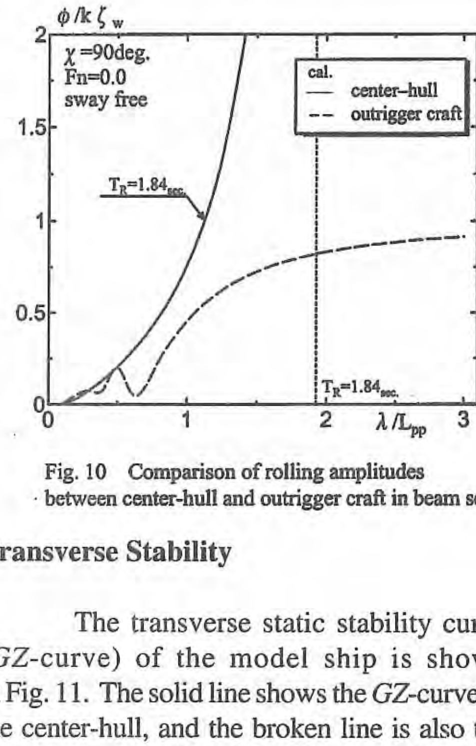

Fig. 10 Comparison of rolling amplitudes between center-hull and outrigger craft in beam seas.

Transverse Stability

The transverse static stability curve (GZ-curve) of the model ship is shown in Fig. 11. The solid line shows the GZ-curve of the center-hull, and the broken line is also the outrigger craft. The height of center of gravity KG is assumed 0.117m ($KG = d_m$). The calculated GZ-curve demonstrates that outriggers significantly increase the roll restoring moment. In addition, the sinkage and the trim for the outrigger craft are larger than the center-hull's ones as shown Fig. 12. Consequently, the roll natural period of the outrigger craft becomes shorter ($T_R = 0.5$s.) compared with the center-hull's one ($T_R = 1.84$s.)

It was found from these calculated results that the outriggers decrease not only heaving amplitude but also rolling amplitude in beam seas.

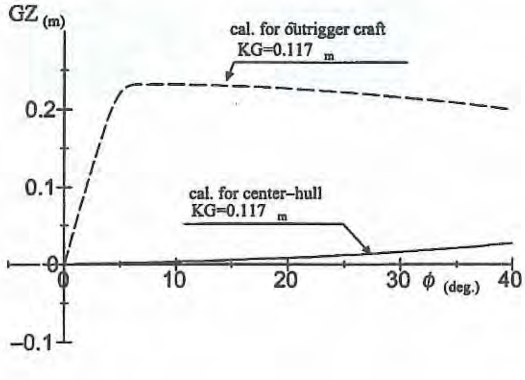

Fig. 11 Comparisons of GZ-curves between the outrigger craft and only center-hull.

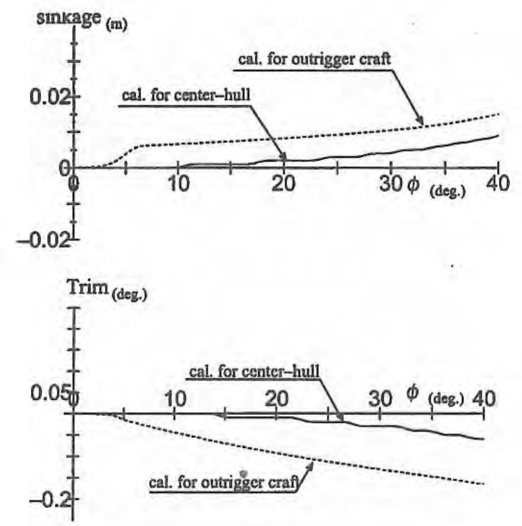

Fig. 12 Comparisons of the trim and the sinkage between outrigger craft and only center-hull.

