PROCEEDINGS OF THE ASEAN-SEAFDEC CONFERENCE ON SUSTAINABLE FISHERIES FOR FOOD SECURITY TOWARDS 2020

"FISH FOR THE PEOPLE 2020:
ADAPTATION TO A CHANGING ENVIRONMENT"

Bangkok, Thailand, 13-17 June 2011

VOLUME II:

THEMATIC PANEL SESSIONS

The Conference was jointly organized by
the Association of Southeast Asian Nations (ASEAN)
and **the Southeast Asian Fisheries Development Center (SEAFDEC)**,
and hosted by
the Department of Fisheries, Thailand.

SEC/SP/138 FEBRUARY 2012

PREPARATION AND DISTRIBUTION OF THIS DOCUMENT

Proceedings of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment" comprise two volumes. *"Volume I: The Conference Proceedings"* publishes the summary outputs of the Conference together with all annexes, except technical papers that were presented during the Thematic Panel Sessions of the Conference; while *"Volume II: Thematic Panel Sessions"* publishes the outputs focusing on the conclusion and recommendations from the Thematic Panel Sessions together with the papers presented during the Sessions.

The Proceedings, *"Volume I: The Conference Proceedings"* and *"Volume II: Thematic Panel Sessions",* were prepared by the Secretariat of the Southeast Asian Fisheries Development Center (SEAFDEC). The Proceedings are distributed to the Conference participants, the ASEAN-SEAFDEC Member Countries, SEAFDEC Departments and concerned organizations/institutions.

BIBLIOGRAPHIC CITATION

SEAFDEC. 2012. Proceedings of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment", Volume II: Thematic Panel Sessions, 13-17 June 2011, Bangkok, Thailand, Southeast Asian Fisheries Development Center, Thailand. 311 pp.

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THE ASEAN-SEAFDEC CONFERENCE ON
SUSTAINABLE FISHERIES FOR FOOD SECURITY TOWARDS 2020
"Fish for the People 2020: Adaptation to a Changing Environment"

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I. INTRODUCTION

1. The Association of Southeast Asian Nations (ASEAN) and the Southeast Asian Fisheries Development Center (SEAFDEC) co-organized the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment" in Bangkok, Thailand from 13 to 17 June 2011. Hosted by the Department of Fisheries of Thailand, the Conference aimed to pave the way for enhancing the contribution of fisheries to food security in the ASEAN region, assess the importance of fisheries to the socio-economic enhancement of the people in the region, and address the emerging issues that impede the sustainable development of fisheries in the ASEAN region.

2. The ASEAN-SEAFDEC Conference comprised four main sessions, namely: the Inaugural Session, the Technical Session, the Senior Officials Session, and the Ministerial Session. The Program Structure of the Conference appears as **Annex 1.** Biography of the Conference Resource Persons appears as **Annex 2.**

II. CONFERENCE PROGRAM

2.1 Inaugural Session

3. The Opening Session of the Conference was presided over by H.E. the Minister of Agriculture and Cooperatives of Thailand, *Mr. Theera Wongsamut*. The Session started with Introductory Remarks by *Dr. Chumnarn Pongsri* the Secretary-General of SEAFDEC, and *Mr. Suriyan Vichitlekarn* in his capacity as the Deputy Director and Head of the Agriculture Industries and Natural Resources Division of the ASEAN Secretariat; the Welcome Remarks by *Dr. Somying Piumsombun* the Director-General of the Department of Fisheries of Thailand; and the Opening Statement by *H.E. Mr. Theera Wongsamut*, the Minister of Agriculture and Cooperatives of Thailand.

4. Following the Opening Session was Keynote Addresses on 1) **Fisheries and ASEAN Community Building** by *Mr. Suriyan Vichitlekarn* from the ASEAN Secretariat; 2) **Fisheries for Poverty Alleviation and Socio-economic Well-being of Fishers** by *Dr. Somying Piumsombun* the Director-General of the Department of Fisheries of Thailand; and 3) **Emerging Issues in World Fisheries and Aquaculture** by *Mr. Lahsen Ababouch* who is the Chief of the Fish Products, Trade and Marketing Service of the Department of Fisheries and Aquaculture of FAO.

2.2 Technical Session

2.2.1 Plenary I: Challenges and Vision on Sustainable Fisheries for Food Security in the ASEAN Region

5. Two papers related to the challenges and vision on sustainable fisheries for food security in the ASEAN region were presented, namely 1) **ASEAN Fisheries: Status and Trends** by *Dató Ahamad Sabki bin Mahmood*, Director-General of the Department of Fisheries Malaysia and concurrently the Chairperson of the SEAFDEC Council for 2011-2012; and 2) **ASEAN Fisheries Towards 2020: Challenges and Vision** by *Dr. Simon Funge-Smith*, Secretary of the Asia-Pacific Fishery Commission (APFIC), FAO Regional Office for Asia and the Pacific (FAO/RAP). The presentations were followed by discussion, which was chaired by the Secretary-General of SEAFDEC, *Dr. Chumnarn Pongsri*, with four experts served as Panelists, namely: *Mr. Suriyan Vichitlekarn* of the ASEAN Secretariat; *Mr. Ichiro Nomura*, Advisor to the President of Tokyo University of Marine Science and Technology (TUMSAT, Japan); *Dr. Naruepon Sukumasavin*, Aquatic Ecology Expert of the Department of Fisheries of Thailand; and *Dr. Stephen Hall*, Director-General of the WorldFish Center in Malaysia.

2.2.2 Thematic Panel Sessions

6. Important fisheries-related issues and concerns were discussed in these panel sessions under eight pre-identified themes. The deliberations were separated into eight panels corresponding to the eight thematic areas, namely: (1) Enhancing Governance in Fishery Management; (2) Sustainable Aquaculture Development; (3) Ecosystem Approach to Fisheries; (4) Post-harvest and Safety of Fish and Fisheries Products; (5) Emerging Requirements for Trade in Fish and Fisheries Products; (6) Climate Change Adaptation and Mitigation Towards Food Security; (7) Livelihood among Fishing Communities and Prospects of Employment in Fisheries-related Activities; and (8) Sustaining Food Supply from Inland Fisheries.

2.2.2.1 *Enhancing Governance in Fishery Management*

7. Coordinated by the SEAFDEC Marine Fishery Resources Development and Management Department (SEAFDEC/MFRDMD), the theme comprised four sub-themes, namely: (1) Can small-scale and commercial fisheries co-exist?; (2) Management of fishing capacity; (3) Co-management; and (4) Application of global instruments and regional agreements. The coverage of the Theme was introduced by *Ms. Mahyam Mohd. Isa*, Chief of SEAFDEC/MFRDMD.

8. The Theme Keynote Paper on **Enhancing Governance in Fisheries Management in Southeast Asia Towards 2020: Issues and Perspectives (Annex 3)** was presented by *Prof. Dr. Kuperan Viswanathan*, Professor of the College of Arts and Sciences of Universiti Utara Malaysia, Kedah Darul Aman in Malaysia. He started by acknowledging the efforts of the ASEAN and SEAFDEC Member Countries in paving the way for enhancing better governance of the region's fisheries within the context of the FAO Code of Conduct for Responsible Fisheries (CCRF) through the regionalized CCRF incorporating internationally accepted sets of principles and guidelines for governance and best practices in fisheries development and management. He continued by recognizing the initiatives of the ASEAN countries in responding to the requirements of other international instruments such as the International Plan of Action (IPOAs) on management of fishing capacity, conservation and management of sharks, reducing the incidental catch of seabirds, and on the Illegal, Unreported, and Unregulated (IUU) Fishing, all of which are aimed at enhancing governance in fisheries management. However, he also mentioned that there are still many challenges that confront the fisheries in the region. These include: developing co-management institutions on a larger scale and providing for representation of fishery groups at different levels; reconciling local and global agendas; identifying management knowledge base that would be acceptable to all stakeholders; developing approaches to manage conflicts in fisheries; and reforming the existing institutions to empower local communities to participate in various activities aimed at achieving fisheries management objectives.

9. Introduction of the First Sub-theme was made by the Chairperson, *Dr. Achmad Poernomo*, Executive Secretary and Research Scientist of the Agency of Marine and Fisheries Research and Development, Ministry of Marine Affairs and Fisheries of Indonesia. This was followed by the presentation of the resource paper on **Can Small-scale and Commercial Fisheries Co-exist? (Annex 4)**, which was made by *Dr. Ratana Chuenpagdee*, Associate Professor of the Department of Geography, Memorial University of Newfoundland in St. John's Newfoundland in Canada. Discussion of the issues under the First Sub-theme was facilitated by the Panelists comprising: *Dr. Magnus Torell*, Senior Advisor to the Southeast Asian Fisheries Development Center in Thailand; *Prof. Dr. Kuperan Viswanathan*, and *Prof. Dr. Yasuhisa Kato*, Professor of the Center for International Planning, Kagoshima University of Japan.

10. The Second Sub-theme was introduced by the Chairperson, *Dr. Achmad Poernomo*. Presentation of the resource paper on **Management of Fishing Capacity (Annex 5)** by *Dr. Magnus Torell* followed, and subsequently the general discussion of the issues on the Sub-theme which was led by the Panelists: *Dr. Ratana Chuenpagdee*; *Prof. Dr. Yasuhisa Kato*; *Dr. Gazi Md. Nurul Islam*, Research Fellow of the Bio-resource and Environment Laboratory, Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia; and *Prof. Dr. Masahiro Yamao*, Professor of Food Resource Economics, Hiroshima University of Japan.

11. The Third Sub-theme was introduced by the Chairperson, *Mr. Raja Mohammad Noordin Raja Omar*, Director of Research of the Fisheries Research Institute, Pulau Pinang in Malaysia. This was followed by the presentation of the resource paper on **Fisheries Co-management: Case of Southeast Asia (Annex 6)** which was made by *Dr. Gazi Md. Nurul Islam*, Research Fellow of the Bio-resource and Environment Laboratory, Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia. Discussion of the issues under the Sub-theme was led by the Panelists comprising: *Dr. Kuperan Viswanathan*; *Prof. Dr. Masahiro Yamao*; *Dr. Yugraj S. Yadava*, Director of Bay of Bengal Programme-Intergovernmental Organization in Chennai, India;

and *Dr. Satoshi Ishikawa*, Visiting Associate Professor of the Research Institute of Humanity and Nature (RIHN) in Kyoto, Japan and Associate Professor of Tokai University of Japan.

12. Introduction of the Fourth Sub-theme was made by the Chairperson *Mr. Raja Mohammad Noordin Raja Omar*, and was followed by the presentation of the resource paper on **Application of Global Instruments and Regional Agreements (Annex 7)** by *Prof. Dr. Yasuhisa Kato*, Professor of the Center for International Planning, Kagoshima University of Japan. Discussion of the Sub-theme was led by the Panelists: *Dr. Ratana Chuenpagdee*, *Dr. Magnus Torell*, *Dr. Yugraj S. Yadava*, and *Prof. Dr. Kuperan Viswanathan*.

13. The summary of the recommendations under **Theme 1:** ***Enhancing Governance in Fishery Management*** that were raised during the general discussions, includes the following:

(1) **Sub-Theme 1.1: Can Small-scale and Commercial Fisheries Co-exist?**

- Carry out appropriate assessment of fisheries institutions and governance systems that affect the co-existence and relationship between small-scale and large-scale fishing sectors for the development of policies that promote sustainability.
- Promote better understanding of the entire fisheries value chain as well as the anticipated changes brought about by effective governance interventions in order to restore balance in fisheries.
- Consider as ways forward the removal of government subsidies and reduction of fishing capacities while channeling such subsidies to support the promotion of sustainable fisheries.
- Recognize and adjust possible power differences among all governing actors to enable the marginalized groups to fully participate in the democratic, transparent and accountable processes.
- Consider the aspects of solving over-capacity and finding effective governance arrangement that support the co-existence of small-scale and large-scale commercial fisheries, as priority issues in fisheries governance.
- Develop a roadmap to alleviate competition over the same resources between small-scale and large-scale fisheries.
- Develop co-management system that could be equally participated by both small-scale and large-scale fisheries.
- Minimize the financial, technical and political gaps between the small-scale and large-scale fisheries sub-sectors.
- Manage large-scale fisheries properly in order to secure the resources and habitat thereby improving the well-being of small-scale fisherfolks.
- Gear-up regional initiatives that support both small-scale and large-scale fisheries to produce competitive products that have better access to national, regional and international markets.
- Specify the role of governments in managing small-scale and large-scale fisheries.
- Develop small-scale and large-scale fisheries sectors mutually and not in isolation.
- Improve collection of information on small-scale fisheries in order to better understand this fisheries sub-sector.
- Carry out careful examination of the values, principles and images of small-scale fisheries embraced by public and private sectors in the state, market and society in order to understand the positioning of small-scale fisheries with regards to large-scale fisheries.
- Ensure holistic governance of the two different fisheries (small-scale and large-scale) by going beyond management of fisheries *per se* but also considering other livelihood opportunities thereby calling for broad framework such as for example the integrated coastal management.

(2) **Sub-Theme 1.2: Management of Fishing Capacity**

- Ensure that management of fishing capacity (and combating illegal fishing) as emphasized during the ASEAN-SEAFDEC and FAO/APFIC consultations, is promoted as key to fisheries management, and provide guidance to ASEAN countries in promoting the development of regional and sub-regional initiatives to improve fisheries management arrangements and in directly addressing the issues of fishing capacity as well as in combating illegal and destructive fishing activities.
- Improve the collection of information on fisheries number, size and structure of vessels, types and number of gear, and number of people involved in fishing in order to establish a clear picture of the fisheries in the region.
- Strengthen institutional links at the national and regional levels in order to promote regional and sub-regional cooperation and coordination for managing fishing capacity and combating IUU fishing considering that the countries in the region are both “port states” and “flag states”.

- Encourage countries to evaluate/assess the limitations of their respective national laws in order to be able to implement the Agreement on Port State Measures and other relevant instruments aimed to combat IUU fishing.
- Strengthen the capacities of the countries in the region to improve fisheries management and to combat IUU fishing, by mobilizing the lead countries responsible for the "Key Clusters" under the ASEAN Fisheries Consultative Forum (AFCF) mechanism.
- Develop programs to promote capacity building of all stakeholders including technical persons, scientists, policy makers, legal officers, inspectors, economists, and the like.
- Provide a clear definition of fishing vessels, refrigerated transport vessel, supply vessels, transshipment vessels, and reefers (by SEAFDEC and RPOA IUU Fishing).
- Strengthen institutional capacity building to enhance fisher's participation in fisheries decision-making.
- Develop co-management arrangements as means of reducing transaction costs for monitoring and surveillance as fishers are capable of successfully protecting their resources and enforcing their respective local fisheries rules.
- Identify high technologically efficient and destructive gears, and impose license limitation strategies as means of reducing fishing effort.
- Develop long-term conservation-based management plan as part of fishing capacity management.
- Promote local level governance arrangement, including self-enforcement, as possible options in managing fishing capacity.
- Ensure that sharing of information to facilitate regional collaboration in fishing capacity should also include information that could depict the characteristics of fishers and the fisheries.
- Regionalize the international fisheries standards and certification in global trading system in order to address the tropical characteristics of small-scale fisheries of the region.

(3) **Sub-theme 1.3: Co-management**

- Examine the concept of purely community-based management as this may not be adequate in dealing with problems that arise outside the communities.
- Design a decentralization program that fits in with local reality.
- Promote zoning of fishing areas and identification of stakeholders (who has the rights and responsibility to the natural resources) in order to strengthen co-management.
- Put more focus on community development of the stakeholders for co-management to ensure wider participation and investigate the possibility of enhancing their potential abilities in resource utilization.
- Promote collaboration between local community, government and researchers groups including NGOs and universities, to ensure successful implementation of co-management.
- Conduct field surveys and information collection by fishing area for the purpose of identifying management reference points and benchmarking, considering the diverse ecosystem structures and features in tropical fisheries.
- Establish strong institutional and organizational arrangements to ensure that appropriate frameworks are available for stakeholders to refer to.
- Strengthen adequate capacity building of primary stakeholders and 'handholding' until the process of co-management is completed.
- Create an atmosphere that reflects strong political will and support to the process of co-management.
- Develop new institutional and organizational arrangements in co-management that would encourage governments to move away from directive-based management to consultative management leading to more open, accountable, transparent, and autonomous management processes.
- Facilitate the establishment of community rights over fisheries by governments and NGOs.
- Foster the support of NGOs in community-based fisheries as this could be the only promising approach for managing small-scale fisheries.

(4) **Sub-theme 1.4: Application of Global Instruments and Regional Agreements**

- Initiate modification to the global instruments to avoid confusions in achieving sustainable fisheries taking into consideration the regional specificities.
- Develop a system that could promote a gradual shift of government services towards technical services on management by fishers through co-management arrangements.
- Establish a system of co-management using group user-rights that could answer the fundamental question of 'who owns the fish' before moving forward.

- Promote with prudence the implementation of the provisions of the international instruments and agreements by the ASEAN countries within the set time-frame, and address the concerns on the adaptation of the provisions of the voluntary and non-binding instruments and agreements to meet the local level conditions, so that the communities would not be put to a disadvantage.
- Strengthen capacity for monitoring and control instead of surveillance, enhance the ability and institutional framework of each country as a basis for "simple effective enforcement systems", and promote information sharing and dialogues with neighboring countries.

2.2.2.2 *Sustainable Aquaculture Development*

14. The Theme which was coordinated by the SEAFDEC Aquaculture Department (SEAFDEC/AQD), has four Sub-themes, namely: (1) Meeting Social and Economic Challenges in Aquaculture; (2) Quality Seed Production for Sustainable Aquaculture; (3) Healthy and Wholesome Aquaculture; and (4) Maintaining Environmental Integrity through Responsible Aquaculture. The coverage of the Theme was introduced by *Dr. Joebert D. Toledo*, Chief of SEAFDEC/AQD in the Philippines.

15. Presentation of the Keynote Paper on **Sustainable Aquaculture Development for Food Security in Southeast Asia Towards 2020: Issues and Perspectives (Annex 8)** was made by *Dr. Sena de Silva*, Director-General of the Network of Aquaculture Centres in Asia-Pacific (NACA) in Bangkok, Thailand, and Professor of the School of Life and Biological Sciences, Deakin University in Victoria, Australia. In his keynote address, he explained the status of aquaculture in Asia-Pacific and its important role in meeting the fish food needs. He added that with the rapid growth of population and the current consumption which is 29 kg/caput/year, an extra 30 million tons will be needed by 2050. He also pointed out that in the Asian region which supplies over 90% of global aquaculture production, a great bulk of aquaculture is small-scale and will remain small-scale. Hence, there is a need to develop strategies that will address the challenges confronting the small-scale farmers. He also cited that climate change impacts, globalization and the expanding trade have impacted significantly on the aquaculture sector specifically the increasing emphasis on requirements for food quality and safety. He surmised that there is a looming food crisis globally but there is a way out if Governments will improve regulations and if strategies will focus on *the plight of small farmers*. He also added that to meet the general challenges in aquaculture, there should be a *gradual paradigm change in cultured commodities accompanied by a shift on consumption habits.*

16. The First Sub-theme was introduced by the Chairperson *Mr. Miao Weimin*, Aquaculture Officer of the FAO Regional Office for Asia and the Pacific in Bangkok, Thailand. This was followed by the presentation of the resource paper on **Meeting Social and Economic Challenges in Aquaculture (Annex 9)** by *Dr. Nerissa D. Salayo*, Associate Scientist of SEAFDEC Aquaculture Department in the Philippines. Discussion on the issues under the Sub-theme was led by the Panelists comprising: *Dr. Le Xuan Sinh*, Senior Lecturer of the Department of Fisheries Management and Economics, Cantho University of Vietnam; *Dr. Maripaz Perez*, Regional Director for Asia of the WorldFish Center in Malaysia; and *Mr. Renato F. Agbayani*, Head of Training and Information Division of SEAFDEC Aquaculture Department in the Philippines.

17. Introduction of the Second Sub-Theme was also made by the Chairperson *Mr. Miao Weimin*, and was followed by the presentation of the resource paper on **Supply of Good Quality Seed for Sustainable Aquaculture (Annex 10)** made by *Dr. Ma. Rowena Romana-Eguia*, Head of the Technology Verification and Demonstration Division of SEAFDEC Aquaculture Department in the Philippines. The discussion of the issues under the Sub-theme was led by the Panelists: *Dr. Felix Ayson*, Scientist and Leader of Marine Fish Program of SEAFDEC Aquaculture Department in the Philippines; *Prof. Dr. Peter Edwards*, Emeritus Professor of the Asian Institute of Technology in Thailand; *Prof. Dr. Uthairat Nanakorn*, Director of Research and Development Institute, Kasetsart University in Thailand; *Dr. Ketut Sugama*, Director-General of Aquaculture, Ministry of Marine Affairs and Fisheries in Indonesia; and *Dr. Koichi Okuzawa*, Chief Researcher of the Aquaculture Technology Division, National Research Institute of Aquaculture, Fisheries Research Agency of Japan.