WAVE LOADS ON OUTRIGGERS

Model Arrangement

Wave loads on the outriggers are experimentally investigated to clarify the maximum load and twist moments in waves. The loads are measured by strain gages that are attached to the supporting arms of 0.58 m from center of an outrigger as shown in Fig. 13. The model of beam is a cantilever. The bending moment is described as follows:

$$MB = F \cdot \ell \tag{7}$$

where F is the vertical force acting on outrigger, ℓ is the lever from center of an outrigger to the strain gage. The positive direction of vertical force is downward in this measure

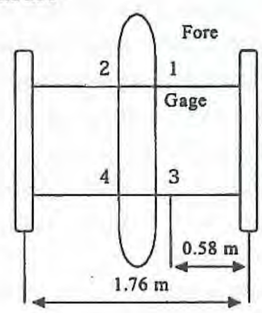

Fig. 13 Model arrangement

Result and Discussion

The maximum bending moments are shown in Figs. 14-17. The largest value is the condition of head seas, and ratio of wave length is 1.25 at the peak. As can be seen, the bending moments at the peaks are getting small to change the wave direction. For instance, the peak of beam seas is about half of one in head seas (see Fig. 15)

Furthermore, the time histories of measurements are shown in Figs, 18-20. In head seas, the peaks of starboard side (No. 1) and port side (No. 2) are almost closed. Meanwhile, in quartering seas (P = 45), the phase of vertical forces is inversed. The phenomenon demonstrates that the twist moment will be getting larger than head seas of one.

In this stage, the matter of the strength will be given careful consideration to prevent the capsizing for the Philippine outrigger craft. For instance, materials, operations for fishermen and the condition of waves near the Philippines. These are the future studies for us.

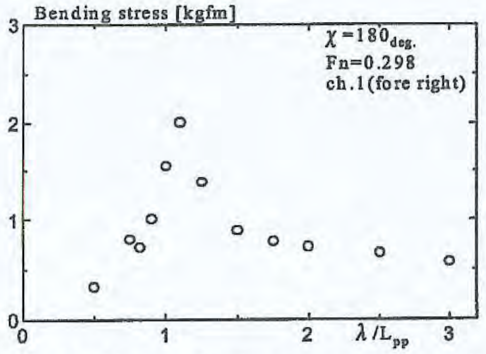

Fig. 14 Maximum bending moment on the supporting arm of outriggers in head seas ($\chi = 180$).

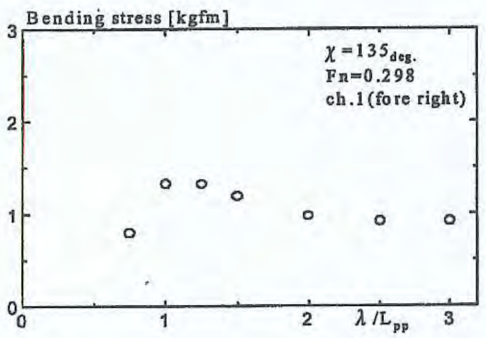

Fig. 15 Maximum bending moment on the supporting arm of outriggers in bow seas ($\chi = 135$).

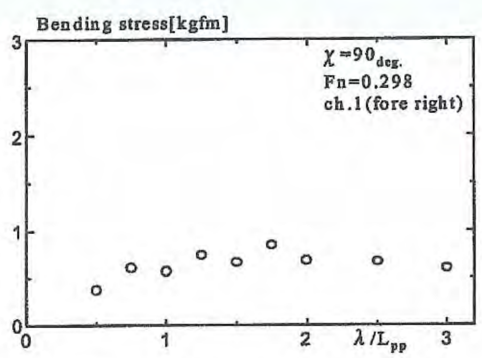

Fig. 16 Maximum bending moment on the supporting arm of outriggers in beam seas ($\chi = 90$).

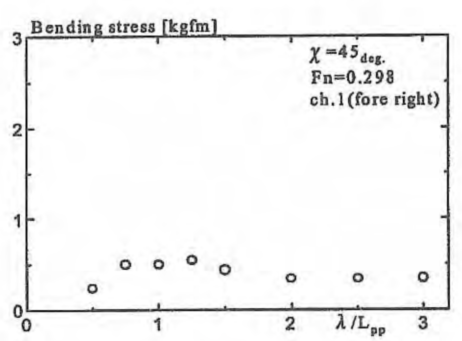

Fig. 17 Maximum bending moment on the supporting arm of outriggers in quartering seas ($\chi = 45$).