18. The Third Sub-theme was introduced by the Chairperson *Dr. Michael Phillips*, Senior Scientist of the WorldFish Center in Malaysia. This was followed by the presentation of the resource paper on **Healthy and Wholesome Aquaculture (Annex 11)** by *Dr. Relicardo M. Coloso*, Scientist of the Nutrition and Feed Development Section of SEAFDEC Aquaculture Department in the Philippines. The discussion of the issues under the Sub-theme was led by the Panelists, comprising: *Mr. Miao Weimin*; *Dr. Celia Lavilla-Pitogo*, Director of Aquatic Animal Health for Integrated Aquaculture in Brunei Darussalam; *Dr. Hiroshi Ogata*, Fish Nutrition Advisor of the National Research Institute of Aquaculture, Fisheries Research Agency in Japan; and *Dr. Mali Boonyaratpalin*, Fisheries Advisor of the Department of Fisheries of Thailand.

19. Introduction of the Fourth Sub-theme was also made by the Chairperson *Dr. Michael Phillips* and was followed by the presentation of the resource paper on **Maintaining Environmental Integrity through Responsible Aquaculture (Annex 12)** which was jointly made by *Dr. Evelyn Grace de Jesus-Ayson*, Head of Research Division of SEAFDEC Aquaculture Department in the Philippines; and *Dr. Wenresti Gallardo*, Associate Professor and Coordinator of the Aquaculture and Aquatic Resources Management of the Asian Institute of Technology in Thailand. The discussion of the issues under the Sub-theme was led by the Panelists comprising: *Dr. Atsushi Ishimatsu*, Professor of the Institute for East China Sea Research, Nagasaki University in Japan; *Dr. Michael Pido*, Director of the Palawan State University in the Philippines; *Dr. Donald Macintosh*, Coordinator for Asia of the World Conservation Union (IUCN) and Mangroves for the Future (MFF) Initiative, IUCN Asia Regional Office in Bangkok, Thailand; and *Dr. Sena de Silva*, Director-General of NACA.

20. The summary of the recommendations under **Theme 2: *Sustainable Aquaculture Development*** that were raised during the general discussions, includes the following:

(1) **Sub-theme 2.1: Meeting Social and Economic Challenges in Aquaculture**

- Assess the role of aquaculture in poverty alleviation to serve as basis for policy formulation.
- Craft enabling policies and formulate mechanisms (*e.g.* cluster approach for small-scale farmers) to facilitate adoption of better management practices (BMPs) for sustainable aquaculture.
- Develop and implement strategic investments and financing programs for aquaculture operations and capital structures.
- Address emerging issues on the impacts of climate change and global trade on aquaculture with emphasis on small-holder farmers.
- Enhance multi-agency collaboration among important players (*i.e.* Member Countries, SEAFDEC and regional/international organizations).

(2) **Sub-theme 2.2: Quality Seed Production for Sustainable Aquaculture**

Producing and distributing good quality seeds

- Continue research on existing genetic resources and improve these for use in aquaculture.
- Promote the production and distribution of quality seeds through:
  - Establishment of certified government/private hatcheries as sources of quality seeds;
  - Dissemination of new breeding technologies and techniques for effective distribution and maintenance of improved strains;
  - Enhancement of the capacity of small-scale farmers and hatchery operators in adopting new simple technologies and innovations;
  - Support to small-scale farmers in gaining access to quality broodstock and seeds produced through farmer-friendly broodstock management methods;
  - Establishment of effective marketing or distribution links/channels; and
  - Implementation of sound policies that will promote better management practices (BMPs).
- Implement mechanisms for control of translocation of stocks.

(3) **Sub-theme 2.3: Healthy and Wholesome Aquaculture**

Producing safe aquaculture products with the least environmental impacts

Nutrition and effective feed management to promote healthy farmed aquatic animals

- Ensure that nutrition and effective feed management promote healthy farmed aquatic animals.
- Improve the efficient use of aquatic feeds by: (1) strictly regulating the quality of manufactured feed and feed ingredients; and (2) supporting research for developing suitable alternative protein sources.
- Encourage the culture of species requiring no or low fish meal content in their feed.
- Apply effective feeding management practices and widely promote these to all levels of fish farmers (small-, medium- and large-scale operators).

Disease diagnosis, control, monitoring and surveillance

- Strengthen the countries' capabilities in disease diagnosis, control, monitoring and surveillance.
- Ensure widespread use of standardized diagnostic testing methodologies.
- Provide support in training and information dissemination to facilitate the use of affordable, field-friendly methods of detection and screening of diseases (by the governments).
- Conduct large-scale field trials or evaluation surveys to scientifically assess the efficacy of probiotics and immunostimulants.

- Apply widely the concept of biosecurity (through Good Aquaculture Practices; compliance to Codes of Conduct).
- Engage in development of high health and diseases resistant broodstock to facilitate access of small-scale hatchery operators (by the governments).
- Enhance collaboration among agencies to prevent and control serious disease outbreaks while Member Countries should support coordinated regional initiatives to handle new and emerging diseases.
- Extend surveillance of diseases to wild population of aquatic animals.

Environmental integrity, certification and food safety

- Create and enforce regulations (for instance, zoning of aquaculture areas) to avoid conflicts in use of common resources and at the same time promote the farming of healthy and wholesome aquaculture products.
- Develop and implement the ASEAN guidelines for good aquaculture practices to secure food safety of aquaculture products.
- Encourage good practices in aquaculture such as the FAO Technical Guidelines on Aquaculture Certification.

(4) **Sub-theme 2.4: Maintaining Environmental Integrity through Responsible Aquaculture**
Maintaining environmental integrity and adapting to climate change impacts

Protecting the environment

- Implement strategies to (1) strictly monitor and regulate aquaculture operations; and (2) prevent over development (for instance, adopting the concept of environmental carrying capacity to prevent aquatic pollution).
- Intensify information dissemination on feeding management schemes.
- Promote the use of various culture technologies that integrate aquaculture with the environment (*e.g.* aqua-silviculture, integrated multitrophic aquaculture systems-IMTA).
- Adopt precautionary approach to safeguard the environment from the acceleration of offshore aquaculture.

Adapting to climate change

- Define and implement strategies for mitigating greenhouse gas emissions from aquaculture.
- Conduct mapping of aquaculture sites that are vulnerable to climate change.
- Identify aquaculture species, strains, farming systems, techniques that will adapt better to climate change.
- Assess and improve infrastructures/habitat to ensure safety of coastal farming communities.
- Enhance awareness on the importance of aquaculture in climate change initiatives.
- Increase resilience and overall capacity of various stakeholder groups through training and knowledge transfer.
- Improve cooperation within the aquaculture sector and with other sectors.

2.2.2.3 *Ecosystem Approach to Fisheries*

21. The Theme which was coordinated by SEAFDEC Training Department (SEAFDEC/TD) was introduced by *Mr. Bundit Chokesanguan*, Head of the Information and Training Division, SEAFDEC/TD in Thailand. The Theme covered three Sub-themes, namely: (1) Ecosystem Interventions; (2) Resource Enhancement and Habitat Improvement; and (3) Reduction of Impacts from Fishing on Marine and Coastal Environment.

22. The Keynote Paper on **Ecosystem Approach for Sustainable Development of Fisheries in Southeast Asia Towards 2020: Issues and Challenges** was presented by *Dr. Simon Funge-Smith*, Secretary of the Asia-Pacific Fishery Commission, and Senior Fisheries Officer of the FAO Regional Office for Asia and the Pacific in Bangkok, Thailand. He stressed that ecosystem approach to fisheries (EAF) is an integrated management system to promote sustainable fisheries development, and in implementing the EAF, there is a need to balance the objectives of human and environmental well-being within an effective governance framework. As an integrated management system, EAF includes all important factors of the ecosystem and the different activities of humans, can be implemented at various levels of the government, and can be integrated with broader ecosystem management schemes.

23. The introduction of the First Sub-theme was introduced by the Chairperson *Dr. John C. Pernetta*, Freelance Fisheries Management Consultant from Thailand, and was followed by presentation of two resource papers. The first on **Understanding the Ecosystem Approach to Fisheries and Its Applicability in Southeast Asia (Annex 13)** was presented by *Ms. Panitnard Taladon*, Head of Training and Fishery Extension Section, Information and Training Division of SEAFDEC/TD in Thailand, while the second on **Implementing the Ecosystem Approach to Fisheries (EAF) in the Bay of Bengal Large Marine Ecosystem (BOBLME) Project (Annex 14)** was presented by *Dr. Rudolf Hermes*, Chief Technical Advisor of the Bay of Bengal Large Marine Ecosystem (BOBLME) Project based in Phuket, Thailand. Discussion of the issues under the Sub-theme was led by the Panelists comprising: *Dr. Simon Funge-Smith* and *Mr. Cristopher Paterson*, Advisor of the Secretariat of the Pacific Community in Fiji.

24. The Second Sub-theme was also introduced by the Chairperson *Dr. John C. Pernetta*. This was followed by the presentation of two resource papers. The first paper on **Resource Enhancement through Fisheries *Refugia* (Annex 15)** was presented by *Mr. Noel Barut*, Deputy Executive Director (*a.i.*) of the National Fisheries Research and Development Institute, Bureau of Fisheries and Aquatic Resources in the Philippines, and the second paper on **Fisheries *Refugia*** was presented by *Mr. Christopher Paterson*. Discussion on the issues under the Sub-theme was led by the Panelists: *Mr. Pirochana Saikliang*, Director of the Deep Sea Fisheries Research and Technology Development Institute, Department of Fisheries of Thailand; and *Mr. Wudianto*, Senior Scientist of the Research Center for Fisheries Management and Conservation in Indonesia.

25. Introduction of the Third Sub-theme was made by the Chairperson *Mr. Bundit Chokesanguan*, and was followed by the presentation of three resource papers. The first paper on **Reducing the Impacts of Fishing Activities on Coastal and Marine Environments in the Southeast Asian Waters: A Regional Synthesis (Annex 16)** was presented by *Dr. Worawit Wanchana*, Head of Capture Fishery Technology Division of SEAFDEC Training Department in Thailand, the second paper on **Ecosystem-based Technology and Management for Capture Fisheries, with Case Studies on Light Fishing: Experiences in Japan (Annex 17)** by *Dr. Takafumi Arimoto*, Professor of the Tokyo University of Marine Science and Technology in Japan; and the third paper on **Modifying Fishing Gears and Fishing Strategies to Reduce Seabed Impact and Fuel Consumption** was presented by *Dr. Christopher Glass*, Director of Northeast Consortium, Institute for the Study of Earth Oceans and Space, University of New Hampshire in the U.S.A.

26. The summary of the recommendations under **Theme 3: *Ecosystem Approach to Fisheries*** that were raised during the general discussions, includes the following:

(1) **General Recommendations**

- Develop comprehensive indicators for long-term planning and decision making on Ecosystem Approach to Fisheries (EAF), taking into consideration its aspects which are difficult to measure especially the characteristics of ecosystem which appear to be uncertain and complex.
- Make use of co-management as tool suitable for EAF although this could pose challenge for managers and build the interdependence of the two aspects of EAF such as ecosystem and human well-being.
- Expand the scale of EAF projects to make these applicable not only for the beneficiaries of pilot projects or the participating communities but for a wider audience, but develop realistic scale for short-term EAF projects.
- Develop extensive framework for EAF starting with 5-year framework as starting point, and establish network of community-based management.
- Develop formal process of collaboration and communication for fisheries agencies within countries and among countries.
- Establish standardized methods for monitoring EAF projects for countries to provide their inputs on the progress in a form of score card, and share information with other countries.
- Develop online data repository that could be accessed by resource managers and policy makers.
- Establish regional technical groups comprising agency representatives based on boundaries of large/regional ecosystems.

(2) **Sub-theme 3.1: Ecosystem Interventions**

- Promote inter-agency cooperation to make EAF work, and encourage ministries to work together, *e.g.* cooperation among ministries on fisheries, environment and tourism as well as other ministries.
- Develop consensual information to support EAF.

- Recognize the value of connecting small community-based management areas or protected areas, to work towards improving habitat and production.
- Build capacity of fishers, managers and other stakeholders on general ecology, and conduct scientific research to underpin EAF.
- Develop social safety nets as the impact of failures in relation to EAF could be huge, although there is remote chance for large-scale failure in the region because of catch diversity (multi-species).
- Promote the concept of Local Commons (as practiced in Japan) considering that the philosophy of the "Tragedy of Commons" could have some influence in fisheries management in coastal waters, by introducing the idea that "the front of sea is one's own garden under one's responsibility, and fish is one's own property to be conserved for next generation".

(3) **Sub-theme 3.2: Resource Enhancement and Habitat Improvement**

- Maximize the benefit-cost ratio in resource enhancement.
- Promote sustainable management rather than prohibition of fishing operations.
- Build up on collaboration between fisheries and eco-tourism which is usually successful at local level, and promote such collaboration at national level.
- Establish cross-sectoral coordination considering that information available with other agencies is also necessary for effective fisheries management.
- Consider biodiversity objectives in the selection of MPA sites in addition to the adoption of no take zones which is the main target of developing coastal areas into MPAs in the ASEAN region.
- Develop ways of identifying critical areas and period of closed season in the implementation of fish refugia.
- Address the lack of expertise on larvae identification in the region to be able to identify the critical areas and closed season.
- Put emphasis on training in larvae identification and training of trainers in this area.
- Select properly the important and area criteria where conservation and rebuilding of fish stocks could be carried out.
- Address the misconception of information failure in fisheries in which case education is necessary.
- Consider the experience of Thailand in crab banking for restocking and conservation of resources.
- Consider the ecological aspects in enhancing coastal areas and social well-being of stakeholders.
- Provide information on basic aspects and not on science *per se* to extension workers who in turn could provide the information to fishers, in which case appropriate training programs should be developed for extension workers and trainers.
- Promote eco-tourism as good support and big aspect for community development, to attain increased economic and improved social well-being of fisherfolks.
- Consider communication as essential for the community in a wider and higher level of management, *e.g.* fisheries/environment and tourism sectors.

(4) **Sub-theme 3.3: Reduction of Impacts from Fishing on Marine and Coastal Environments**

- Establish gear management plan and promote gear selectivity supported by legislations and regulations.
- Implement management measures for ecologically friendly and selective fishing gears and practices that reduce the negative impacts on biodiversity and the environment.
- Promote regional capacity building programs to increase awareness of responsible fishing technologies.
- Conduct regular dialogue and enhance involvement of stakeholders in project development, implementation and monitoring to enhance awareness, cooperation and sustainability.
- Consider long-term monitoring of catch composition for fish species and sizes.
- Promote the use of renewable energy and balance selective fishing against energy optimization.
- Conduct energy audits to fundamentally promote efficient fishing operations.
- Minimize cost of fuel consumption especially in lights fishing (*e.g.* use of LED for light fishing).
- Incorporate climate change adaptation strategies into fishing policies to achieve low carbon high efficiency economy.
- Consider modification of fishing gears' selectivity.
- Promote set net fisheries as a community operation and enhance community involvement in the fisheries.
- Link the idea of livelihood and fisheries management.
- Relate community subsidies with fisheries management.
- Consider the impacts of aquaculture to the environment.

- Consider the impacts of fish consumers on the fishery resources and the environment.
- Consider reducing the cost of investment of artisanal fisheries.
- Strengthen and promote the Network for the Reduction of Impact of Fishing on Coastal and Marine Environment (IFCOME).
- Develop National Plans of Action on reduction of impacts of fishing on environment.
- Regulate the implementation of incentives and subsidies.

2.2.2.4 *Post-harvest and Safety of Fish and Fisheries Products*

27. The Theme which was coordinated by SEAFDEC Marine Fisheries Research Department (SEAFDEC/MFRD) was introduced by *Mr. Yeap Soon Eong*, Chief of SEAFDEC/MFRD in Singapore. The Theme covered three Sub-themes, namely: (1) Improving Fish Handling, Processing and Preservation; (2) Improving Traditional Products; and (3) Quality, Safety and Control Systems for Fish Products.

28. The Keynote Paper on **Fish Utilization and Trade (Annex 18)** was presented by *Dr. Lahsen Ababouch*, Chief of Fish Products, Trade and Marketing Service of the Department of Fisheries and Aquaculture, FAO in Rome, Italy. He emphasized that being a highly perishable commodity, fish is often processed to conserve its nutritional properties and prolong its shelf life. Fish is processed in a great variety of ways and product forms, and is generally distributed as live, fresh, chilled, frozen, heat-treated, fermented, dried, smoked, salted, pickled, boiled, fried, freeze-dried, minced, powdered or canned, or a combination of two or more of these forms. The many options for processing fish allow for a wide range of tastes and presentations, making fish one of the most versatile food commodities. Yet, unlike many other food products, processing does not necessarily lead to greater value than that of premium fresh fish. In fact, for many fish species, premium fresh gutted fish can fetch the highest price. Of the fish destined for direct human consumption, fish in live or fresh-fish form has been the most important product, with a share of 49.1% followed by frozen fish (25.4%), prepared or preserved fish (15.0%) and cured fish (10.6%). Specifically in Asia, a large proportion of fish is marketed in live or fresh forms representing 60% of fish destined for human consumption. However, notwithstanding technical changes and innovations, many of the Asian countries still lack adequate infrastructure, especially properly equipped landing centers with access to electricity, potable water, roads, ice plants, cold rooms and refrigerated transport. These factors, combined with tropical temperatures, lead to high percentage of post-harvest losses and quality deterioration. Furthermore, market infrastructure and facilities are often limited and congested, increasing the difficulty of marketing the very highly perishable fish.

29. Introduction of the First Sub-theme was made by the Chairperson *Mr. Yeap Soon Eong*, followed by an overview of the Sub-theme on **Post-harvest and Safety of Fish and Fisheries Products (Annex 19)** which was reported by *Mr. Leonard G. Limpus*, Chief Executive Officer, L.G. Limpus Associates, Food/Fish Quality Management Consultants in Australia, and presentation of four resource papers. The first paper on **Emerging Trends in Fish Processing Technology** was presented by *Mr. Goh Kian Heng*, Assistant Director of Supply Chain Section, Post-Harvest Technology Division of the Agri-Food & Veterinary Authority of Singapore; the second paper on **Improvement of Fish Handling, Processing and Preservation (Annex 20)** was presented by *Mr. Suthipong Thanasarnsakorn*, Head of the Fisheries Engineering Section of SEAFDEC Training Department in Thailand; the third paper on **International Experience in Maximizing Fish Utilization** was presented by *Dr. Lahsen Ababouch*; and the fourth paper on **By-product Utilization** presented by *Mr. Bordin Iddhibongsa*, Officer of the Fishery Technological Development Division, Department of Fisheries of Thailand. Discussion of the issues under the Sub-theme was facilitated by the Panelists: *Mr. Goh Kian Heng, Mr. Suthipong Thanasarnsakorn, Dr. Lahsen Ababouch,* and *Mr. Bordin Iddhibongsa.*

30. The Second Sub-theme was introduced by the Chairperson *Mr. Leonard G. Limpus* who also presented an overview of the Sub-theme, which was followed by the presentation of four resource papers. The first paper on **Traditional Fish Products: National and Regional Markets and Trade** was presented by *Mrs. Fatima Ferdouse*, Chief of Trade Promotion Division, INFOFISH in Malaysia; the second paper on **Improved Traditional Fish Products: Quality, Marketing and Trade (Annex 21)** by *Dr. Melanie R. Guerra*, Supervising Aquaculturist of the Bureau of Fisheries and Aquatic Resources in the Philippines; the third paper on **Traditional Fish Products** by *Ms. Varatip Somboonyarithi*, Head of Fishery Technological Development Division of the Department of Fisheries of Thailand; and the fourth paper on **Safety of Traditional Fish Products: From Home Industry to Small and Medium Enterprises** was presented by *Mr. Mohd Nor bin Noordin*, Head of Processing and Fish Handling of the Department of Fisheries Malaysia. The discussion of the issues under the Sub-theme was led by the Panelists comprising: *Mrs. Fatima Ferdouse, Dr. Melanie R. Guerra, Ms. Varatip Somboonyarithi*, and *Mr. Mohd Nor bin Noordin*.

31. The Third Sub-theme was introduced by the Chairperson *Dr. Lahsen Ababouch* with the overview presented by *Mr. Leonard G. Limpus*, and followed by the presentation of four resource papers. The first paper on **Harmonizing Fish Import and Export Inspection and Certification Systems** was presented by *Dr. Lahsen Ababouch***;** followed by the second paper on **Harmonizing Laboratories within the ASEAN Region** which was presented by *Ms. Saw Huiyi*, Scientist of the Post-harvest Technology Division, Technology and Industry Development Department of the Agri-Food & Veterinary Authority of Singapore; the third paper on **Quality, Safety and Control System for Fish Products (Annex 22)** by *Dr. Simson Masengi*, Deputy Director of Small-Medium Processing Enterprises, Directorate General of Fisheries Product Processing and Marketing, Ministry of Marine Affairs and Fisheries of Indonesia; and the fourth paper on **New Challenges: Safety of Freshwater Fish, Aquaculture Safety and Certification, and Traceability of Fisheries Products** was presented by *Mrs. Niracha Wongchinda*, Senior Expert in Fishery Products of the Department of Fisheries of Thailand. Discussion on the Sub-theme was led by the Panelists, namely: *Dr. Lahsen Ababouch, Ms. Saw Huiyi, Dr. Simson Masengi*, and *Mrs. Niracha Wongchinda.*

32. The summary of the recommendations under **Theme 4:** ***Post-harvest and Safety of Fish and Fisheries Products*** that were raised during the general discussions, includes the following:

(1) **Sub-theme 4.1: Improving Fish Handling, Processing and Preservation**

Improve human resources and expertise in fishery post-harvest technology by:

- Developing training programs on post-harvest technology which could be used by extension workers.
- Conducting training programs for trainers from both the government and industry on critical aspects of handling, processing, distribution and marketing in the fish supply chain and implementation of the cold chain at all levels.
- Developing standard training requirements on fish handling as part of the requirements for issuance of permits for fishing vessel crews at all levels.
- Developing guidelines for specialized on-board handling or on-shore activities.

Improve national infrastructure by:

- Encouraging governments through their national development activities to improve fisheries infrastructure where appropriate.
- Developing guidelines for small-scale fisheries infrastructure requirements for landing areas.
- Developing standards and guidelines for fishing vessel design and construction taking into consideration on-board fish hygiene.

Improve handling, processing, distribution and marketing by:

- Developing guidelines for handling live fish.
- Continuing work on the development of value-added products, particularly for low value fish using low-cost methods as appropriate.
- Conducting studies on distribution and marketing of fish and investigating the means of redistributing benefits along the supply chain towards primary producers.
- Conducting studies on economic returns of low value fish.
- Conducting baseline studies on post-harvest losses.
- Conducting research on energy efficient ways to preserve fish on-board and during transportation.
- Conducting research on appropriate tools, equipment and techniques for fish handling on-board.

Increase utilization of under-utilized species, by-products, and recovery of processing waste by:

- Continuing research on optimum utilization of under-utilized species.
- Conducting studies on waste reduction and recovery, and environmental impact of fish waste.
- Conducting research in by-product utilization.

Improve the use of incentives/credit to promote the industry and alleviate poverty by:

- Promoting greater access to credit for post-harvest activities, and greater support to develop marketing cooperatives and/or SMEs.
- Investigating incentives to foster the demand for higher economic returns and more fish for human consumption.

(2) **Sub-theme 4.2: Improving Traditional Products – Quality, Marketing and Trade**

Improve raw materials supply and quality by:

- Conducting work on diversification of raw materials to see if different types of raw materials can be used for the same traditional product.
- Conducting work on different materials to create 'improved' traditional products.
- Enhancing community cooperation in producing raw materials and endemic (indigenous) ingredients.

Improve processing and preservation technologies and facilities by:

- Developing training programs on handling, processing, distribution and marketing of traditional products at all levels.
- Conducting work on reduction of insect infestation and use of insecticides, and the use of non-food grade additives/preservatives.
- Continuing the work on the development of traditional and value-added products, particularly using low-cost methods.
- Conducting work on improving efficiencies of processing equipment/facilities and promoting the use of alternative energy sources.

Improve packaging by:

- Conducting research on traditional and/or indigenous materials for packaging, and use of modern technology to reduce the cost of packaging and better preservation of products.
- Investigating the utilization of government-established fish processing centers to reduce the costs of processing and packaging.

Improve marketing practices by:

- Investigating marketing strategies that promote traditional fish products in urban communities.
- Investigating means whereby rural communities may gain better market access for their products.
- Promoting the concept of "One Village, One Fisheries Product (FOVOP)" initiated by SEAFDEC, and developing products and marketing strategies for this program.
- Developing a joint platform to improve international trade competitiveness of traditional products.
- Harmonizing data collection and reporting systems for traditional products.

Improve the use of incentives/credits to promote the industry and alleviate poverty, by:

- Assisting in the development of co-operatives or SME's based in fishing communities, FOVOP programs, processing centers or other means to assist traditional fish processors; and
- Investigating means whereby traditional processors could gain better access to credit or micro-credit facilities.

(3) **Sub-theme 4.3: Quality, Safety and Control Systems for Fish Products**

Implement GMP/SSOP in SMEs by:

- Developing training materials, conducting training programs for trainers, and training of industry on the implementation Good Manufacturing Practices/Standard Sanitary Operating Practices (GMP/SSOP).
- Investigating the means whereby the industry could obtain funds to incorporate GMP/SSOP.

Improve traceability methodology and capacity to deal with new emerging export requirements by:

- Investigating the current and existing traceability systems, and developing the mechanism whereby such systems can be harmonized nationally and regionally.
- Investigating new emerging issues, and examining how these could be incorporated into a harmonized certification management mechanism.

Improve harmonization between inspection systems and standards in ASEAN by:

- Studying certification and accreditation issues related to Halal and organic foods.
- Continuing ASEAN laboratory accreditation, developing methodologies and mechanisms for proficiency testing, and promoting Good Laboratory Practices (GLP).
- Continuing the process of harmonizing food/fish inspection systems and standards for common products.
- Building capacity in risk assessment and its implementation.
- Investigating how private certification schemes could be incorporated into national or ASEAN certification management mechanisms.

- Providing a platform for the sharing of information among ASEAN Member Countries on the implementation of harmonization activities within the fisheries sector.

Improve internal regulatory control, and technical manpower by:

- Developing a National Plan of Action in conjunction with other regulatory agencies to coordinate and control all aspects of fish handling, processing, distribution, and marketing.
- Encouraging the recruitment and training of quality management personnel.

2.2.2.5 *Emerging Requirements for Trade in Fish and Fisheries Products*

33. The Theme which was coordinated by SEAFDEC Secretariat was introduced by *Dr. Somboon Siriraksophon*, Policy and Program Coordinator of SEAFDEC in Thailand. The Theme covered two Sub-themes, namely: (1) Required and Compulsory Actions; and (2) Trade Facilitation and Supply Chains.

34. The Keynote Paper on **Emerging Requirements for Trade of Fish and Fisheries Products** was presented by *Dr. Lahsen Ababouch*, Chief of Fish Products, Trade and Marketing Service of the Department of Fisheries and Aquaculture, FAO in Rome, Italy. He cited that trading in fish and fisheries products is usually characterized by a wide range of product types and actors. Exporting fish is important for many economies, in particular the developing nations as it generates foreign currency earnings, in addition to its impact on employment, income and food security. Among the Southeast Asian countries, Thailand is the top three exporters of fish and fisheries products while Vietnam is experiencing significant growth in fish export linked to its flourishing aquaculture of *Pangasius* as well as marine shrimps and freshwater prawns. Nevertheless, a major barrier for fish export by developing countries is the stringent quality and safety standards and buyers' requirements for animal health, environmental and social responsibility standards. While large retail and food services in seafood distribution is shifting negotiating power towards the final stages in the value chain, more private- or market-based standards and labels are imposed on exports from developing countries. All these are making it more difficult for small-scale fish producers and operators to penetrate the international markets and distribution channels.

35. Introduction of the First Sub-theme was made by the Chairperson *Dr. Jose Ingles*, Project Leader of the World Wild Fund for Nature (WWF) Philippines, and followed by the presentation of five resource papers. The first paper on **Addressing Emerging International Fish Trade Concerns to Support the Sustainable Development of Fisheries (Annex 23)** was made by *Ms. Sawitree Chamsai*, Policy and Program Officer of SEAFDEC Secretariat in Thailand; the second paper on **Japanese Shark Research Activities in Response to Recent Change of World's Opinions on the Fishery Stock Management (Annex 24)** by *Dr. Miki Ogura*, Director of the Tuna and Skipjack Resources Division, National Research Institute of Far Seas Fisheries, Fisheries Research Agency of Japan; the third paper on **Challenges on Foreign Trade and Marketing of Fish and Fishery Products (Annex 25)** by *Mr. Saut P. Hutagalung*, Director of Foreign Market Division, Trilateral Partnership Secretariat, Ministry of Marine Affairs and Fisheries of Indonesia; the fourth paper on **Lessons Learnt on the EC Regulation to Combat IUU Fishing: Thailand Implementation on the EC Regulation to Combat IUU Fishing (Annex 26)** by *Dr. Kamonpan Awaiwanont*, Senior Fisheries Biologist, Upper Gulf Marine Fisheries Research and Development Center of the Department of Fisheries of Thailand; and the fifth paper on **Legislation and Regulation Related to Trade Measures (Annex 27)** was presented by *Atty. Benjamin F.S. Tabios, Jr.*, Assistant Director for Administrative Services, Bureau of Fisheries and Aquatic Resources of the Philippines. Discussion of the issues under the Sub-theme was led by the Panelists comprising: *Dr. Achmad Poernomo*, Executive Secretary and Research Scientist of the Agency for Marine and Fisheries Research and Development, Ministry of Marine Affairs and Fisheries of Indonesia; *Dr. Jose Ingles*; *Mr. Duncan Leadbitter*, Technical Director of the Sustainable Fisheries Partnerships, U.S.A. and Director of Fish Matter – Australia; and *Mr. Arthorn Piboonthanapathana*, Secretary of the Thai Frozen Foods Association of Thailand.

36. Introduction of the Second Sub-theme was made by the Chairperson *Dr. Somboon Siriraksophon*, which was followed by the presentation of five resource papers. The first paper on **Traceability and Food Safety Assurance (Annex 28)** was presented by *Ms. Niracha Wongchinda*; the second paper on **International Trade: Challenges for Small-scale Fishers in the ASEAN Region (Annex 29)** by *Dr. Sebastian Mathew*, Programme Advisor of the International Collective in Support of Fishworkers (ICSF) in India; the third paper on **Partnerships with the Private Sector: Key to Sustainable Seafood & Trade (Annex 30)** by *Dr. Jose Ingles*; the fourth paper on **New Standards Drive Interest in Fish Used for Fish Meal (Annex 31)** by *Mr. Duncan Leadbitter*; and the fifth paper on **Sustainable Tuna Trade in Southeast Asia (Annex 32)** was presented by *Mr. Marc Wilson*, Regional Program Manager of GEF International Pacific Waters' Integrated Water Resources Management (IWRM) Project of the Pacific Islands Applied GeoScience Commission

(SOPAC) at the Secretariat of the Pacific Community (SPC) in Fiji. Discussion of the issues under the Sub-theme was facilitated by the Panelists, namely: *Atty. Benjamin F.S. Tabios, Jr.*, *Dr. Amonpan Awaiwanont*, and *Dr. Lahsen Ababouch*.

37. The summary of the recommendations under **Theme 5:** ***Emerging Requirements for Trade in Fish and Fisheries Products*** that were raised during the general discussions, includes the following:

(1) **Sub-theme 5.1: The Required and Compulsory Actions**

- Develop standards to raise the competence of countries in trading their fish and fisheries products.
- Ensure and improve compliance to standards and requirements (consistency), *i.e.* for food quality and safety.
- Harmonize standards and requirements for the ASEAN countries.
- Improve sustainability (need protection of livelihoods of producers – fishers), and promote cooperation and partnership among producers, traders, and consumers (for better distribution of benefits).
- Improve competence and quality of fish and fisheries products for export, through capacity building of fisheries associations.
- Investigate what offers higher benefits comparing the cost in producing fish for food security of own country with producing and selling fish to other countries, considering that the numerous trade regulations make production very costly.
- Educate people and increase awareness on fish trade concerns.
- Address the concern of imposing equal and uniform application of tariffs on ASEAN Member Countries (by the ASEAN).
- Develop market-based measures, along line with international laws and standards, and private regulations.
- Benchmark the equivalence of international standards and national initiatives.
- Ensure that benefits from adopting the system of better practices and improved sustainability should trickle down to the fishers as the producers.
- Advocate the fact that trade regulations led to increasing requirements and that fisheries sustainability is affected by these regulations.
- Ensure that governments consider fish sustainability as an emergency rather than an evolving issue for better decision-making.
- Learn from lessons in solving problems related to trade regulations in the European region as these could also be very useful for the ASEAN countries.
- Consider fishers as price takers and not price makers.
- Consider the need for an ASEAN dialogue in order that the region can sell seafood following its own standards.
- Educate the stakeholders on fish trade-related issues through the use of cartoons to make information more interesting rather than using traditional documents which could be boring.
- Investigate the need for traders paying the cost of complying with the trade regulations.

(2) **Sub-theme 5.2: Trade Facilitation and Supply Chains**

- Provide platform for sharing of information among ASEAN Member Countries on traceability system, and promote the implementation of traceability systems in the ASEAN region.
- Implement traceability also for products for domestic markets.
- Improve infrastructure, *e.g.* develop a floating fish port near the fishing grounds to maintain the best state of freshness of the catch so that there is no need to catch twice as much fish.
- Build up partnership with stakeholders being part of the supply chain without neglecting the poorest of the suppliers who are very vulnerable and often left out in most development activities.

2.2.2.6 *Climate Change Adaptation and Mitigation Towards Food Security*

38. The Theme which was coordinated by SEAFDEC Secretariat was introduced by *Dr. Magnus Torell*, Senior Advisor to SEAFDEC in Thailand. The Theme covers two Sub-themes, namely: (1) Impacts of Climate Change on Fisheries and Aquaculture; and (2) Adaptation to the Climate Change.

39. The Keynote Paper on **Climate (Change) Adaptation and Mitigation: Application Towards Food Security** was presented by *Dr. Anond Snidvongs*, Director of the Southeast Asia Global Change System for Analysis, Research and Training (SEA-START) in Thailand. He accentuated on the capability of fish stocks and harvest practices and technologies in terms of exposure, sensitivity, risk, coping capacity and vulnerability

to climate change in marine (capture) fishery, inland fishery and aquaculture. He also suggested that for marine (capture) fishery adaptation could focus on reducing exposure through the use of long-lead weather forecast, reducing sensitivity based on weather proof technology, and increasing the coping capacity through surveillance/rescue, insurance/compensation. In inland fishery, the adaptation could focus on reducing exposure through proper water management (quality and quantity), reducing sensitivity by establishing *refugia* and management of "introduced" species, and increasing the coping capacity through the enforcement of closed season and adoption of restocking schemes. For aquaculture, adaptation could focus on reduced or lessened intensity of exposure through appropriate water quantity and quality control, promote area protection (erosion, severe weathers), relocation, weather/water forecast; reduced sensitivity by promoting the use of climate tolerance species, climate/weather proof technology/practices; and increased coping capacity through the introduction of insurance schemes. He added that climate contingency plans and strategies for fisheries could include the promotion of climate resilience fishery and climate friendly fishery, and adaptation of new technologies in fisheries that promote low carbon footprint.

40. The introduction of the First Sub-theme was made by the Chairperson *Dr. Worawit Wanchana*, and was followed by presentation of four resource papers. The first paper on **Climate Change and Fisheries: the Philippines Experiences (Annex 33)** was presented by *Dr. Mudjekeewis D. Santos*, Head of Marine Fisheries Research Division of the Bureau of Fisheries and Aquatic Resources in the Philippines; the second paper on **Adaptation to the Climate Change in the Fisheries Sector in Japan (Annex 34)** by *Dr. Kaoru Nakata*, Deputy Director of the Research Management Department, Fisheries Research Agency of Japan; the third paper on **Impact of Climate on Scope for Growth of Penaeid Shrimp: Results of Numerical Modeling (Annex 35)** by *Dr. Jutarat Kittiwanich*, Fisheries Biologist of the Marine Shrimp Culture Research Institute, Coastal Fisheries Research and Development Bureau, Department of Fisheries of Thailand; and the fourth paper on **Climate Change: A Challenge for Marine Transportation (Annex 36)** was presented by *Mr. Pakorn Prasertwong*, Chief of Environment Subdivision of the Marine Department of Thailand. Discussion of the issues under the Sub-theme was facilitated by *Dr. Maria Rebecca Campos*, Consultant of the International Institute of Fisheries Economics and Trade, Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) in the Philippines.

41. The Second Sub-theme was also introduced by the Chairperson *Dr. Worawit Wanchana*. This was followed by the presentation of two resource papers. The first paper on **Climate Change Adaptation and Mitigation: Fishers in the Philippines (Annex 37)** was presented by *Dr. Maria Rebecca Campos*, Consultant Consultant of the International Institute of Fisheries Economics and Trade, Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) in the Philippines; the second paper on **Adaptive Responses of Traditional Fishers to Climate Change in Indonesia (Annex 38)** was presented by *Dr. Ari Purbayanto*, Professor of the Faculty of Fisheries and Marine Sciences, Bogor Agricultural University of Indonesia; and the third paper on **Experienced and Conceptual Framework of the Modeling Study for Mitigation of the Impacts of Climate Change on Shrimp Farming in Thailand (Annex 39)** was presented by *Dr. Putth Songsangjinda*, Director of the Marine Shrimp Culture Research Institute, Coastal Fisheries Research and Development Bureau, Department of Fisheries of Thailand. Discussion on the Sub-theme was facilitated by *Dr. Mudjekeewis D. Santos*. The discussion of the issues under the Sub-theme was led by the Panelists, namely: *Dr. Magnus Torell; Ms. Suzanne Young*, Climate Change Specialist of the ASEAN-US Technical Assistance and Training Facility in Indonesia; *Dr. Mudjekeewis D. Santos; Dr. Rudolf Hermes;* and *Dr. Donald Macintosh.*

42. The summary of the recommendations under **Theme 6: *Climate Change Adaptation and Mitigation Towards Food Security*** that were raised during the general discussions, includes the following:

(1) **Key Issues on Climate Change**

- Improve capacity of fishery sector to access information since the sector is vulnerable to climate change, *e.g.* impact to both resource (sustainable use) and people (socio-economic).
- Consider it is difficult/impossible to predict climate change due to unclear/insufficient information from the region.
- Investigate the source of CO_2 emission which is not mainly contributed by the fisheries sector, and clarify misunderstanding that mangrove replanting and other relevant activities are not the only means that could contribute to the reduction of the greenhouse gas emission.
- Conduct more action-oriented research in the region on climate change because only few of such research are done in the tropical areas (*e.g*. Southeast Asia).

(2) **Things that need to be done under ASEAN framework**

- Promote awareness building (for planners and traditional fishers).
- Improve weather/climate forecast, and establish early warning systems.
- Enhance information exchange among relevant agencies.
- Explore the new technologies for reduction of the sensitivity to climate change.
- Strengthen capacity building (especially for those living in high and medium risk areas).
- Advocate effective communication on climate change at community level.
- Promote "early stock estimation/prediction" as means of mitigating the impact of climate change.
- Develop National Plans of Action for adaptation and mitigation of climate change.
- Conduct impact assessment (resource and people at all levels).
- Develop long-term and short-term mitigation measures/adaptation.

(3) **Summary of the recommendations**

Suggestions and recommendations made during the Conference were in line with the following recommendations that were developed through the ASEAN-SEAFDEC RTC (November 2010), and consequently at the APFIC Workshop on Climate Change in Nepal (May 2011):

- Ensure that fisheries aspects are incorporated in the national action plans on response to climate change.
- Integrate climate change into fisheries policy framework.
- Integrate climate change into existing fisheries and habitat management program framework.
- Develop and implement policy/program to maintain and restore coastal/inland habitats.
- Minimize the impacts from climate change to fisheries/aquaculture and the contribution from fisheries/aquaculture to climate change.
- Build up adaptive capacity of people dependent and involved in fisheries-related activities to cope with changing environment, including effects of climate change.
- Strengthen information collection, capacity building and inter-agency coordination.

2.2.2.7 *Livelihood among Fishing Communities and Prospects of Employment in Fisheries-related Activities*

43. The Theme which was coordinated by SEAFDEC Training Department was introduced by *Dr. Sebastian Mathew*, Programme Advisor of the International Collective in Support of Fishworkers (ICSF) in India and *Dr. Yugraj Singh Yadava*, Director of the Bay of Bengal Programme-Intergovernment Organization (BOBP-IGO) in India. The Theme covered five Sub-themes, namely: (1) Social and Economic Aspects of an Ecosystem Approach to Fisheries; (2) Monitoring and Recording of Social Aspects, Migratory Labor (Fishing Crews, Factory Laborers, Fishers); (3) Meeting Social and Economic Challenge Building Capacity to Adapt to Change; (4) Social Rights, Social Security and Labor (including Social Rights and Social Security in Traditional Small-scale Fisheries, Social Rights and Social Security among Migratory Fishers in Large Vessels); and (5) Safety at Sea for Small-scale Fisheries.