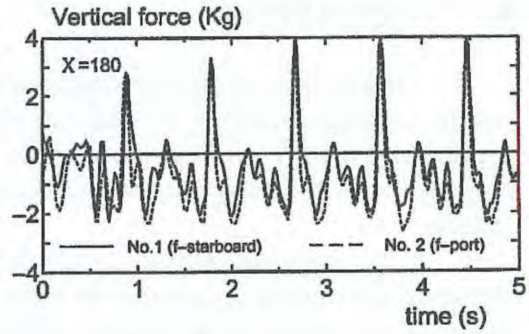

Fig. 18 Time histories of vertical forces on outriggers of starboard and port side in head seas ($\chi = 180$)

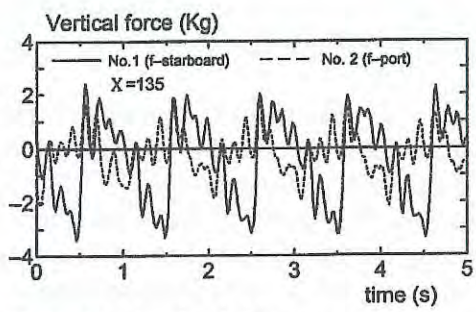

Fig. 19 Time histories of vertical forces on outriggers of starboard and port side in bow seas ($\chi = 135$).

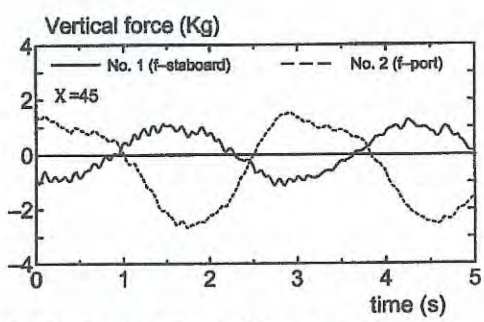

Fig. 20 Time histories of vertical forces on outriggers of starboard and port side in quartering seas ($\chi = 45$).

CONCLUSIONS

On the basis of the experimentally studies, characteristics of seakeeping performance of Philippine outrigger craft are discussed. The following conclusions are as follows:

1. A computer program to calculate ship motions of the outrigger craft is developed based on an Ordinary strip Method (OSM). The accuracy of this program is adequate to consider the safety of the outrigger craft in the Philippines.

2. In Head seas, the outriggers make the peak of heaving and pitching motion shift to short wave length and increase heaving and pitching amplitudes at short wave length ($\lambda/L_{pp} < 1.0$)

3. In beam seas, heaving amplitudes of the outriggers craft have a remarkable peak at the short wave length ($\lambda/L_{pp} = 0.3$). This is because that phase of heave exciting forces acting on the center-hull and two outriggers agree, as $\lambda/L_{pp} = 0.3$) is nearly equal to the distance of between the center-hull and the outrigger.

4. The outriggers significantly decrease rolling amplitudes in beam seas. This is because that the outriggers significantly increase transverse static stability and the roll natural period becomes shorter.

ACKNOWLEDGEMENTS

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INTRODUCTION OF SAFETY AT SEA FOR SMALL BOATS

W.R.B. ELSTOW

SEAFDEC, Training Department, Thailand

INTRODUCTION

It was William Shermuly, the inventor of the line-throwing rocket that saved many lives at sea who said:

"Ships lost at sea can be replaced, but lives lost at sea are gone forever".

Accidents at sea can never be entirely eliminated, but we can find ways to reduce the risk of lives being lost. The principle behind what we shall talk about today is a very simple concept.

See and be seen

The greatest problem faced by people like ourselves trying to prevent the loss of life is that professional seamen believe very much in their own abilities. They are of the view that "It will never happen to me" and therein lies the cause of the problem. The problem is in the unforeseen accident. Nobody can predict the causes of all accidents, but we can mitigate the effects.

There are maritime conventions and emergency equipment lists generated by organizations like the United Nations IMO (International Maritime Organization) and the American SOLAS (Safety Of Life At Sea) protocol, but these are only mandatory on ships above 25 tons. In this region the great majority of fishing vessels are small-scale of less than 10 tons. However, if we break down the difficulties a boat can face when at sea they fall into a few categories and it is in our own interests to use our common sense to carry aboard our boats, equipment that can help us.

Accidents at sea fall broadly into two categories: 1. Those accidents that are catastrophic resulting in the loss of the vessel, and 2. Those accidents that cause personal injury, but not the loss of the vessel.