44. The Keynote Paper on **Promotion of Livelihood Diversification in Coastal Fishing Communities (annex 40)** was presented by *Dr. Don Griffiths*, Senior Technical Advisor of the Regional Fisheries Livelihoods Programme (RFLP), FAO Regional Office for Asia and the Pacific in Bangkok, Thailand. He stressed that many small-scale coastal fishers are very vulnerable and face numerous constraints brought about by under-developed infrastructures, lack of collateral and assets, weak extension and micro-financing services, and few livelihood diversification options. Since coastal fishers need to improve their incomes, and enhance livelihood security and resilience, diversification is important to reduce vulnerability and pressure on natural resources. Nevertheless, this should be done with caution considering that many plug-in livelihoods had failed, thus, livelihoods diversification needs holistic multi-sectoral approaches that include assessment of available standard of living assets (SLA), learning lessons from past livelihoods initiatives, strengthening sustainable livelihoods first and foremost, promotion of participatory process to identify and agree on livelihoods options, and adoption of "discovery-direction-doing" under the concept of sustainable livelihoods and economic development (SLED). He added that in dealing with people's livelihoods, it is crucial to make it right because to a poor household, failure of a new livelihood can be disastrous. It is therefore very important not to get wrong.

45. The First Sub-theme was introduced by the Chairpersons *Dr. Sebastian Mathew* and *Dr. Kungwan Juntarashote*, Associate Professor of the Faculty of Fisheries, Kasetsart University in Thailand. This was followed by the presentation of two resource papers, the first paper on **Diversification of Livelihood Strategy toward Sustainable Development of Fishing Community in Southeast Asia (Annex 41)** was made by *Dr. Masahiro Yamao*, Professor of Food Resource Economics, Hiroshima University of Japan; and the second

paper on **Social and Economic Aspects of the Mekong Fisheries (Annex 42)** made by *Dr. Suchart Ingthamjit*, Senior Professional Fisheries Biologist of the Department of Fisheries of Thailand. Discussion of the issues under the Sub-theme was led by the Panelists, namely: *Prof. Dr. Yasuhisa Kato*, Professor of the Center for International Planning, Kagoshima University of Japan; and *Dr. Don Griffiths*.

46. The Second Sub-theme was also introduced by the Chairpersons *Dr. Sebastian Mathew* and *Dr. Kungwan Juntarashote.* This was followed by the presentation of two resource papers. The first paper on **Monitoring Social Aspects of Fisheries in the ASEAN** was presented by *Dr. Sebastian Mathew*, Programme Advisor of the International Collective in Support of Fishworkers (ICSF) in India, and the second paper on **International Standards and Good Practices on Protection of Migrant Workers Applicable in the Fishing Sector** was presented by *Mr. Nilim Baruah*, Chief Technical Advisor of the Tripartite Action to Protect Migrant Workers from Labour Exploitation (TRIANGLE) Project, International Labour Organization, United Nations in Thailand. Discussion of the issues under the Sub-theme was facilitated by *Dr. Yugraj Singh Yadava*.

47. The Third Sub-theme was again introduced by the Chairpersons *Dr. Sebastian Mathew* and *Dr. Kungwan Juntarashote,* and followed by the presentation of a resource paper on **Livelihood Approach to Fishing Ground Use in the Lower Mekong River Basin: A Case Study in a Lao Village in the Korat Plateau (Annex 43)** made by *Dr. Akiko Ikeguchi*, Associate Professor of Geography, Faculty of Education and Human Sciences, Yokohama National University of Japan. Discussion of the issues under the Sub-theme was led by the Panelists, namely: *Dr. Masahiro Yamao* and *Prof. Dr. Yasuhisa Kato*.

48. The Fourth Sub-theme comprised the concerns on small-scale fishers and migrant fishers, and the concern on small-scale fishers was introduced by the Chairpersons *Dr. Yugraj Singh Yadava* and *Dr. Yuttana Theparoonrat*, Head of the Coastal and Small-scale Fisheries Management Division of SEAFDEC Training Department in Thailand. This was followed by the presentation of two resource papers, the first paper on **Social Rights and Social Security in Traditional Small-scale Fisheries (Annex 44)** was presented by *Dr. Phattareeya Suanrattanachai*, Head of Fishery Governance and Management System Section of the SEAFDEC Training Department in Thailand, and the second paper on **Livelihood among Fishing Communities and Prospects of Employment in Fisheries-related Activities: Options for Improvement and Monitoring of Change (Annex 45)** was presented by *Prof. Dr. Yasuhisa Kato*. Discussion of the issues under this concern on small-scale fishers was led by *Dr. Tatsuro Matsuoka,* Professor of Kagoshima University in Japan.

49. The second concern under the Fourth Sub-theme was introduced by the Chairpersons *Dr. Yugraj Singh Yadava* and *Dr. Yuttana Theparoonrat,* and was followed by the presentation of a resource paper on **Origins of Rights and Social Security for Fishers in Relation to Sustainable Development of Fisheries: Including Migratory Fishers and Larger Vessels (Annex 46)** by *Dr. Tatsuro Matsuoka.* Discussion of the issues under this concern on migrant fishers was facilitated by the Panelists comprising: *Mr. Nilim Baruah* and *Dr. Waraporn Prompoj*, Senior Expert on International Fisheries Affairs of the Department of Fisheries of Thailand.

50. The Fifth Sub-theme was introduced by the Chairpersons *Dr. Yugraj Singh Yadava* and *Dr. Yuttana Theparoonrat.* This was followed by the presentation of a resource paper on **Impact of Fisheries Management in Improving Safety at Sea Measures: A Case Study in Thailand (Annex 47)** made by *Mr. Bundit Chokesanguan*, Head of Information and Training Division of the SEAFDEC Training Department in Thailand. Discussion of the issues under the Sub-theme was facilitated by *Dr. Tatsuro Matsuoka.*

51. The summary of the recommendations under **Theme 7: *Livelihood Among Fishing Communities and Prospects of Employment in Fisheries-related Activities*** that were raised during the general discussions, includes the following:

(1) **Sub-theme 7.1: Social and Economic Aspects of an Ecosystem Approach to Fisheries**

Diversification of livelihood strategy towards sustainable development of fishing community in Southeast Asia

- Integrate policy for livelihood improvement at the local (households) to national levels with overall water resource planning strategy and development programs.
- Support directions for diversification of community-based livelihoods in fishing communities within (fish processing) and outside fisheries (textile/batik, local business, micro-finance) while maintaining sustainable use of resources.
- Maintain sustainable use of common-pool coastal resources while improving fishing livelihoods.
- Ensure government and external donor support to rehabilitate tsunami and similar affected areas in the region.

- Develop an integrated and comprehensive policy for livelihood improvement at the local (households) to national levels with overall water resource planning strategy and development program.

(2) **Sub-theme 7.2: Monitoring and Recording of Social Aspects, Migratory Labor**

- Promote and improve equity including gender equity, sustainability of human well-being, and respect for human rights and welfare for those who are dependent on fisheries.
- Recognize comprehensively and improve responsibly the social aspect of fishery modernization (*e.g.* choice of technology, labor access to capital and credit, access to fishing ground).
- Assess the impact of receiving migrant workers by ASEAN Member Countries in protecting the community pillar of ASEAN Community for the benefit of fishers and fisher workers.
- Ensure that international labor standards and requirements are complied with (*e.g.* the rights at work, freedom of association, rights to collective bargaining, freedom from forced labor and child labor, and non-discrimination).
- Make sure that social security aspects such as food, education, medical care and health protection, is equally provided to migratory labor as with nation's labor.
- Provide information, training and assistance on their rights, condition of life and work in the destination country to migratory labor before departure from their countries and on arrival at receiving countries.

(3) **Sub-theme 7.3: Meeting Social and Economic Challenge Building Capacity to Adapt to Change**

- Secure low-investment on-farm and off-farm livelihoods for young families preferring to stay in rural areas rather than migrating to cities to work.
- Monitor multiple uses of the Lower Mekong River Basin and its impact on floodplains, including areas with good access to urban labor market.

(4) **Sub-theme 7.4: Social Rights, Social Security and Labor**

- Encourage global and regional organizations to provide comprehensive guidelines combined with guiding principles on extreme poverty and human rights, which is integral in social inclusion, decent work and full employment along with poverty eradication.
- Promote social rights in improving social and economic conditions, and human rights.
- Put in place social security as it also performs the function of a welfare system.
- Recommend improvement of the provisions of the CCRF and Regional Guidelines, which are acceptable instruments, to include human rights principles to fulfill the social dimension of fisheries.
- Promote good practice and lessons learned concerning responsible fisheries management especially on the economic points of view: benefit, cost and increase of job opportunities to secure means of livelihoods and reduce poverty.
- Promote the adaptation of social security such as decent occupation, medical care, and safety at work under the social security convention 188-principle of social security of fishing workers.
- Provide social security pension equally to migrant workers as with the national workers.
- Make sure that pension should be paid to migrant workers when they are back to their home countries.
- Address the shortage of skilled labor and inadequate number of workers through bilateral agreement or other relevant channels.
- Ensure that enabling environment should cover four main criteria, namely: decent work onboard vessels, provision of amenities onboard such as safe drinking water, registration system for migrant workers in order to avoid illegal workforce, and prevention of labor-refusing or accepting cheap labor.
- Develop a regional guideline on decent work in fisheries sector in order to manage both national and migrant workers onboard fishing vessels, which should also include labor standards and practices.

(5) **Sub-theme 7.5: Safety at Sea**

- Develop appropriate incident reporting and investigation systems for the purpose of improving safety at sea, taking into account the following considerations:
  - Guidelines on accident reporting and analysis currently being developed by FAO;
  - Possible establishment of incentives for fishers, indemnity programs, registration systems for fishing vessels, MCS systems and subsidies to the fishing industry; and

  - Objective of the systems should be appropriate for the size of vessels and types of fishing operations and the facilities onboard.
- Promote the registration of small fishing boats.
- Promote and ensure that safety aspects, including considerations on working conditions and socio-economic development, are incorporated and addressed by concerned authorities while improving the monitoring and control of the status and use of small fishing vessels.
- Strengthen local authorities and local organizations and promote application of safety at sea standards among the coastal communities.
- Promote technical and financial support from authorities, including subsidies, at all levels for issues on safety at sea, including considerations of the working conditions and socio-economic development.
- Identify and promote the basic requirements for safety at sea in the following areas:
  - Research on the design and construction of small fishing boats including the modification of traditional type boats;
  - Safety equipment including fire fighting and life-saving appliances;
  - Regular maintenance and repair of boats, gear and equipment; and
  - Development of regular boat inspection systems.
- Implement training and education programs for all stakeholders including the fishers, family members, boat builders and others, on the basic requirements of:
  - Boat design and construction;
  - Equipment and its correct use (including avoidance of dangerous fishing practices);
  - Search and rescue operations;
  - Occupational health, working conditions and safety awareness; and
  - Awareness of environmental factors.
- Promote awareness among policy makers, central authorities and broader public on the safety hazards faced by people involved in fisheries, in order to:
  - Attract more attention and resources to be allocated to safety at sea aspects;
  - Provide knowledge on the working conditions and hardships faced by fishers (which are increasing following the impact of climate change); and
  - Raise political will to address safety at sea and strengthening of local organizations.
- Develop and promote the use of appropriate communication systems for:
  - Weather forecasting information; and
  - Search & rescue systems.
- Consider the definition of ‘small fishing boats’ and ‘operational range’ as referred to in the respective rules and laws of individual countries.

2.2.2.8 *Sustaining Food Supply from Inland Fisheries*

52. The Theme which was coordinated by SEAFDEC Marine Fishery Resources Development and Management Department (MFRDMD) was introduced by *Dr. Masaya Katoh*, Deputy Chief of SEAFDEC/MFRDMD in Malaysia. The Theme covered four Sub-themes, namely: (1) Safeguarding Food Security; (2) Sustainable Development of Inland Fisheries; (3) Towards Sustainable Community-based Management in Inland Fisheries; and (4) Integrating Fisheries with Multiple Inland Water Resources Use.

53. The Keynote Paper on **Integrating Inland Fisheries Management in Southeast Asia Towards 2020: Issues and Perspectives (Annex 48)** was presented by *Mr. Xaypladeth Choulamany*, Fisheries Program Coordinator of the Mekong River Commission (MRC) Secretariat in Cambodia. He started by acknowledging a major novelty in the present Conference where a separate panel is dedicated to inland fisheries, which was not the case during the Millennium Conference in 2001. This could be due to certain reasons that included inadequate information on the real magnitude and importance of the inland fishery sector. Although he also recognized that there are still some gaps in terms of information, it is important to discuss this sector considering that its contribution to food security in the ASEAN region has often been undervalued, while the importance of inland fisheries to developing countries in the region in terms of participation and employment of local fishers should be understood. He stressed that management of inland fisheries is necessary in order to achieve sustainable development, this is notwithstanding the rapidly changing situation with regards to the environment and the practice of extracting from it to satisfy people’s needs and secure access to food. He added that one of the most serious threats to inland fisheries is infrastructure development in rivers which impede important migration of fish species leading to transboundary repercussions on the regional fishery resource.

54. The First Sub-theme was introduced by the Chairperson *H.E. Dr. Sam Nuov*, Deputy Director-General of the Fisheries Administration of Cambodia and Vice Secretary-General of the Tonle Sap Authority of Cambodia. This was followed by the presentation of a resource paper on **Safeguarding Food Security (Annex 49)** made by *Dr. Maripaz Perez*, Regional Director for Asia and Country Manager for the Philippines, WorldFish Center in Malaysia. Discussion of the issues under the Sub-theme was led by the Panelists, namely: *Mr. Kent G. Hortle*, Chief Technical Advisor of the Mekong River Commission Fisheries Programme in Cambodia; *Mr. Wolf Hartmann*, Independent Consultant on Aquatic Resource Management of the Mekong River Commission in Cambodia; and *Dr. Satoshi Ishikawa*, Visiting Associate Professor of the Research Institute of Humanity and Nature (RIHN) and Associate Professor of Tokai University, Japan.

55. Introduction of the Second Sub-theme was also made by the Chairperson *H.E. Dr. Sam Nuov*, and followed by the presentation of a resource paper on **Status and Trends of Sustainable Inland Fisheries Development in Southeast Asia (Annex 50)** by *Mr. Khin Maung Soe*, Deputy Director of Research and Development Division of the Department of Fisheries of Myanmar. Discussion of the issues under the Sub-theme was led by the Panelists comprising: *Mr. Kent G. Hortle*, *Mr. Wolf Hartmann*, *Dr. Satoshi Ishikawa*, and *Mr. Xaypladeth Choulamany.*

56. The Third Sub-theme was introduced by the Chairperson *Mr. Sommano Phounsavath*, Technical Staff of the Fisheries Division, Department of Livestock and Fisheries, Ministry of Agriculture and Forestry in Lao PDR. This was followed by the presentation of a resource paper **Towards Sustainable Community-based Management in Inland Fisheries (Annex 51)** by *Mr. Wolf Hartmann*. Discussion of the issues under the Sub-theme was led by the Panelists, namely: *Dr. Maripaz Perez*, *Mr. Khin Maung Soe*, *Dr. Satoshi Ishikawa*, and *Dr. Kuperan Viswanathan*, Professor of the College of Arts and Sciences, Universiti Utara Malaysia in Kedah, Malaysia.

57. The Fourth Sub-theme was also introduced by the Chairperson *Mr. Sommano Phounsavath*, and was followed by the presentation of a resource paper on **Integrating Fisheries with Multiple Inland Water Resource Use (Annex 52)** by *Mr. Kent G. Hortle*. Discussion of the issues under the Sub-theme was led by the Panelists comprising: *Dr. Maripaz Perez*, *Mr. Khin Maung Soe*, *Dr. Satoshi Ishikawa*, and *Dr. Suchart Ingthamjit.*

58. The summary of the recommendations under **Theme 8: *Sustaining Food Supply from Inland Fisheries*** that were raised during the general discussions, includes the following:

(1) **Sub-theme 8.1: Safeguarding Food Security**

- Identify and align appropriate management strategies for inland fisheries development with national poverty alleviation strategies.
- Sustain and/or modify the collection of more comprehensive information/statistics on inland fisheries, which could include fish consumption data.
- Make concerted efforts to promote consultation among concerned agencies in maintaining the ecological health of water bodies and the connectivity of the habitats.
- Promote alternative livelihood especially during seasonal flooding/drought.
- Ensure and safeguard food supply during off-season by developing post-harvest and processing techniques and ensure that food quality and safety of the fish and fish products are maintained.
- Sustain the investments of government and international donors in fisheries education, research and extension, as well as in infrastructure development.
- Enhance the support of local and national governments in credit and market development especially for small-scale fisheries outputs/products.
- Formulate strategic policy response in order to increase the resilience and sustainability of agriculture and fisheries productivity, improve disaster risk management, enhance social protection schemes, and strengthen community-based development.
- Empower vulnerable groups through human capacity building taking into consideration the role of women and indigenous peoples in sustainable small-scale fisheries development and management.
- Recognize environmental dimensions of food security in regional food security frameworks and facilitate community-based responses to the challenges associated with food insecurities.
- Institute governance arrangements that are transparent and accountable.
- Ensure that management of inland fisheries should cover all activities, which are conducted by local people, including farming and labors.
- Consider management target, which should not only be meant to increase income but also improve livelihoods and match the peoples' interests and hopes.

(2) **Sub-theme 8.2: Sustainable Development of Inland Fisheries**

- Put emphasis on enhancing awareness of local ecological knowledge, species conservation and the impacts of introducing alien species and aquaculture technology.
- Reactivate and/or develop fisheries extension in order to enhance knowledge-based information and management.
- Conduct regular assessment and evaluation of man-made and harnessed activities, and pollutants from land-based activities that may impact the health of freshwater ecosystem.
- Strengthen the collection, compilation, analysis and dissemination of scientific and statistical data and information in order to increase the visibility of inland fisheries as an economic sector.
- Consider the use of indigenous species in restocking programs to maintain and secure genetic structure of the species in a particular environment, and avoid the introduction of alien species.
- Create alternative employment options to improve livelihoods of the rural poor and users of the fisheries resources thereby enabling effective empowerment of fisheries management to take place.
- Ensure that irrigation systems should not disturb fish reproduction.
- Include the rural and other sectors development in the sustainable development of inland fisheries, *e.g*. civil engineering infrastructure, tourism, industry, and processing.
- Strengthen the collaboration of and/or communication between fishers and researchers in order to obtain the necessary on-site reliable data (*e.g.* from each reproduction unit) to be used in evaluating the situation of stocks.
- Propose alternative jobs for subsistence fishers instead of regulating their activities.
- Ensure that reduction of commercial fishing efforts is acceptable even if the price of fish is increased through market mechanisms and processing technology.
- Pay attention to the fish reproduction aspects, in order to gather information on genetics and population structure of the fishes.
- Integrate inland fisheries development into overall development plans.
- Promote discussions and consultations on the issue of overcapacity and IUU fishing.
- Make use of GIS for classifying habitats and ecosystems, considering that the current estimates tend to be grossly under-estimated.

(3) **Sub-theme 8.3: Towards Sustainable Community-based Management in Inland Fisheries**

- Establish rights-based approach in inland fisheries as it is a remedy to unsustainable fisheries in inland waters, which should be implemented through fisheries co-management.
- Make sure that governance reforms should aim for downward decentralization.
- Promote the out-scaling (horizontally) and up-scaling (vertically) of community-based fisheries management.
- Consider the shift from "focus on community location to a community focus at all levels".
- Develop and/or strengthen organizational and institutional linkages with other sectors and their users, *e.g.* by bringing together (or merge) local fishers, forest users and irrigation organizations, in order to make use of synergies, and to economize on villagers' time for community development purposes.
- Promote the concept of supra-village area approaches to fisheries co-management, such as catchment and basin-wide approaches.
- Align organizational structure with that of overall decentralized rural administration, in order to benefit from funds made available at different levels.
- Promote, in policy development as well as in practice, rights-based approach in fisheries that goes beyond mere access limits, based on development strategies on peoples' claims to their basic entitlements, such as enough food, decent work, freedom from oppression, and the right to a dignified life.
- Strengthen and make visible the women's involvement in fisheries co-management.
- Take a more active role in fisheries co-management and effectively strengthen community-based organizations, including financial support (by governments).
- Establish licensing system or registration not only for large-scale fishery but also middle-scale fishery for the sustainable co-management of commercial fishery and fish trade.
- Establish communication line between local people and managers for the promotion of co-management in subsistence inland fishery.
- Develop the capacity of local communities to effectively and efficiently manage the resources.
- Developed and nurture governance structures within the community with assistance from the government and private sector in order that community-based management would succeed and be sustainable.

- Identify and develop resource utilization and marketing strategies to ensure optimum benefits from the resource.
- Enhance capacity building as a first step in implementing community-based management in inland fisheries, especially for women who play the major role in improving livelihood through post-harvest activities.

(4) **Sub-theme 8.4: Integrating Fisheries with Multiple Inland Water Resource Use**

- Document and disseminate the importance and potential of inland fisheries, and their habitats.
- Promote better understanding of the impacts of other sectors on inland fisheries, and on how to mitigate and manage such impacts.
- Promote the integration of fisheries with water resources and agriculture development activities.
- Expand the scope of the functions of fisheries agencies to include where possible environmental management and increase their inclusion in other agencies outside the fisheries sector.
- Enhance awareness of fisheries issues as well as issues on food production and food safety through the use of various media.
- Increase and sustain funding for inland fisheries integration in accordance with their value and potential (by governments).
- Control rapid industrial development in areas where farming and fisheries support large communities considering that farming and fisheries support many rural people's lives.
- Develop propagation techniques for indigenous species to support aquaculture development and/or fish stocking programs in order to replace the use of alien species, which can bring about loss of biodiversity, habitat alteration, increased competition, predation, and introduction of diseases.
- Ensure that fish stocking should focus more on the purpose of diversity conservation and production enhancement instead of being associated with ceremonies, particularly for rare species and those that are vulnerable to development projects.
- Strengthen the role of genetic investigation of captive and wild stocks in fisheries management planning, and mitigate the likely impact of dam construction on fisheries development.
- Develop key indicators that focus on establishing the importance of inland fisheries, instead of conducting census which could be time-consuming and the results of which may not be easily accessible.
- Promote understanding of the impact of other sectors on inland fisheries which is very crucial to identifying critical interventions to enhance development.
- Identify the champion who could push inland fisheries issues at every forum.
- Strengthen the capability of fisheries agencies to be able to project themselves and the sector they represent within the broader context of development, climate change debates and poverty alleviation discussions.
- Integrate inland fisheries development in the overall development strategy of the locality, country or region.
- Collect and compile reliable information and more accurate statistics to assess the real status of inland capture fisheries (*i.e.* whether it is declining or developing).

2.2.3 Plenary II: Overview of Sustainable Fisheries for Food Security Towards 2020

59. In order to conclude the discussions and recommendations of the eight panels based on the eight thematic areas, Plenary II was convened and chaired by *Dr. Chumnarn Pongsri*, Secretary-General of SEAFDEC. Outputs of the panel discussions were summarized on various scopes, namely: sustainable aquaculture development for food security, by *Dr. Joebert D. Toledo*, the Chief of SEAFDEC Aquaculture Department; marine fisheries management, by *Ms. Mahyam Mohd. Isa*, the Chief of SEAFDEC Marine Fishery Resources Development and Management Department; post-harvest and safety of fish and fisheries products for food security, by *Mr. Leonard G. Limpus*, on behalf of SEAFDEC Marine Fisheries Research Department; planning and information, and regional and international policy formulation, by *Mr. Bundit Chokesanguan*, the Head of the Information and Training Division of SEAFDEC Training Department; emerging requirements for trade of fish and fishery products, by *Dr. Somboon Siriraksophon*, the Policy and Program Coordinator of SEAFDEC; inland fisheries management, by *Mr. Xaypladeth Choulamany*, Fisheries Programme Coordinator of the Mekong River Commission (MRC) Secretariat.

60. The presentations were followed by comments from renowned experts, namely: *Prof. Dr. Peter Edwards* of the Asian Institute of Technology, *Dr. Simon Funge-Smith* of the FAO Regional Office for Asia and the Pacific, and *Dr. Stephen J. Hall* of the WorldFish Center; and general discussion and recommendations from the Conference participants.

2.2.4 Plenary III: Fisheries Cooperation in the ASEAN Region – Vision of Cooperation in the Region Towards 2020

61. The Session was chaired by *Mr. Suriyan Vichitlekarn*, Assistant Director and Head of Agriculture Industries and Natural Resources Division of the ASEAN Secretariat. In the discussion of possible future cooperation in fisheries, expressions of support were made by *Mr. Ichiro Nomura*, Advisor to the President of Tokyo University of Marine Science and Technology of Japan, on behalf of the Government of Japan; *Dr. Makarim Wibisono*, the Executive Director of the ASEAN Foundation; *Dr. Howell Howard*, the Officer for Regional Environment, Science, Technology and Health of the United States-Agency for International Development (USAID) for Southeast Asia; *Dr. Simon Funge-Smith*, the Secretary of the Asia-Pacific Fisheries Commission (APFIC) and Senior Fisheries Officer of the FAO Regional Office for Asia and the Pacific; *Dr. Stephen J. Hall*, the Director-General of the WorldFish Center; *Mr. Xaypladeth Choulamany*, the Fisheries Programme Coordinator of the Fisheries Programme of the MRC Secretariat; *Dr. Rudolf Hermes*, the Chief Technical Advisor of the Bay of Bengal Large Marine Ecosystem (BOBLME) Project; and *Dr. Wenresti Gallardo*, the Coordinator of the Aquaculture and Aquatic Resources Management of the Asian Institute of Technology (AIT).

2.3 Senior Officials Session

62. Organized by the ASEAN Secretariat in collaboration with SEAFDEC and hosted by the Department of Fisheries of Thailand, the Senior Officials Session for the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment" was held on 16 June 2011 in Bangkok, Thailand. Comprising the Senior Officials Plus Three and the Senior Officials Meetings.

2.3.1 Meeting of the ASEAN-SEAFDEC Senior Officials Plus Three

63. The Senior Officials (FSOM) Plus Three Meeting for the ASEAN-SEAFDEC Conference was held on 16 June 2011. During the Meeting, *Dr. Chumnarn Pongsri* presented the report of the Technical Session of the Conference. The representative from Japan, *Mr. Akira Inoue*, Director-General, Resource Management Department of the Fisheries Agency of Japan, then informed the Meeting on the willingness of Japan to continue to cooperate with SEAFDEC and the ASEAN countries especially in terms of the sustainable utilization of fishery resources based on scientific data. His statement was followed by presentation on summary of the ASEAN Plus Three Cooperation Strategy (APTCS) on Food, Agriculture and Forestry for 2011-2015, which had been endorsed at the 10th AMAF Plus Three in October 2010. The Meeting then agreed to support the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020, which will be further submitted for consideration by the Senior Officials Meeting and the Ministerial Meeting, respectively. The Deputy Director-General of the Department of Fisheries of Thailand, *Dr. Nanthiya Unprasert* then summarized the major areas where cooperation of the Plus Three Countries with the ASEAN region could be focused on.

2.3.2 Meeting of the ASEAN-SEAFDEC Senior Officials

64. The Senior Officials Meeting (FSOM) for the ASEAN-SEAFDEC Conference was held on 16 June 2011. The FSOM also noted the support expressed by the Plus Three countries including the possible areas of cooperation under the AMAF Plus Three arrangement. The FSOM then endorsed the "Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020". In addition, the FSOM also reviewed and supported the ASEAN Programme Concept Note on Sustainable Fisheries for Food Security: 2011-2015 to support the future implementation of the Plan of Action. Moreover, the FSOM supported the draft Resolution to be further considered and adopted by the ASEAN-SEAFDEC Ministers as a common regional policy framework, which would support the implementation of the Plan of Action. The FSOM also acknowledged the support of the Plus Three Countries through the Meeting of the ASEAN-SEAFDEC Senior Officials Plus Three for their support to the Plan of Action, as well as for their expression of support in the potential areas of cooperation under the AMAF Plus Three arrangement.

2.4 Ministerial Session

65. The Ministerial Meeting for the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment" was held in Bangkok on 17 June 2011 under the chairmanship of *H.E. Mr. Theera Wongsamut*, Minister of Agriculture and Cooperatives, Thailand. The Ministerial Meeting of the Conference was also organized by the ASEAN

Secretariat and hosted by the Government of Thailand through the Department of Fisheries of Thailand in collaboration with SEAFDEC. The Opening Ceremony of the Ministerial Meeting was presided over by the Deputy Prime Minister of Thailand, *H.E. Mr. Trairong Suwankiri*, on behalf of the Prime Minister of Thailand *H.E. Mr. Abhisit Vejjajiva*.

66. The Ministers responsible for fisheries of the ASEAN-SEAFDEC Member Countries adopted the "Resolution on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020" on 17 June 2011. Expression of support for the promotion of sustainable fisheries for food security in the ASEAN region was then provided by the Minister of Industry and Primary Resources of Brunei Darussalam, *H.E. Pehin Dató Yahya*; the Minister of Marine Affairs and Fisheries of Indonesia, *H.E. Dr. Fadel Muhammad*; the Ambassador Extraordinary and Plenipotentiary of Japan to the Kingdom of Thailand, *H.E. Mr. Seiji Kojima*, on behalf of the Government of Japan; the Vice Minister of Agriculture and Forestry of Lao PDR, *H.E. Dr. Ty Phommasack*; the Minister of Agriculture and Agro-Based Industry of Malaysia, *H.E. Noh Bin Omar*; the Deputy Minister of Livestock and Fisheries of Myanmar, *H.E. Mr. Khin Maung Aye*; the Ambassador Extraordinary and Plenipotentiary of Republic of the Philippines to the Kingdom of Thailand, *H.E. Ms. Linglingay F. Lacanlale*, on behalf of the Government of the Philippines; the Senior Parliamentary Secretary for National Development of Singapore, *H.E. Dr. Mohamad Maliki Bin Osman*; the Minister of Agriculture and Cooperatives of Thailand, *H.E. Mr. Theera Wongsamut*; and the Deputy Director-General of Fisheries Administration of the Ministry of Agriculture and Rural Development of Vietnam, *H.E. Dr. Chu Tien Vinh.*

67. Statement of support and cooperation was also delivered by the Assistant Director-General of the FAO Regional Office for Asia and the Pacific, *Mr. Hiroyuki Konuma*; the Vice President of Vietnam Association of Seafood Exporters and Producers (VASEP), *Dr. Nguyen Huu Dung* in his capacity as the Chairman of the ASEAN Seafood Federation (ASF); the Executive Director of Tambuyog Development, *Mr. Arsenio Tanchuling* in his capacity as the Coordinator of SEAFish for Justice; and the Secretary-General of SEAFDEC, *Dr. Chumnarn Pongsri*.

III. SIDE EVENTS

68. Side events were also conducted during the Conference. These included the Technical Exhibition, Display of the Best Drawings, Side Meetings, and Excursion Programs for interested participants and their accompanying guests.

Annex 1

CONFERENCE STRUCTURE

ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment"

1. Inaugural Session: 13 June 2011 (morning)

The Inaugural Session of the Conference is presided over by His Excellency the Minister of Agriculture and Cooperatives of Thailand, and is an **open session** for guests and all registered participants. The Session starts with an opening ceremony, and followed by keynote speeches by the organizers and FAO as the key partner organization.

2. Technical Session: 13 June (afternoon)-16 June 2011 (morning)

The Technical Session is an **open session** for all registered participants. The Session starts with a plenary presentation to provide an overview of the status and the importance of fisheries to food security of the ASEAN Member Countries. The Session is then separated into panel sessions for two days (four panels each day) to discuss the important fisheries-related topics under eight pre-identified themes. This would be followed by two more plenary sessions to conclude the outputs from the panel discussions and discuss on the way forward, as well as future cooperation that would ensure the sustainable development and the contribution of fisheries to food security in the ASEAN region.

3. Senior Officials Session: 16 June 2011 (afternoon)

This Session comprises the "Senior Officials Plus Three Meeting for the ASEAN-SEAFDEC Conference" to be participated in by Senior Officials of the ASEAN Plus Three countries (ASEAN countries, plus China, Japan and Republic of Korea); and the "Senior Officials Meeting for the ASEAN-SEAFDEC Conference" to be participated in by the Senior Officials responsible for fisheries from the ASEAN-SEAFDEC Member Countries. While taking note of the conclusion and recommendations from the Technical Session, it is expected that the Draft Resolution is reviewed during this Session (for further endorsement by the ASEAN Ministers), and the Draft Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 is endorsed. During this Session, the Plus Three Countries would also make statements on the possible roles of their respective countries in supporting the ultimate goal of enhancing the contribution of fisheries to food security in the ASEAN region.

4. Ministerial Session: 17 June 2011 (morning)

This Session is participated mainly by the Ministers responsible for fisheries from the ASEAN-SEAFDEC Member Countries (except certain specific agenda that are open for invited guests and the press). It is expected that the Draft Resolution as previously reviewed by the ASEAN-SEAFDEC Senior Officials would be presented for endorsement by the ASEAN Ministers. Upon the endorsement by the Ministers, the Resolution and Plan of Action would serve as a regional policy and priority actions in guiding the development of ASEAN fisheries in the coming decade.

The overall program for the different sessions of the Conference is shown below:

13 June 2011	
09.00-10.30	**Inaugural Session** o Opening of the Conference - Introductory Remarks by the Secretary-General of SEAFDEC - Introductory Remarks by the Secretary-General of ASEAN - Welcome Remarks by the Director-General of the Department of Fisheries of Thailand - Opening Address by His Excellency the Minister of Agriculture and Cooperatives of Thailand
	o Photography Session
10.30-11.00	Coffee/Tea Break

11.00-12.00	o Keynote Addresses - Fisheries and ASEAN Community Building by ASEAN - Fisheries for Poverty Alleviation and Socio-economic Well-being of Fishers (DOF, Thailand) - Emerging Issues in World Fisheries and Aquaculture (FAO) o Introduction of the Framework and Arrangements of the Technical Session
12.00-14.00	Lunch Break
14.00-17.00	**Technical Session** **Plenary I** o ASEAN Fisheries: Status and Trends (Chairperson, SEAFDEC Council) o ASEAN Fisheries Towards 2020: Challenges and Vision (FAO/Regional Office for Asia and the Pacific) o Open Forum for Plenary Discussion
19.00-22.00	**Reception Dinner**
14 June 2011 (*four panel sessions to run simultaneously*)	
Theme 1: Enhancing Governance in Fishery Management	
09.00-09.05	Introduction to the Theme by Master, Ms. Mahyam Mohd. Isa, SEAFDEC/MFRDMD, Malaysia
09.05-09.35	Keynote Presentation: Enhancing Governance in Fisheries Management in Southeast Asia Towards 2020: Issues and Perspectives By Prof. Dr. Kuperan Viswanathan, UUM, Malaysia
	1.1 Can Small-scale and Commercial Fisheries co-exist?
09.35-09.40	Introduction by Chairperson, Dr.Achmad Poernomo, MMAF, Indonesia
09.40-10.00	Can Small-scale and Commercial Fisheries Co-exist? By Dr. Ratana Chuenpagdee, MUN, Canada
10.00-10.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Magnus Torell, SEAFDEC Secretariat, Thailand 2. Prof. Dr. Kuperan Viswanathan, UUM, Malaysia 3. Prof. Dr. Yasuhisa Kato, Kagoshima University, Japan
10.30-11.00	*Coffee/ Tea Break*
	1.2 Management of Fishing Capacity-Strengthen MCS
11.00-11.05	Introduction by Chairperson, Dr. Achmad Poernomo, MMAF, Indonesia
11.05-11.25	Management of Fishing Capacity By Dr. Magnus Torell, SEAFDEC Secretariat, Thailand
11.25-12.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Ratana Chuenpagdee, MUN, Canada 2. Prof. Dr. Yasuhisa Kato, Kagoshima University, Japan 3. Dr. Gazi Md. Nurul Islam, UPM, Malaysia 4. Prof. Dr. Masahiro Yamao, Hiroshima University, Japan
12.30-14.00	*Lunch Break*
	1.3 Co-management
14.00-14.05	Introduction by Chairperson, Mr. Raja Mohammad Noordin Raja Omar, Fisheries Research Institute, Malaysia
14.05-14.25	Co-management By Dr. Gazi Md. Nurul Islam, UPM, Malaysia
14.25-15.30	Open Forum and Panelists' Recommendations and Conclusions 1. Prof. Dr. Kuperan Viswanathan, UUM, Malaysia 2. Prof. Dr. Masahiro Yamao, Hiroshima University, Japan 3. Dr. Yugraj S. Yadava, BOBP-IGO, India 4. Dr. Satoshi Ishikawa, Tokai University, Japan
15.30-16.00	*Coffee/ Tea Break*
	1.4 Application of Global Instruments and Regional Agreements
16.00-16.05	Introduction by Chairperson, Mr. Raja Mohammad Noordin Raja Omar, Fisheries Research Institute, Malaysia
16.05-16.25	Application of Global Instruments and Regional Agreements By Prof. Dr. Yasuhisa Kato, Kagoshima University, Japan

16.25-17.20	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Ratana Chuenpagdee, MUN, Canada 2. Dr. Magnus Torell, SEAFDEC Secretariat, Thailand 3. Dr. Yuraj S. Yadava, BOBP-IGO, India 4. Prof. Dr. Kuperan Viswanathan, UUM, Malaysia
17.20-17.30	Wrap-up of Overall Theme Discussions
Theme 2: Sustainable Aquaculture Development	
09.00-09.05	Introduction to the Theme by Master, Dr. Joebert D. Toledo, SEAFDEC/AQD, the Philippines
09.05-09.35	Key Presentation: Sustainable Aquaculture Development for Food Security in Southeast Asia Towards 2020: Issues and Perspectives By Dr. Sena de Silva, NACA, Thailand
	2.1 Meeting Social and Economic Challenges in Aquaculture
09.35-09.40	Introduction by Chairperson, Mr. Miao Weimin, FAO/RAP, Thailand
09.40-10.00	Meeting Social and Economic Challenges in Aquaculture By Dr. Nerissa D. Salayo, SEAFDEC/AQD, the Philippines
10.00-10.30	Open Forum and Panelists' Recommendation and Conclusions 1. Dr. Harvey Demaine, DANIDA, Bangladesh 2. Dr. Le Xuan Sinh, Cantho University, Vietnam 3. Dr. Maripaz Perez, the WorldFish Center, Malaysia
10.30-10.50	*Coffee/ Tea Break*
10.50-11.10	Open Forum and Panelists' Recommendations and Conclusions (Cont'd)
	2.2 Quality Seed Production for Sustainable Aquaculture
11.10-11.15	Introduction by Chairpersons, Mr. Miao Weimin, FAO/RAP, Thailand
11.15-11.35	Quality Seed Production for Sustainable Aquaculture By Dr. Rowena Romana-Eguia, SEAFDEC/AQD, the Philippines
11.35-12.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Felix Ayson, SEAFDEC/AQD, the Philippines 2. Prof. Dr. Peter Edwards, AIT Thailand 3. Prof. Dr. Uthairat Nanakorn, Kasetsart University, Thailand 4. Dr. Ketut Sugama, Ministry of Marine Affairs and Fisheries, Indonesia 5. Dr. Koichi Okuzawa, FRA, Japan
12.30-14.00	*Lunch Break*
	2.3 Healthy and Wholesome Aquaculture
14.00-14.05	Introduction by Chairperson, Dr. Michael Phillips, the WordFish Center, Malaysia
14.05-14.25	Healthy and Wholesome Aquaculture By Dr. Relicardo Coloso, SEAFDEC/AQD, the Philippines
14.25-15.30	Open Forum and Parnelists' Recommendations and Conclusions 1. Mr. Miao Weimin, FAO/RAP, Thailand 2. Dr. Celia Lavilla-Pitogo, Aquatic Animal Health Research and Service Center, Brunei Darussalam 3. Dr. Hiroshi Ogata, National Research Institute of Aquaculture, Japan 4. Dr. Mali Boonyaratpalin, Department of Fisheries, Thailand
15.30-16.00	*Coffee/ Tea Break*
	2.4 Maintaining Environmental Integrity through Responsible Aquaculture
16.00-16.05	Introduction by Chairperson, Dr. Michael Phillips, the WordFish Center, Malaysia
16.05-16.25	Maintaining Environmental Integrity through Responsible Aquaculture By Dr. Evelyn de Jesus-Ayson, SEAFDEC/AQD, the Philippines and Dr. Wenresti Gallardo, AIT, Thailand
16.25-17.20	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Atsushi Ishimatsu, Nagasaki University, Japan 2. Dr. Michael Pido, Palawan State University, the Philippines 3. Dr. Donald Macintosh, IUCN, Thailand 4. Dr. Sena de Silva, NACA, Thailand
17.20-17.30	Wrap-up Overall Theme Discussions
Side Meeting	
18.00-19.30	Global Food Production and Aquaculture By the WorldFish Center
19.30-20.00	*Refreshment*