Accident cause and effect

In the first case where accidents are catastrophic and the vessel is lost, or in effect lost, because if we are using vessels of 10 tons or under there are cheap methods of preventing the sinking of the vessel. When we say a vessel is ten tons we mean that while that is the weight of the vessel it is also the amount of water it displaces. I must be careful here because when we use the term 10 tons we are using the imperial system of measurement. If we use the metric system the displacement is said to be 10 tonnes. There is a considerable difference. The weight of an English ton is 2240lbs (also called a 'long ton') while the American ton is 2000lbs (called a 'short ton') the metric tonne is different again at 2205lbs. The word "ton" is derived from the same source as that of a 'tunne' of wine, a cask which held about 250 gallons. Tons were in use in the late 15th Century.

A gallon of water weighs 10 pounds (lbs) at 60 degrees Centigrade, and a ton of water is 224 gallons. So a vessel rated at 10 tons (imperial weights and measures) displaces 2240 gallons. However, if we look at this logically, consider the shape of a boat and how it floats in the water. A small-scale fishing boat floats with about one-third in the water and two thirds above the water. Moreover, we are lucky in that this type of vessel is commonly made of wood. Thus, if the vessel is filled with water it should not sink except for the weight of the engine and other heavy gear that may be aboard.

Now, a very simple solution for keeping the boat afloat and compensating for other weights aboard is to use four pieces of four inch diameter plastic hose capped at each end so that it is watertight and attach them on the outboard side at the top along the gunwale.

They serve two purposes, one to act as buoyancy and the other to act as a 'rubbing strake' that protects the boat from damage when it is alongside another boat, or alongside a pier. This is a very cheap and very simple solution to what is a terminal problem. Because the buoyancy is fastened at the outside of the vessel around the top edge of the gunwale (the word gunwale, pronounced gun'le, and comes from the days of the old fighting sailing ships where the cannons were sited and pointed outboard over the top edge of the rail) it also assists anyone in the water to turn the vessel right side up if it has capsized. The fisherman/fishermen can now clamber into the boat and although they cannot move, at least they are safe from sharks and can access any other safety equipment they carry.

Depending on the number of fishermen in the boat it makes sense to have and equal number of short lifelines with one end made onto fixed parts inside the hull. These should be about 4 to 5 meters long and should be stowed away but should be stowed away in such a manner that they are unobstructed by other equipment. In the event of a potential total inundation of the boat these can be tied on around the body and the knot to be used should be a bowline with a stopper knot (see sketch), which because of its nature and method of tying, does not slip. The lifeline should be tied around the upper body, under the arms and outside any protective clothing. The use of rope is second nature to seamen and is easily obtained.

Now we have the situation of a waterlogged boat lying level with the surface of the water and even when the waters are calm a boat under these circumstances is very difficult to see. Now this is where we come to the difficult part. See and be seen.

It is quite easy and except for certain items not expensive to assemble an emergency pack that is stowed in the boat and is always protected. The skipper, or whomsoever is in charge, should ensure that everyone on board the vessel knows where it is kept.

Now, what should be in the pack and why?

A means of signaling is vital. At night a torch will serve if the lights of another vessel are seen. Obviously, because the torch is for emergency use it must be kept for that purpose alone, not to be used to look for mermaids when the boat is in happier circumstances. It is a good idea to select a rubber coated, waterproof type and the skipper should remember to change the batteries every 3 months, whether the torch has been used or not. These are not horrendously expensive and apart from that, it's a good form of insurance. OK that takes care of the nighttime. Well what about the day? The answer to this is really quite simple, generally, in the tropical zones there is some sunlight and a small hand held mirror can be used. This is very easily made from a piece of hand polished stainless steel plate. It is useless to steal the hand mirror from the wife's handbag. The silver coating comes off in damp condition making it a window, not a mirror.

An obvious choice is a radio transmitter and receiver. This would be kept permanently tuned to the VHF (Very high frequency) distress and calling channel, channel 16 at 144 Mhz. This is for a fisherman, a very expensive item, so are there any alternatives? Well, yes, there is an ordinary referee's whistle will serve to attract attention over quite long distances, both in daylight and at night. The sound of a whistle is distinctive and rarely heard at sea so it will, and does, attract attention.