Theme 3: Ecosystem Approach to Fisheries	
09.00-09.05	Introduction to the Theme by Master, Mr. Bundit Chokesanguan, SEAFDEC/TD, Thailand
09.05-09.15	Keynote Presentation: Ecosystem Approach for Sustainable Development of Fisheries in Southeast Asia Towards 2020: Issues and Challenges Dr. Simon Funge-Smith, FAO/RAP, Thailand
	3.1 Ecosystem Interventions
09.15-09.20	Introduction by Chairperson, Dr. John C. Pernetta, Freelance Expert
09.20-09.30	Understanding of Ecosystem Approach to Fisheries in Southeast Asia By Ms. Panitnard Taladon, SEAFDEC/TD, Thailand
09.30-09.45	Implementation of the Ecosystem Approach to Fisheries in the Bay of Bengal Large Marine Ecosystem Project By Dr. Rudolf Hermes, BOBLME, Thailand
09.45-10.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Simon Funge-Smith, FAO/RAP, Thailand 2. Mr. Christopher Paterson, SPC, Fiji
10.30-11.00	*Coffee/ Tea Break*
	3.2 Resource Enhancement and Habitat Improvement
11.00-11.05	Introduction by Chairperson, Dr. John C. Pernetta, Freelance Expert
11.05-11.15	Resource Enhancement By Mr. Noel Barut, BFAR, the Philippines
11.15-11.30	Fisheries *Refugia* By Mr. Christopher Paterson, SPC, Fiji
11.30-12.30	Open Forum and Panelists' Recommendations and Conclusions 1. Mr. Pirochana Saikliang, Department of Fisheries, Thailand 2. Dr. Wudianto, Research Center for Fisheries Management and Conservation, Indonesia
12.30-14.00	*Lunch Break*
	3.3 Reduction of Impacts from Fishing on Marine and Coastal Environment
14.00-14.05	Introduction by Chairperson, Dr. John C. Pernetta, Freelance Expert
14.05-14.20	Reducing the Impacts of Fishing Activities on Coastal and Marine Environments in the Southeast Asian Waters: A regional synthesis By Dr. Worawit Wanchana, SEAFDEC/TD, Thailand
14.20-14.30	Ecosystem-based Technology and Management for Capture Fisheries By Prof. Takafumi Arimoto, TUMSAT, Japan
14.30-14.40	Modifying Fishing Gears to Reduce Seabed Impact and Fuel Consumption By Dr. Christopher Glass, University of New Hamshire, USA
14.40-15.25	Open Forum and Panelists' Recommendation and Conclusions 1. Dr. Matsuoka Tatsuro, Kagoshima University, Japan 2. Dr. Jonathan O. Dickson, BFAR, the Philippines 3. Mr. Keith Symington, WWF, Canada
15.25-15.55	*Coffee/Tea Break*
15.55-16.30	Wrap-up Overall Theme Discussions
Side Meeting	
16.30-17.00	International Cooperation on Sustainable Fisheries for Food Security- A practical value chain approach By Dr. Carey Bonnell, MI, Canada
17.00-17.30	Area Capability Approach for Harmonizing Ecosystem Health and Rural Development By Dr. Satoshi Ishikawa, Tokai University, Japan
17.40-20.00	European Union Research Funding Opportunities in Fisheries and Aquaculture: FP7 Information and Matchmaking Session By the European Commission and the SEA-EU-NET Project
20.00-20.30	*Refreshment*
Theme 4: Post-harvest and Safety of Fish and Fisheries Products	
09.00-09.05	Introduction to the Theme by Master, Mr. Yeap Soon Eong, SEAFDEC/MFRD, Singapore
09.05-09.30	Keynote Presentation: Post-harvest Technology, Working Towards Food Security and a Sustainable, Safe Fisheries By Dr. Lahsen Ababouch, FAO, Italy
	4.1 Improving of Fish Handling, Processing and Preservation
	Chairperson: Mr. Yeap Soon Eong, SEAFDEC/MFRD, Singapore
09.30-09.45	Overview of Sub-theme, by Mr. L.G. Limpus, SEAFDEC/MFRD, Singapore

09.45-10.00	Technological Advancements and Emerging Technologies in Fish Processing and Packaging By Mr. Goh Kian Heng, SEAFDEC/TD, Thailand
10.00-10.15	Improving Fish Handling at Sea By Mr. Suthipong Thanasarnsakorn, SEAFDEC/TD, Thailand
10.15-10.45	*Coffee/Tea Break*
10.45-11.00	International Experience in Maximizing Fish Utilization By Dr. Lahsen Ababouch, FAO, Italy
11.00-11.15	By-product Utilization By Mr. Bordin Itipong, Department of Fisheries, Thailand
11.15-12.00	Open Forum and Panelists Recommendations and Conclusions 1. Mr. Goh Kian Heng, SEAFDEC/MFRD, Singapore 2. Mr. Suthipong Thanasarnsakorn, SEAFDEC/TD, Thailand 3. Dr. Lahsen Ababouch, FAO, Italy 4. Mr. Bordin Ittipong, Department of Fisheries, Thailand
12.00-14.00	*Lunch Break*
14.00-14.15	Overview of Sub-theme, by Mr. L.G. Limpus, SEAFDEC/MFRD, Singapore
14.15-14.30	Traditional Fish Products, National and Regional Markets and Trade By Mrs. Fatima Ferdouse, INFOFISH, Malaysia
14.30-14.45	Improving Traditional Fish Products (excepting fermented products) for New Markets and Trade By Dr. Melanie R. Guerra, BFAR, the Philippines
14.45-15.00	Fermented Fish Products: Traditional and New Developments By Ms. Varatip Somboonyarithi, Department of Fisheries , Thailand
15.00-15.15	Safety of Traditional Fish Products, from Home Industry to SME By Mr. Mohd Nor bin Noordin, Department of Fisheries, Malaysia
15.15-15.45	Open Forum and Panelists' Recommendations and Conclusions 1. Mrs. Fatima Ferdouse, INFOFISH, Malaysia 2. Dr. Melanie R. Guerra, BFAR, the Philippines 3. Ms. Varatip Somboonyarithi, Department of Fisheries, Thailand 4. Mr. Mohd Nor bin Noordin, Department of Fisheries, Malaysia
15.45-16.15	*Coffee/Tea Break*
	4.3 Quality, Safety and Control Systems for Fish Products
	Chairperson: Dr. Lahsen Ababouch, FAO, Italy
16.15-16.30	Overview of Sub-theme, by Mr. L.G, Limpus, SEAFDEC/MFRD, Singapore
16.30-16.45	Harmonizing Fish Import and Export Inspection and Certification Systems By Dr. Lahsen Ababouch, FAO, Italy
16.45-17.00	Harmonizing Laboratories within the ASEAN Region By Mr. Saw Huiyi, Agri-Food &Veterinary Authority of Singapore, Singapore
17.00-17.15	Quality, Safety and Control Systems for SME By Dr. Simson Masengi, Ministry of Marine Affairs and Fisheries, Indonesia
17.15-17.30	New Challenge: Safety of Freshwater Fish, Aquaculture Safety and Certification, and Traceability of Fisheries Products By Mrs. Niracha Wongchinda, Department of Fisheries, Thailand
17.30-18.00	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Lahsen Ababouch, FAO, Italy 2. Mr. Saw Huiyi, Agri-Food&Veterinary Authority of Singapore, Singapore 3. Dr. Simson Masengi, Ministry of Marine Affairs and Fisheries, Indonesia 4. Mrs. Niracha Wongchinda, Department of Fisheries, Thailand
18.00-18.10	Wrap-up of Overall Theme Discussions
15 June 2011	
Theme 5: Emerging Requirements for Trade in Fish and Fisheries Products	
09.00-09.10	Introduction to the Theme by Master, Dr. Somboon Siriraksophon, SEAFDEC Secretariat, Thailand
09.10-09.40	Keynote Presentation: Emerging Requirements for Trade in Fish and Fisheries Products By Dr. Lahsen Ababouch, FAO, Italy
	5.1 Required, Compulsory Actions
09.40-09.50	Introduction by Chairperson, Mr. Jose Ingles, WWF, the Philippines
09.50-10.10	Addressing Emerging International Fish Trade Concerns that Support the Sustainable Development of Fisheries By Ms. Sawitree Chamsai, SEAFDEC Secretariat, Thailand

10.10-10.30	Japanese Shark Research Activities in Response to Recent Change of World's Opinions on the Fishery Stock Management By Dr. Miki Ogura, Fishery Research Agency, Japan
10.30-11.00	*Coffee/Tea Break*
11.00-11.20	Challenge on Foreign Trade and Marketing By Mr. Saut P. Hutagalung, Directorate General of Fisheries Product Processing and Marketing, Indonesia
11.20-11.40	Lessons Learnt on the EU Regulation to Combat the IUU Fishing By Dr. Kamonpan Awaiwanont, Departments of Fisheries, Thailand
11.40-12.00	Legislation and Regulation Related to Trade Measures By Mr. Benjamin F.S. Tabios, Jr., BFAR, the Philippines
12.00-12.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Achmad Poernomo, MMAF, Indonesia 2. Mr. Jose Ingles, WWF, the Philippines 3. Mr. Duncan Leadbitter, Sustainable Fisheries Partnership, USA 4. Mr. Arthorn Piboonthanapathana, Thai Frozen Foods Association, Thailand
12.30-14.00	*Lunch Break*
	5.2 Trade Facilities /Supply Chains
14.00-14.10	Introduction by Chairperson, Dr. Somboon Siriraksophon, SEAFDEC Secretariat, Thailand
14.10-14.35	Traceability and Food Safety Assurance By Dr. Sebastian Mathew, ICSF, India
14.35-15.00	International Trade: Challenges for Small-scale Fishers By Dr. Sebastian Mathew, ICSF, India
15.00-15.25	Partnerships with Business Towards Sustainable Trade By Mr. Jose Ingles, WWF, the Philippines
15.25-16.00	*Coffee/Tea Break*
16.00-16.25	New Standards Drive Interest in Fish Used for Fish Meal By Mr. Duncan Leadbitter, Sustainable Fisheries Partnership, USA
16.25-17.10	Open Forum and Panelists' Recommendations and Conclusions 1. Mr. Benjamin F.S. Tabios, Jr., BFAR, the Philippines 2. Dr. Kamonpan Awaiwanont, Departments of Fisheries, Thailand 3. Dr. Lahsen Ababouch, FAO, Italy
17.10-17.20	Wrap-up of Overall Theme Discussions
Side Meeting	
17.30-19.00	Private Sector Roles on Sustainable Fisheries for Food Security By ASEAN-US Technical Assistance and Training Facility II
19.00-19.30	*Refreshment*
Theme 6: Climate Change Adaptation and Mitigation Towards Food Security	
09.00-09.10	Introduction to the Theme by Master, Dr. Magnus Torell, SEAFDEC Secretariat, Thailand
09.10-09.30	Keynote Presentation: Climate Change Adaptation & Mitigation Toward Food Security By Dr. Anond Snidvongs, Southeast Asia's START Program, Thailand
	6.1 Impacts of Climate Change on Fisheries and Aquaculture
09.30-09.40	Introduction by Chairperson, Dr. Worawit Wanchana, SEAFDEC/TD, Thailand
09.40-09.55	Climate Change and Fisheries: the Philippines Experience By Dr. Mudjekeewis D. Santos, BFAR, the Philippines
09.55-10.10	Adaptation to the Climate Change in the Fisheries Sector in Japan By Dr. Kaoru Nakata, National Research Institute, Japan
10.10-10.30	Impact of Climate on Scope for Growth of *Penaeus* Shrimp: Results of Numerical Modeling By Dr. Jutarat Kittiwanich, Department of Fisheries, Thailand
10.30-11.00	*Coffee/Tea Break*
11.00-11.15	Climate Change, a Challenge for Marine Transport By Mr. Pakorn Prasertwong, Marine Department, Thailand
11.15-12.30	Open Forum for Discussion and Recommendations Facilitated by Dr. Maria Rebecca Campos, Southeast Asian Regional Center for Graduate Study and Research in Agriculture, the Philippines
12.30-14.00	*Lunch Break*
	6.2 Adaptation to the Climate Change
14.00-14.05	Introduction by Chairperson, Dr. Worawit Wanchana, SEAFDEC/TD, Thailand

14.05-14.25	Climate Change Adaptation and Mitigation: Fishers in the Philippines By Dr. Maria Rebecca Campos, Southeast Asian Regional Center for Graduate Study and Research in Agriculture, the Philippines
14.25-14.45	Adaptive Responses of Traditional Fishers to Climate Change in Indonesia By Dr. Ari Purbayanto, Bogor Agricultural University, Indonesia
14.45-15.05	Experience and Conceptual Framework of the Modeling Study for Mitigation of the Impact of Climate Change on Shrimp Farming in Thailand By Dr. Putth Songsangginda, Department of Fisheries, Thailand
15.05-15.30	Open Forum and Panelists' Recommendations and Conclusions Facilitated by Dr. Mudjekeewis D. Santos, BFAR, the Philippines
15.30-16.00	*Coffee/Tea Break*
16.00-17.15	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Magnus Torell, SEAFDEC Secretariat, Thailand 2. Ms. Suzanne Young, ASEAN-US Technical Assistance and Training Facility 3. Dr. Mudjekeewis D. Santos, BFAR, the Philippines 4. Dr. Rudolf Hermes, BOBLME, Thailand 5. Dr. Donald Macintosh, Mangrove for the Future, Thailand
17.15-17.30	Wrap-up of Overall Theme Discussions
Theme 7: Livelihood among Fishing Communities and Prospects of Employment in Fisheries-related Activities	
09.00-09.05	Introduction to the Theme by Master, Mr. Sebastian Mathew, ICSF, India and Dr. Yugraj Singh Yadava, BOBP-IGO, India
09.05-09.15	Keynote Presentation: Livelihood Among Fishing Communities and Prospects of Employment in Fisheries-related Activities- Options of Improvement and Monitoring of Change By Mr. Don Griffths, FAO/RAP, Thailand
	7.1 Social and Economic Aspects of an Ecosystem Approach to Fisheries
09.15-09.20	Introduction by Chairperson, Mr. Sebastian Mathew, ICSF, India and Dr. Kungwan Juntarashote, Kasetsart University, Thailand
09.20-09.35	Diversification of Livelihood Strategy toward Sustainable Development of Coastal Community in Southeast Asia By Prof. Dr. Masahiro Yamao, Hiroshima University, Japan
09.35-09.50	Social and Economic Aspects of Mekong Fisheries By Dr. Suchart Ingthamjit, Department of Fisheries, Thailand
09.50-10.10	Open Forum and Panelists' Recommendations and Conclusions 1. Prof. Dr. Yasuhisa Kato, Kagoshima University, Japan 2. Mr. Don Griffiths, FAO/RAP, Thailand
	7.2 Monitoring and Recording of Social Aspects, Migratory Labor (Fishing Crews, Factory Laborers, Fishers)
10.10-10.15	Introduction by Chairpersons, Mr. Sebastian Mathew, ICSF, India and Dr. Kungwan Juntarashote, Kasetsart University, Thailand
10.15-10.30	Presentation By Mr. Sebastian Mathew, ICSF, India
10.30-11.00	*Coffee/Tea Break*
11.00-11.15	International Standards and Good Practices concerning Protection of Migrant Workers Applicable in the Fishing Sector By Mr. Nilim Baruh, ILO, Thailand
11.15-11.35	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Yuraj Singh Yadava, BOBP-IGO, India
	7.3 Meeting Social and Economic Challenge Building Capacity to Adapt to Change
11.35-11.45	Introduction by Chairperson, Mr. Sebastian Mathew, ICSF, India and Dr. Kungwan Juntarashote, Kasetsart University, Thailand
11.45-12.05	Livelihood Approach to Fishing Ground Use in the Lower Mekong Basin By Dr. Akiko Ikeguchi, Yokohama University, Japan
12.05-12.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Masahiro Yamao, Hiroshima University, Japan 2. Prof. Dr. Yasuhisa Kato, Kagoshima University, Japan
12.30-14.00	*Lunch Break*
	7.4 Social Rights, Social Security and Labor
	7.4.1 Social rights and social in traditional small-scale fisheries

14.00-14.10	Introduction by Chairpersons, Dr. Yuraj Singh Yadava, BOBP-IGO, India and Dr. Yuttana Theparoonrat, SEAFDEC/TD, Thailand
14.10-14.25	Social Rights and Social Security in Traditional Small-scale Fisheries (including economic security) By Dr. Phatareeya Suanrattanachai, SEAFDEC/TD, Thailand
14.25-14.40	Livelihood Among Fishing Communities and Prospects of Employments in Fisheries Related Activities-Options for Improvement and Monitoring of Change By Prof. Dr. Yasuhisa Kato, Kagoshima University, Japan
14.40-15.00	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Tatsuro Matsuoka, Kagoshima University, Japan
	7.4.2 Social rights and social security among migratory fishermen at larger vessels
15.00-15.10	Introduction by Chairpersons, Dr. Yuraj Singh Yadava, BOBP-IGO, India and Dr. Yuttana Theparoonrat, SEAFDEC/TD, Thailand
15.10-15.30	Origins of Social Right and Social Security of Fishers By Dr. Tatsuro Matsuoka, Kagoshima University, Japan
15.30-16.00	*Coffee/Tea Break*
16.00-16.20	Open Forum and Panelists' Recommendations and Conclusions 1. Mr. Nilim Baruah, ILO, Thailand 2. Dr. Waraporn Prompoj, Department of Fisheries, Thailand
	7.5 Safety at Sea for Small-scale Fisheries
16.20-16.30	Introduction by Chairpersons, Dr. Yuraj Singh Yadava, BOBP-IGO, India and Dr. Yuttana Theparoonrat, SEAFDEC/TD, Thailand
16.30-16.45	Impact of Fisheries Management in Improving Safety at Sea Measures: A case study in Thailand By Mr. Bundit Chokesanguan, SEAFDEC/TD, Thailand
16.45-17.20	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Tatsuro Matsuoka, Kagoshima University, Japan
17.20-17.30	Wrap-up of Overall Theme Discussions
Side Meeting	
17.30-19.00	Small-scale Fisheries Guideline Development Process By Mr. Rolf Willmann, FAO, Italy
19.00-19.30	*Refreshment*
Theme 8: Sustaining Food Supply from Inland Fisheries	
09.00-09.05	Introduction to the Theme by Master, Dr. Masaya Katoh, SEAFDEC/MFRDMD, Malaysia
09.05-09.35	Keynote Presentation: Integrating Inland Fisheries Management in Southeast Asia Towards 2020: Issue and Perspectives By Mr. Xaypladeth Choulamany, MRC, Cambodia
	8.1 Safeguarding Food Security
09.35-09.40	Introduction by Chairperson, Dr. Sam Nuov, Fisheries Administration, Cambodia
09.40-10.00	Safeguarding Food Security By Dr. Maripez Perez, the WorldFish Center, Malaysia
10.00-10.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Theo Ebbers, AIT, Thailand 2. Mr. Wolf Hartmann, MRC, Cambodia 3. Dr. Satoshi Ishikawa, Tokai University, Japan
10.30-11.00	*Coffee/Tea Break*
	8.2 Sustainable Development of Inland Fisheries
11.00-11.05	Introduction by Chairperson, Dr. Sam Nuov, Fisheries Administration, Cambodia
11.05-11.25	Sustainable Development of Inland Fisheries By Mr. Khin Maung Soe, Department of Fisheries, Myanmar
11.25-12.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Theo Ebbers, AIT, Thailand 2. Mr. Wolf Hartmann, MRC, Cambodia 3. Dr. Satoshi Ishikawa, Tokai University, Japan 4. Mr. Xaypladeth Choulamany, MRC, Cambodia
12.30-14.00	*Lunch Break*
	8.3 Towards Sustainable Community-based Management in Inland Fisheries
14.00-14.05	Introduction by Chairperson, Mr. Sommano Phousavath, Department of Livestock and Fisheries, Lao PDR

14.05-14.25	Towards Sustainable Community-based Management in Inland Fisheries By Mr. Wolf Hatmann, MRC, Cambodia	
14.25-15.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Maripaz Perez, the WorldFish Center, Malaysia 2. Mr. Khin Maung Soe, Department of Fisheries, Myanmar 3. Dr. Satoshi Ishikawa, Tokai University, Japan 4. Prof. Dr. Kuperan Viswanathan, UUM, Malaysia	
15.30-16.00	*Coffee/Tea Break*	
	8.4 Integrating Fisheries with Multiple Inland Water Resources Use	
16.00-16.05	Introduction by Chairperson, Mr. Sommano Phousavath, Department of Livestock and Fisheries, Lao PDR	
16.05-16.25	Integrating Fisheries with Multiple Inland Water Resources Use By Dr. Theo Ebbers, AIT, Thailand	
16.25-17.30	Open Forum and Panelists' Recommendations and Conclusions 1. Dr. Maripaz Perez, the WorldFish Center, Malaysia 2. Mr. Khin Maung Soe, Department of Fisheries, Myanmar 3. Dr. Satoshi Ishikawa, Tokai University, Japan 4. Dr. Suchart Ingthamjit, Department of Fisheries, Thailand 5. Mr. Kent G. Hortle, MRC, Cambodia	
17.30-17.40	Wrap-up of Overall Theme Discussion	
Side Meeting		
17.30-19.00	Future Collaboration with Hokkaido University By Prof. Junichiro Okamoto, Hokkaido (By Invitation Only)	
16 June 2011		
09.00-12.00	**Plenary II:** Overview of Sustainable Fisheries for Food Security Towards 2020 o Summary of Outputs – Sustainable Aquaculture Development (AQD Chief) o Summary of Outputs – Marine Fisheries Management (MFRDMD Chief) o Summary of Outputs – Post-harvest and Safety of Fish and Fisheries Products (MFRD Chief) o Summary of Outputs – Planning and Information, and Regional and International Policy Formulation (SEAFDEC/TD) o Summary of Outputs – Emerging Requirements for Trade of Fish and Fishery Products (SEAFDEC Policy and Program Coordinator) o Summary of Outputs – Inland Fisheries Management (MRC Fisheries Programme) **Plenary III:** Fisheries Cooperation in the ASEAN Region - Vision of Cooperation in the Region Towards 2020 o The Government of Japan o ASEAN Foundation o United States Agency for International Development (USAID) o Asia-Pacific Fisheries Commission (APFIC) o The WorldFish Center o Mekong River Commission (MRC) Fisheries Programme o Bay of Bengal Large Marine Ecosystem (BOBLME) Project o Asian Institute of Technology (AIT)	
13.30-17.00	**Senior Officials Session** (*Arranged by ASEAN Secretariat and DOF Thailand*)	
13.30-14.30	o Senior Officials Plus Three Meeting for the ASEAN-SEAFDEC Conference (*By Invitation*)	**Half-day Excursion Programs**
14.30-17.00	o Senior Officials Meeting for the ASEAN-SEAFDEC Conference (*By Invitation*)	
17 June 2011		
09.00-12.00	**Ministerial Session** (*Arranged by ASEAN Secretariat and DOF Thailand*)	
09.00-10.00	o Inauguration Session (*By Invitation*)	**Full-day Excursion Programs**
10.00-12.00	o Ministerial Meeting for the ASEAN-SEAFDEC Conference (*By Invitation*)	
13.30-14.00	o Joint Press Statement for the ASEAN-SEAFDEC Ministerial Session (*By Invitation*)	
14.00-14.30	o Statement by Stakeholders (*By Invitation*)	
14.30-15.00	o Press Conference (*By Invitation*)	

Annex 2

BIOGRAPHY OF THE CONFERENCE RESOURCE PERSONS

Plenary I: Challenges and Vision on Sustainable Fisheries for Food Security in the ASEAN Region

Name	:	**Dr. Chumnarn Pongsri**
Position	:	Secretary-General
Organization /Institution	:	Southeast Asian Fisheries Development Center (SEAFDEC)
E-mail	:	sg@seafdec.org
Biography	:	Dr. Chumnarn Pongsri is currently the Secretary-General of SEAFDEC. Before joining SEAFDEC he was the Secretary to the Permanent Secretary of the Ministry of Agriculture and Cooperatives. He also served as the Director of the Environment Division of the Mekong River Commission from 2000 to 2003. He completed his B.Sc. in Fisheries from Kasetsart University (Thailand), M.Sc. in Aquaculture from the Asian Institute of Technology (Thailand), and Ph.D. from the University of Wales (UK). He has almost 30 years of experience in fisheries.
Name	:	**Dató Ahamad Sabki bin Mahmood**
Position	:	Director General
Organization /Institution	:	Department of Fisheries, Malaysia
E-mail	:	ahamadsabki@dof.gov.my
Biography	:	Dató Ahamad Sabki Bin Mahmood has been involved with the Department of Fisheries Malaysia for over 30 years. He started as a laboratory assistant and gradually rose to ranks becoming a senior officer, section head, Director of Planning and Development Division, Resource Protection and Extension Division and as the current Director General of Fisheries Malaysia. He is the SEAFDEC Council Director for Malaysia and is the Chairperson of the Council of Directors of SEAFDEC for the year 2011-2012.
Name	:	**Dr. Simon Funge-Smith**
Position	:	Senior Fisheries Officer
Organization /Institution	:	FAO Regional Office for Asia and the Pacific, Thailand
E-mail	:	simon.fungesmith@fao.org
Biography	:	Dr. Simon Funge-Smith obtained his first degree in Marine Biology at the University of Liverpool, UK and Ph.D. in Tropical Aquaculture from University of Stirling, Scotland, UK. He has worked in the Asia-Pacific region for twenty years in aquaculture development, and environment and management in Thailand, Lao PDR and in many other countries. He has spent the last 10 years coordinating the FAO regional fisheries groups in such areas as sustainable development of fisheries and aquaculture, promotion of responsible fisheries particularly in developing countries; coastal and inland fisheries ecosystem management; fisheries livelihoods. He is also actively involved in a number of FAO projects in Asia including the multi-sectoral management of the Bay of Bengal Large Marine Ecosystem and Regional Small-scale Fisheries Livelihoods project. A significant duty which he also performs is as Secretary of the Asia-Pacific Fishery Commission (APFIC).
Name	:	**Mr. Ichiro Nomura**
Position	:	Advisor to the President of the Tokyo University of Marine Science and Technology, Japan
Organization /Institution	:	Tokyo University of Marine Science and Technology
E-mail	:	inomura75@gmail.com
Biography	:	Mr. Nomura earned the distinction of the First Secretary in charge of fisheries in 1983. He has been the Assistant Director-General and Head of the Fisheries and

Aquaculture Department of the Food and Agriculture Organization of the United Nations (FAO) in Rome, Italy until 2010. He is presently the Advisor to the President of the Tokyo University of Marine Science and Technology. He completed his M.A. (Public Administration) at the John F. Kennedy School of Government, Harvard University, USA.

Name : **Dr. Stephen J. Hall**
Position : Director-General
Organization /Institution : The WorldFish Center, Malaysia
E-mail : s.hall@cgiar.org

Biography : Dr. Stephen J. Hall was appointed Director General of The WorldFish Center in March 2004. He was previously Director of the Australian Institute of Marine Science (AIMS) and was a member of Prime Minister's Steering Committee on Mapping Australia's Innovation System from 2003 until 2004. He also served as Director of Lincoln Marine Science Center, Australia, worked in Flinders University as Professor of Marine Biology, and as Section Head (Fish Biology) in the Scottish Office Agriculture Environment and Fisheries Department, Marine Laboratory of Aberdeen, UK. In January 2005, he was awarded the Public Service Medal for outstanding service as Director of the Australian Institute of Marine Science. He has published extensively in the scientific and development literature on tropical fisheries and aquaculture. He has a Ph.D. in Marine Ecology and B.Sc. in Marine Biology and Biochemistry.

Name : **Mr. Suriyan Vichitlekarn**
Position : Assistant Director and Head
Organization /Institution : Agriculture Industries and Natural Resources Division
The ASEAN Secretariat
E-mail : suriyan@asean.org

Biography : Mr. Suriyan Vichitlekarn is a fisheries graduate from Kasetsart University in Thailand. He continued his studies on Management of Agricultural Knowledge Systems (MAKS) from Wageningen Agricultural University in the Netherlands. He started working with the Southeast Asian Fisheries Development Center (SEAFDEC) where he spent his 17 years in various disciplines of fisheries development. In 2008, he joined the Secretariat of the Association of Southeast Asian Nations (ASEAN) where he is now the Assistant Director and Head of Agriculture Industries and Natural Resources Division. His current responsibility is to coordinate and facilitate the implementation of ASEAN policy and cooperation on food, agriculture and forestry.

Name : **Dr. Naruepon Sukumasavin**
Position : Aquatic Ecology Expert
Organization /Institution : Department of Fisheries, Thailand
E-mail : naruepos@gmail.com

Biography : Dr. Naruepon Sukumasavin is an Aquatic Ecology Expert attached to the Office of Experts, Department of Fisheries of Thailand. He specializes in fish reproductive endocrinology and population genetics. With almost 30 years experience since he started his career as Fisheries Biologist, he published a number of scientific papers in his field of expertise. Besides his full time work, he also served as consultant for various projects mainly on freshwater aquaculture development in the Mekong River Basin including Broodstock Management of the Hatchery Stocks of Indigenous Species in Cambodia, Planning and Design of National Broodstock Center for Freshwater Aquaculture Development in the Northern Region of Vietnam, and Test Running and Adjustment of Yen Ly Hatchery, Nghe An Province, Vietnam. He finished his M.Sc. in Marine Science from Kasetsart University in 1982, Masters in Zoology from the University of British Columbia, Canada in 1992, and Ph.D. in Applied Population Genetics from Tohoku University, Japan in 2006.

Technical Panel Sessions

(Listed in alphabetical order by first names)

Name	**:**	**Dr. Achmad Poernomo**
Position	**:**	Executive Secretary and Research Scientist
Organization /Institution	**:**	Agency for Marine and Fisheries Research and Development, Ministry of Marine and Fisheries Affairs, Indonesia
E-mail	**:**	achpoer@yahoo.com
Biography	**:**	Dr. Achmad Poernomo completed his Master's and doctoral degrees in the field of food science and technology from the University of New South Wales, Australia. At present, he is the Executive Secretary of the Agency for Marine and Fisheries Research and Development. He has published articles on fisheries specifically in food processing, safety, marketing, and industry in local and international journals, proceedings, and presented papers in national and international fora. He is also a part-time lecturer at several universities in Indonesia and abroad.

Name	**:**	**Dr. Akiko Ikeguchi**
Position	**:**	Associate Professor
Organization /Institution	**:**	Geography, Faculty of Education and Human Sciences, Yokohama National University, Japan.
E-mail	**:**	ikeguchi@ynu.ac.jp
Biography	**:**	Dr. Akiko Ikeguchi is a human geographer currently affiliated with the Yokohama National University, Japan. She has been working in research projects on development issues and small-scale fisheries in Japan, Federal States of Micronesia, Vietnam, and Lao PDR since 1996. Her present concern is on how cultural ecological perspective can be applied to small-scale marketing and gathering of aquatic resources, aquaculture, and coastal governance.

Name	**:**	**Dr. Anond Snidvongs**
Position	**:**	Director
Organization /Institution	**:**	Southeast Asia Global Change System for Analysis, Research and Training (SEA-START), Thailand
E-mail	**:**	anond@start.or.th
Biography	**:**	Dr. Anond Snidvongs is the Director of the Southeast Asia-START Global Change Regional Center. He received his doctoral degree in the field of Oceanography from the University of Hawaii, USA in 1993. He is also the Acting Executive Director of the Geo-Informatics and Space Technology Development Agency (GISTDA) of Thailand.

Name	**:**	**Dr. Ari Purbayanto**
Position	**:**	Professor/Lecturer
Organization /Institution	**:**	Faculty of Fisheries and Marine Sciences, Bogor Agricultural University, Indonesia
E-mail	**:**	purbayanto@yahoo.com, purbayanto@ipb.ac.id
Biography	**:**	Dr. Ari Purbayanto is a fisheries scientist with a doctoral degree from Tokyo University of Marine Science and Technology. He is a lecturer at the Faculty of Fisheries and Marine Sciences, Bogor Agricultural University since 1990. Starting in 2002, he intensified his research to focus on gear selectivity, fish behavior, and coastal fisheries development which were funded through government research grants as well as international support from FAO, JSPS, and the Lemelson Foundation of USA. He was awarded Professorship from the Government of Indonesia in June 2007, the RINTEK 2010 awards, and BIC-Innovation 102-2010 awards in 2010.

Name : **Mr. Arthorn Piboonthanapathana**
Position : Secretary
Organization /Institution : Thai Frozen Foods Association, Thailand
E-mail : -
Biography : Mr. Arthorn Piboonthanapathana completed his Master's degree in Business Management at Strathclay University, Glasgow, Scotland, U.K. He is the Secretary of the Thai Frozen Foods Association and also the Assistant Managing Director of Narong Seafood Co., Ltd.

Name : **Dr. Atsushi Ishimatsu**
Position : Professor
Organization /Institution : Institute for East China Sea Research, Nagasaki University, Japan
E-mail : a-ishima@nagasaki-u.ac.jp
Biography : Dr. Atsushi Ishimatsu is a Professor of the Institute for East China Sea Research, Nagasaki University, Japan. He has a Ph.D. in Agricultural Science from Kyushu University, Fukuoka, Japan. His research interest includes comparative and environmental physiology, and now he is focusing on the effect of ocean acidification and warming on marine life. He has published over 100 papers in international and local journals and 13 book chapters. He has also been involved in various environmental impact assessments (*e.g.* ocean CO_2 sequestration and geological CO_2 storage), and resource and ecological assessments (*e.g.* fish kills caused by red tide).

Name : **Atty. Benjamin F. S. Tabios, Jr.**
Position : Assistant Director for Administrative Services
Organization /Institution : Bureau of Fisheries and Aquatic Resources (BFAR), Philippines
E-mail : benjo_tabios@yahoo.com
Biography : Atty. Benjamin F. S. Tabios, Jr. is the Assistant Director for Administrative Services of the Philippine Bureau of Fisheries and Aquatic Resources. He also served as a legislative staff chief and legislative consultant in many districts at the Congress of the Republic of the Philippines for 16 years. He has attended many regional and international seminars and conferences related to the highly migratory fish stocks (tuna) and on illegal, unreported and unregulated (IUU) fishing.

Name : **Mr. Bordin Ittipong**
Position : Government Officer
Organization /Institution : Fishery Technological Development Division, Department of Fisheries, Thailand
E-mail : bord7227@yahoo.com
Biography : Mr. Bordin Ittipong is a Government Officer and food technologist at the Fishery Technological Development Division of the Department of Fisheries of Thailand. His responsibilities are on the utilization of fish industrial wastes or by-products for human consumption and various applications, maximizing the utilization of fishery resources through research and development, surveying and monitoring biotoxins and related substances in aquatic animals, and promoting the fishery industry through the development of the products quality through appropriate post-harvest technology.

Name : **Mr. Bundit Chokesanguan**
Position : Information and Training Division Head
Organization /Institution : SEAFDEC Training Department (SEAFDEC/TD), Thailand
E-mail : bundit@seafdec.org

Biography : Mr. Bundit Chokesanguan is a capture fisheries specialist and fishing gear technologist, involved in the development and use of fishing gears that follow the concept of responsible fishing gear and practices. His most recent activities included the design, development and improvement of selective and by-catch reduction devices, and is also involved in the demonstration, experiments and the promotion of these devices to fishers in the SEAFDEC Member Countries. He was involved in the regional administration for regionalization of the FAO Code of Conduct for Responsible Fishing Operations to render it suitable for application in Southeast Asia.

Name : **Dr. Celia Lavilla-Pitogo**

Position : Director of Aquatic Animal Health for Integrated Aquaculture International (IAI)

Organization /Institution : Integrated Aquaculture International, Brunei Darussalam

E-mail : celia.pitogo@fulbrightmail.org

Biography : Dr. Celia Lavilla-Pitogo is currently the Director of Aquatic Animal Health for Integrated Aquaculture International based in Brunei Darussalam. Before joining the IAI, she was a Scientist in the Fish Health Section of SEAFDEC/AQD and has authored over 60 scientific papers, reviews, and extension manuals. Her expertise and work in aquatic animal health is recognized in the scientific community. She is also actively involved in international organizations in the region.

Name : **Dr. Christopher Glass**

Position : Director, Northeast Consortium

Organization /Institution : Institute for the Study of Earth Oceans and Space, University of New Hampshire, USA

E-mail : chris.glass@unh.edu

Biography : Dr. Christopher Glass is Director of the Northeast Consortium and Research Professor in the Ocean Process Analysis Laboratory of the Institute for the Study of Earth, Oceans and Space at the University of New Hampshire, USA. A specialist in animal behavior and marine biology, he has a long record in research of conservation gear in New England and international fisheries. Prior to joining the Northeast Consortium, he served for 9 years as Director of Marine Conservation at Monument Center for Conservation Sciences in USA, where he studied fish behavior and applied his knowledge of this subject to develop selective fishing gears directed at reducing by-catch and discard in commercial fisheries.

Name : **Mr. Christopher Paterson**

Position : Adviser

Organization /Institution : Secretariat of the Pacific Community (SPC), Fiji

E-mail : chrisjpaterson@yahoo.com.au

Biography : Mr. Christopher Paterson lives in the Fiji Islands where he works for the Applied Geoscience and Technology Division of the Secretariat of the Pacific Community (SPC). He is currently responsible for coordinating the GEF-funded Pacific Integrated Water Resource Management Project involving 14 Pacific Island countries. Before joining SPC, he worked as Fisheries Expert for UNEP in the Project Coordinating Unit of the UNEP/GEF South China Sea Project. Prior to this, he worked as a Lecturer in Marine Policy and Management at the Australian Maritime College's School of Fisheries, and also worked as Information Officer for the Southeast Asian Fisheries Development Center.

Name : **Mr. Don Griffiths**

Position : Senior Technical Advisor

Organization /Institution : Regional Fisheries Livelihoods Programme (RFLP), FAO Regional Asia Pacific Office, Bangkok

E-mail : don.griffiths@fao.org

Biography	**:**	Mr. Don Griffiths is Senior Technical Advisor for Regional Fisheries Livelihoods Programme (RFLP) at FAO. He has over 30 years work experience mostly with applied field-based poverty alleviation development projects/programmes for Asia implemented by various institutions including ODA/DFID, DANIDA, AECID, EU, USAID, FAO, MRC, and AIT. He has conducted specific activities in fisheries sector including stock enhanced fisheries, aquatic resource and bio-diversity conservation, capture fisheries, aquaculture, animal and crop systems, aquatic product processing and marketing, genetics, applied research and development, and training and extension.

Name	**:**	**Dr. Donald Macintosh**
Position	**:**	Coordinator
Organization /Institution	**:**	IUCN Asia Regional Office, Bangkok, Thailand
E-mail	**:**	secretariat@mangrovesforthefuture.org
Biography	**:**	**Dr. Donald Macintosh** is currently the Coordinator of the IUCN (World Conservation Union), Asia Regional Office in Bangkok and with the Mangroves for the Future (MFF) Initiative. He was a Professor at the University of Aarhus in Denmark since 1995 and Director of the Centre for Tropical Ecosystems Research. He has managed several large coastal management and capacity building projects in Southeast Asia and worked as a Senior Technical Adviser to the project "Support to the Marine Protected Area Network in Viet Nam" from 2003 to 2006.

Name	**:**	**Mr. Duncan Leadbitter**
Position	**:**	Director
Organization /Institution	**:**	Australia based fisheries and natural resource consulting company (Fish Matter)
E-mail	**:**	duncan.leadbitter@sustainablefish.org
Biography	**:**	Mr. Duncan Leadbitter is consultant for the Sustainable Fisheries Partnerships as Technical Director where one of his roles focuses on feed fish fisheries. He is a Director of the Australia-based Fish Matter which provides practical advice to industry, government and NGOs regarding the sustainable use of fish and other aquatic natural resources. Prior to this, in 2000, he served as the International Fisheries Director for the Marine Stewardship Council (MSC), and was responsible for developing and managing the MSC's Asia Pacific region.

Name	**:**	**Dr. Evelyn Grace de Jesus-Ayson**
Position	**:**	Scientist and concurrently the Head of Research Division
Organization /Institution	**:**	SEAFDEC Aquaculture Department (SEAFDEC/AQD), the Philippines
E-mail	**:**	edjayson@seafdec.org.ph
Biography	**:**	Dr. Evelyn Grace T. De Jesus-Ayson is a Scientist and concurrently the Head of Research Division of SEAFDEC/AQD. She has also been involved in foreign funded projects on growth and survival improvement of commercially important fish species and poverty alleviation in the Philippines under USAID and AusAID, respectively. She has also published several scientific papers and is also a Council member of the Asia-Oceania Society for Comparative Endocrinology and the Asian Fisheries Society.

Name	**:**	**Mrs. Fatima Ferdouse**
Position	**:**	Chief
Organization /Institution	**:**	Trade Promotion Division, INFOFISH, Malaysia
E-mail	**:**	info@infofish.org

Biography	**:**	Mrs. Fatima Ferdouse joined FAO/INFOFISH in 1983. Since then she has been actively monitoring the international trade and market for fish and seafood, including aquaculture products. She is responsible for fishery trade promotion, analysis and monitoring the international markets for fish and fishery products. She undertakes marketing consultancies for private/public companies, financial institutions, regional and international organizations. As adviser and also as a marketing consultant, she works closely with fishery industries, government bodies, and various regional and international organizations in the Asia/Pacific region and beyond.