Although the next item is much more expensive, it is worth buying. This is a package of fluorescent floating dyestuff. A waterlogged boat will follow the surface currents of the water as will the floating dyestuff. The most visible colour is orange/yellow. This is not easily homemade because most powders are hygroscopic and absorb moisture from the air.

The next item of equipment is a very natural one for a fisherman to carry, an ordinary length of fishing line, complete with hooks and some pieces of silver paper (aluminum foil) to tie on the hook as a lure. Why fishing gear? The answer to that lies in the fact that when exposed for long periods in salt-water people become dehydrated and suffers from raging thirst. Access to fresh water is problematical, but it is a fact that the juice wrung from the body of a fish is good fresh water and will keep someone alive for a long time, moreover, the fishing gear is reusable. So separation from fresh water need not be a problem. Furthermore, the slime on the body of a fish is very rich in protein and will offset hunger quite readily. Now, what else should be in the emergency pack? An obvious choice would be a knife. It is a fact that most fishermen carry knives, but these can get lost in the activities of staying afloat. So a good knife, stainless steel and kept sharp and if it is a folded knife the joint, or hinge should be greased. As far as food value is concerned, while raw fish may not be wholly palatable, it will support life and it has the added advantage of not being fattening.

Although it is uncomfortable to be in water for long periods of time, unlike in the northern latitudes exposure is not a problem. During my time as a naval pilot we carried in our emergency packs a mylar reflective sheet that is a very good insulator against body heat loss. However, in Southeast Asia this would be an unnecessary piece of equipment. There is a form of exposure in Southeast Asia however, that can be dangerous and that is exposure to the sun. As it is uncertain how long anyone may be exposed in an accident situation it is of value to carry some short lengths of cloth or oilskin as a wrap around. This will reduce ultra-violet exposure both from direct sunlight and from ultra-violet reflection from the water. If space can be found onboard the boat a small awning should be carried to protect from ultra-violet this should be painted, at least on one side, with the brightest orange paint that can be found, if the paint is fluorescent orange, so much the better. Orange is the most conspicuous colour at sea and can be seen most easily.

From the seamanship point of view, it is a great advantage to steam a drogue of some sort. Although the vessel is inundated with water it still has some maneuverability and is the narrowest part of the boat can be presented to wind and waves this will give the best chance for the occupant(s) of the boat. A drogue may be fashioned from almost anything that is onboard, net, canvass, almost anything.

Although this may be a laborious process, and depending on the reasons for the accident a 'bailer' should be available. If it is a hole in the vessel one of the pieces of cloth used for ultra-violet protection can be passed around the hull to staunch the incoming water and the vessel can be bailed out. This may well be impossible as wave action will refill the boat, but it may be worth trying.

In terms of more expensive equipment available for distress situations, there are three types of pyrotechnic signal available (fireworks). An orange coloured flare brightly visible by day or night, an orange smoke that produces vast volumes of orange smoke and lastly two types of hand held rocket, the full sized parachute flare. This flare rises to about a thousand feet and deploys a red flare that burns for about 2 minutes retained in the air by a parachute and the much cheaper mini-flare, These are a single coloured star that is fired from an igniter no bigger than a fountain pen.

An afterthought

An ideal situation would be that each nation should have a vessel monitoring system such that the whereabouts of all vessels large and small should be known at all times.

In this day and age of sophisticated electronics and the worldwide GPS service if all vessels a smart card that could be interrogated by satellite the whereabouts of every vessel would be known. Today there are satellites built that will handle 120,000 telephone calls simultaneously so it would be no great feat to monitor 1,000,000 boats within say every 30 minutes. This would achieve two purposes. 1. If a vessel fails to respond within 1 hour, a distress situation would be called and through the GPS monitor the last known position would be known and a vessel could be dispatched to go to the area. 2. The question of illegal fishing and subsequent conflict would be resolved. This would avoid the need for expensive standing patrols of protection vessels. The inclusion of a smart card is beyond the scope of fishermen, but not of governments and the use of such a smart card should be a condition of licensing. Each country has a department of fisheries and a control room would be sited there. In the event of illegal fishing, there would be no argument, the evidence would be recorded.