Name	**:**	**Dr. Felix Ayson**
Position	**:**	Scientist and Program Leader of the Marine Fish Program
Organization /Institution	**:**	SEAFDEC Aquaculture Department (SEAFDEC/AQD), the Philippines
E-mail	**:**	fgayson@seafdec.org.ph
Biography	**:**	Dr. Felix Ayson is presently a Scientist and Program Leader of the Marine Fish Program at SEAFDEC/AQD. His research studies are geared towards improving the production and/or increasing the survival of marine fish larvae (milkfish, sea bass, grouper) in the fish hatchery and understanding the physiology of growth in fishes. He is also involved in the investigations for alternative feeding strategies in milkfish grow-out culture. He has also initiated a study on the effects of increasing ocean temperature and ocean acidity on fish reproduction and early development in relation to the effect that climate change may have on aquaculture.

Name	**:**	**Dr. Gazi Md. Nurul Islam**
Position	**:**	Research Fellow
Organization /Institution	**:**	Bio-resource and Environment Laboratory, Institute of Agricultural and Food Policy Studies, University Putra Malaysia, Malaysia
E-mail	**:**	gazinurul236@gmail.com
Biography	**:**	Dr. Gazi Md. Nurul Islam is an economist and presently a Research Fellow at the Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia. He served as consultant and as a Senior Research Associate to Rural Employment Sector Program in Bangladesh and the WorldFish Center for Bangladesh, respectively. He has published many articles including fisheries management and other fisheries related issues in many flagship journals.

Name	**:**	**Mr. Goh Kian Heng**
Position	**:**	Assistant Director
Organization /Institution	**:**	Supply Chain Section, Post-Harvest Technology Division, Agri-Food & Veterinary Authority Singapore (AVA) of Singapore.
E-mail	**:**	goh_kian_heng@ava.gov,sg
Biography	**:**	Mr. Goh Kian Heng has been working in fisheries post-harvest technology for several years and is currently the Assistant Director of the Supply Chain Section in the Post-Harvest Technology Division of the Agri-Food & Veterinary Authority of Singapore. He has been involved with SEAFDEC/MFRD regional programmes on maximizing the utilization of under-utilized fisheries resources and development of value-added fishery products. He is Council Member of the Singapore Institute of Food Science and Technology (SIFST) and Chief Editor of the Institute's newsletter.

Name	**:**	**Dr. Harvey Demaine**
Position	**:**	Senior Advisor
Organization /Institution	**:**	Regional Fisheries and Livestock Development Component, Noakhali, Agricultural Sector Programme Support, Bangladesh
E-mail	**:**	hdemaine@yahoo.com,hdemaine@gmail.com gnaep@citechco.net

Biography : Dr. Harvey Demaine is involved in the aquaculture sector since 1988 specializing in the socio-economic aspects of small-scale low cost systems, and was involved in FAO's initiative in measuring the impact of small-scale aquaculture on livelihood. He has been the joint editor/co-author of two monographs on Rural Aquaculture and over 40 technical reports and almost 70 academic publications. He is currently employed as an Advisor in DANIDA's Agricultural Sector Support Programme in Bangladesh and undertaking numerous consultancy assignments for a range of multilateral and bilateral donors. He was a special advisor to H.M. the King of Thailand's Royal Projects Division.

Name : **Dr. Hiroshi Ogata**

Position : Fish Nutrition Advisor

Organization /Institution : National Research Institute of Aquaculture, Fisheries Research Agency (FRA), Japan

E-mail : ogata1@affrc.go.jp

Biography : Dr. Hiroshi Ogata is presently a Fish Nutrition Advisor at the National Research Institute of Aquaculture, Fisheries Research Agency, Japan. He was a former Deputy Chief of SEAFDEC/AQD and Government of Japan (GOJ) Trust Fund Co-Manager of GOJ regional programs implemented in Southeast Asia from April 2007 to March 2009. As Co-Manager, he initiated the conduct of activities which led to implementation of SEAFDEC/AQD's on-going regional program on 'Food Safety of Aquaculture Products in Southeast Asia'.

Name : **Dr. Joebert D. Toledo**

Position : Chief

Organization /Institution : SEAFDEC Aquaculture Department (SEAFDEC/AQD), Philippines

E-mail : jdtoledo@seafdec.org.ph

Biography : Dr. Joebert D. Toledo is the current Chief of SEAFDEC Aquaculture Department. An accomplished aquaculture scientist, he is duly recognized by prestigious institutions for his work in marine fish breeding and seed production. He has published papers on seed production particularly groupers in refereed journals. He was also involved in various marine fish breeding programs for the Government of India, Brunei Darussalam, and in Vietnam. Apart from this, he has been consultant or partner of various aquaculture-related companies in the Philippines and a proficient trainer of many farmers and government officers from various parts of Southeast Asia.

Name : **Dr. John C. Pernetta**

Position : Freelance Fisheries Management Consultant and Environment

Organization /Institution : Thailand

E-mail : jpernetta@gmail.com

Biography : Dr. John C. Pernetta has been the Institutional Focal Point for the South Pacific Regional Environment Programme (SPREP) of the University of Papua New Guinea (UPNG) from 1983-89. He has been the advisor on environmental matters and a consultant for the ministry of planning and development for UNEP, UNDP and the Government of Maldives in the preparation of the National Action Plan for Environmental Management. His research experience includes examination of the exploitation of natural resources for subsistence uses, the impacts of large scale developments, mariculture, and the potential impacts of climate change and sea level rise on insular countries and coastal areas.

Name : **Dr. Jonathan O. Dickson**
Position : Chief, Capture Fisheries Division
Organization /Institution : Bureau of Fisheries and Aquatic Resources, the Philippines
E-mail : jod_bfar@yahoo.com
Biography : Dr. Jonathan O. Dickson obtained his Bachelor's Degree in Marine Fisheries from the University of the Philippines. After completing his Master's Degree in Research Management and Doctoral Degree on Fishing Technology and Fisheries Management, he serves as Chief of the Capture Fisheries Division of the Philippine Bureau of Fisheries and Aquatic Resources. He is the SEAFDEC National Coordinator and an active participant to the SEAFDEC meetings, and consultations especially on the implementation of the 2001 Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region.

Name : **Mr. Jose Ingles**
Position : Project Leader
Organization /Institution : World Wide Fund for Nature (WWF), the Philippines
E-mail : ingles.jose@gmail.com
Biography : Mr. Jose Ingles has an academic degree in zoology, marine biology and fisheries. His career and passion for the oceans spans 3 decades – as a fisheries researcher for 10 years, he then spent 12 years with the Fisheries Faculty of the University of the Philippines where he mentored graduate students while undertaking research. He is currently with the WWF and is the coordinator of the Sulu Sulawesi Marine Ecoregion (SSME) fisheries project.

Name : **Dr. Jutarat Kittiwanich**
Position : Fisheries Biologist
Organization /Institution : Marine Shrimp Culture Research Institute, Coastal Fisheries Research and Development Bureau, Department of Fisheries, Thailand
E-mail : jutark@yahoo.com
Biography : Dr. Jutarat Kittiwanich is a Fisheries Biologist of the Marine Shrimp Culture Research Institute, Department of Fisheries of Thailand. Her interest is in the mathematical modeling of aquatic ecosystem such as nutrient (N, P) cycle in aquaculture ponds. Her research areas include evaluation of nutrient budget in natural resource and also in shrimp ponds, and determination of the carrying capacity of water bodies for aquaculture using modeling approaches.

Name : **Dr. Kamonpan Awaiwanont**
Position : Senior Fisheries biologist
Organization /Institution : Upper Gulf Marine Fisheries Research and Development Center, Department of Fisheries, Thailand
E-mail : kamonpana@fisheries.go.th
Biography : Dr. Kamonpan Awaiwanont graduated with a degree fishing technology from the Faculty of Fisheries, Kagoshima University Japan. He is a Senior Fisheries Biologist and has been working on fishery extension for small-scale fishers under Department of Fisheries of Thailand since 1985. He worked on artificial reefs construction and monitoring, worked on light fishing in collaboration with SEAFDEC and the Faculty of Fisheries, Kasetsart University. He is currently involved in the implementation of EC Regulation to Combat IUU Fishing.

Name	**:**	**Dr. Kaoru Nakata**
Position	**:**	Deputy Director, Research Management Department
Organization /Institution	**:**	Fisheries Research Agency (FRA), Japan
E-mail	**:**	may31@affrc.go.jp
Biography	**:**	Dr. Kaoru Nakata specializes in marine biology. She completed her doctoral degree from Tokyo University in 1995, and studied the effects of climate change on the plankton ecosystem in the Kuroshio waters, and material cycling in coastal seas. She worked for FRA (including the predecessor agency of FRA) for 27 years. She was the recipient of the Uda Prize from the Japanese Society of Fisheries Science in 2003. She is now the Deputy Director of the Research Management Department of Fisheries Research Agency, Japan which is mainly responsible for marine research.

Name	**:**	**Mr. Keith Symington**
Position	**:**	Bycatch Strategy Leader
Organization /Institution	**:**	WWF, Canada
E-mail	**:**	keithsymington@yahoo.ca
Biography	**:**	Mr. Keith Symington is the By-catch Strategy Leader for the WWF's Coral Triangle Programme. He has worked with WWF Vietnam on various areas of concern including community-based management, poverty and sustainability in coastal fishing communities, MPAs and fisheries reconstruction. His current main areas of interest include: i) fisheries co-management and livelihoods; ii) market-based strategies for advancing fisheries Best Practices and sustainability in Asian fisheries, and; iii) by-catch reduction in Asian fisheries.

Name	**:**	**Mr. Kent G. Hortle**
Position	**:**	Chief Technical Advisor
Organization /Institution	**:**	Mekong River Commission (MRC) Fisheries Programme, Cambodia
E-mail	**:**	khortle@gmail.com, kent@mrcmekong.org
Biography	**:**	Mr. Kent G. Hortle has many years experience as a project manager or specialist in fisheries and aquatic ecosystem assessment. He has contributed to more than 100 reports or publications, presented at several conferences on fisheries, fish biology or limnology. Currently, he is responsible for technical oversight of the MRC's fisheries programme. Prior to working with the MRC, he managed several major aquatic monitoring programs and assessments, mostly in developing countries, mainly in Indo-China, Indonesia and Papua New Guinea.

Name	**:**	**Dr. Ketut Sugama**
Position	**:**	Director General of Aquaculture, Ministry of Marine Affairs and Fisheries of Indonesia
Organization /Institution	**:**	Aquaculture Ministry of Marine Affairs and Fisheries, Indonesia
E-mail	**:**	Sugama@indosat.net.id
Biography	**:**	Dr. Ketut Sugama specializes in fish breeding and genetics. From 2008 to 2011, he was the Director of Seeds Development of the Directorate General of Aquaculture in Indonesia. He now holds the position of Director General of Aquaculture, Ministry of Marine Affairs and Fisheries of Indonesia. He is known in the region for his experience and significant contributions on marine finfish aquaculture.

Name : **Mr. Khin Maung Soe**
Position : Deputy Director
Organization /Institution : Research and Development Division of Department of Fisheries, Myanmar
E-mail : Aquadof10@gmail.com
Biography : Mr. Khin Maung Soe is the Head of Research and Development Division of the Department of Fisheries of Myanmar where he undertakes the overall management and guides the tasks and activities in various fields of inland and marine fisheries development, management and conservation. Currently he is the national coordinator for the ASEAN/SEAFDEC Rights-based Fisheries and Fisheries Co-Management Project and the FAO Sustainable Small-scale Fisheries and Aquaculture livelihoods in Coastal Mangrove Ecosystem Project.

Name : **Dr. Koichi Okuzawa**
Position : Chief Researcher, Seed Quality Research Group, Aquaculture Technology Division, National Research Institute of Aquaculture (NRIA), Japan
Organization /Institution : National Research Institute of Aquaculture, Fisheries Research Agency, Japan
E-mail : kokuzawa@fra.affrc.go.jp
Biography : Dr. Koichi Okuzawa has been working on fish reproduction for more than 20 years and has published 66 original papers. His research is highlighted by the identification of a GnRH receptor cDNA from catfish, a first for non-mammalian species. He was also responsible for the management and coordination of research projects both in SEAFDEC/AQD and in Fisheries Research Agency (FRA). Recently, he was designated as Head of the Stock Enhancement Technology Section in Ishigaki Tropical Station (ITS) in Okinawa and later returned to NRIA to conduct studies on fish reproduction.

Name : **Dr. Kungwan Juntarashote**
Position : Associate Professor
Organization /Institution : Faculty of Fisheries, Kasetsart University, Thailand
E-mail : ffiskwj@ku.ac.th
Biography : Dr. Kungwan Juntarashote is the Director of the Coastal Development Centre, Faculty of Fisheries of Kasetsart University in Bangkok, Thailand. He finished his doctoral degree in fisheries from Nihon University, Japan. In 2011, he wrote a book on "Learning from the Experts: Attaining sufficiency in small-scale fishing communities in Thailand. He was a recipient of the Yamamoto Award in 2004.

Name : **Dr. Kuperan Viswanathan**
Position : Professor
Organization /Institution : Universiti Utara Malaysia, College of Arts and Sciences, Malaysia
E-mail : kuperan@uum.edu.my
Biography : Dr. Kuperan Viswanathan is a natural resource economist with a Ph.D. in marine resource economics. He started his career as a university lecturer before joining the WorldFish Center where he got the opportunity to be with the WorldFish Center South Asia Office and obtain CGIAR award for excellent partnership. To date, he has spent over 25 years of university teaching, doing research leadership and management, directing and consulting on areas of economics, managing and doing developmental work locally and internationally.

Name : **Dr. Lahsen Ababouch**
Position : Chief
Organization /Institution : Fish Products, Trade and Marketing Service. Department of Fisheries and Aquaculture, FAO, Rome, Italy
E-mail : Lahsen.Ababouch@fao.org

Biography : Dr. Lahsen Ababouch leads the Fish Products, Trade and Marketing Service at FAO in Rome, Italy. Before June 2000, he was Professor at the King Hassan II Institute of Agronomy and Veterinary Medicine, in Rabat, Morocco, where in addition to teaching and research, he held advisory positions for research, industry outreach, bilateral trade agreements and agribusiness. He has wide experience in training, research, technical assistance and capacity building in fish and seafood technology, safety and trade, in over 60 developing countries mainly in Africa, the Middle East, Asia and the Pacific.

Name : **Mr. Leonard G. Limpus**
Position : CEO
Organization /Institution : L. G. Limpus and Associates, Food/Fish Quality Management Consultants, Australia
E-mail : lglimpus@gmail.com

Biography : Mr. Leonard G. Limpus is CEO of L. G. Limpus and Associates, Food/Fish Quality Management Consultants. Currently, he is a consultant to MFRD on fisheries post-harvest technology (FPHT). He has extensive experience in fisheries post-harvest technology. He worked as Program Manager of the ASEAN Executing Agency based at MFRD, for the conduct of activities to improve regional FPHT including improved fish inspection, conduct training in FPHT, and produce training materials for developing HACCP competencies for fish processors in the Southeast Asian region.

Name : **Dr. Le Xuan Sinh**
Position : Senior Lecturer
Organization /Institution : Department of Fisheries Management and Economics, College of Aquaculture and Fisheries, Cantho University, Vietnam
E-mail : lxsinh@ctu.edu.vn

Biography : Dr. Le Xuan Sinh specializes in aquaculture economics, aquatic resources economic and management, and research methodology of socio-economic aspects in aquaculture and fisheries. He has been a consultant in farming system studies, rural development, development and management of small-scale fisheries and aquaculture, marketing of aquatic products for World Bank, FAO, NACA, JIRCAS, WWF, DANIDA, MSC, and OXFAM United Kingdom. He has also worked in a number of development projects on farming systems, fisheries and aquaculture management, aquatic resources management, marketing of agricultural and aquatic products.

Name : **Dr. Magnus Torell**
Position : Senior Advisor
Organization /Institution : SEAFDEC Secretairat, Thailand
E-mail : magnus@seafdec.org

Biography : Dr. Magnus Torell is currently the Senior Advisor to the Southeast Asian Fisheries Development Center (SEAFDEC). He has roughly 13 years of experience in the field of research starting from his homeland in Sweden and various parts of Asia. Among his major works include wetland management in Cambodia, and institutional implications of an ecosystem approach to capture fisheries management.

Name : **Ms. Mahyam Mohd Isa**
Position : Chief
Organization /Institution : SEAFDEC Marine Fishery Resources Development and Management Department (SEAFDEC/MFRDMD), Malaysia
E-mail : mahyam@seafdec.org.my

Biography : Hjh. Mahyam bte Mohd. Isa is the Chief of the Marine Fishery Resources Development and Management Department (MFRDMD) in Terengganu, Malaysia. Before her appointment as Chief of MFRDMD, she served as the SEAFDEC Special Departmental Coordinator for MFRDMD. She has been serving as the Chief of MFRDMD since November 2007. Her fields of expertise are in stock assessment, fisheries management and inland fisheries.

Name : **Dr. Mali Boonyaratpalin**
Position : Fisheries Advisor
Organization /Institution : Department of Fisheries, Thailand
E-mail : boonyaratpalin@yahoo.com

Biography : Dr. Mali Boonyaratpalin is a renowned fish nutritionist in Asia and is currently a Fisheries Advisor of the Department of Fisheries of Thailand. She has chaired countless number of governmental as well as international projects in aquaculture specifically on aquatic feed development. She is a committee member of Thailand's National Bureau of Agricultural Commodity and Food Standards. More recently, she has dedicated herself to the implementation of technical advancement for sustainable aquaculture development through alternative candidates for farming such as seaweeds and abalone.

Name : **Dr. Maria Rebecca Campos**
Position : Consultant
Organization /Institution : International Institute of Fisheries Economics and Trade, Philippines
E-mail : cmaribec@yahoo.com

Biography : Dr. Maria Rebecca Campos is currently an Executive Committee Member of the International Institute of Fisheries Economics and Trade in Asia and the Pacific. She has been an independent consultant as Resource Economist for almost 20 years for different international organizations like the Asian Development Bank, United Nations Development Programme, among others. She is also involved in part time teaching at the University of the Philippines.

Name : **Dr. Maria Rowena R. Romana-Eguia**
Position : Head of Technology Verification and Demonstration Division
Organization /Institution : SEAFDEC Aquaculture Department (SEAFDEC/AQD), the Philippines
E-mail : mreguia@seafdec.org.ph

Biography : Dr. Maria Rowena R. Romana-Eguia currently heads the SEAFDEC/AQD's Small Holder Freshwater Aquaculture Program as Program Leader and AQD's Technology Verification and Demonstration Division. She is involved in genetics research, and has authored and co-authored several extension manuals and scientific journal publications, three of which have been locally awarded as best published papers in aquaculture by the Philippine Council for Aquatic and Marine Research and Development of the Department of Science and Technology. She finished her B.Sc. Zoology at the University of the Philippines in 1982 and M.Sc. Genetics at the University of Wales, Swansea, UK in 1984, the latter through a scholarship grant from the International Development Research Center of Canada. She obtained her Ph.D. in Agricultural Science (major in Fish Population Genetics) from the Tohoku University as a Ronpaku Fellow of the Japan Society for the Promotion of Science in 2003.

Name : **Dr. Maripaz Perez**
Position : Regional Director for Asia and Country Manager
Organization /Institution : Philippine Country Office, WorldFish Center
E-mail : ma.perez@cgiar.org
Biography : Dr. Maripaz Perez is a Resource Economist and she has over 30 years of professional and academic experience in Philippine government service. Since May 2008 she has been spearheading the identification and implementation of projects on sustainable fisheries and aquaculture development in Asia in general and the Philippines in particular. Presently she is attached to the WorldFish Center as Regional Director for Asia and Country Manager for the Philippines.

Name : **Mr. Marc Wilson**
Position : Regional Project Manager
Organization /Institution : GEF International Waters Pacific IWRM Project at the Secretariat of the Pacific Community (SPC/SOPAC)
E-mail : marcawilson@gmail.com
Biography : Mr. Marc Wilson is a Natural Resource Management Specialist and currently the Regional Project Manager for the GEF International Waters Pacific Project on Implementing Sustainable Water Resources and Wastewater Management (IWRM) of the Pacific Islands Applied GeoScience Commission (SOPAC) of the Secretariat of the Pacific Community (SPC). He has particular interest in integrated management of natural resources and the challenges of institutionalizing real stakeholder participation in decision making and in developing non government stakeholder participation capacity. As a fisheries scientist he was involved in the early studies and assessment of Pacific Tuna Stocks and South-East Australia's Deep Water Fish Resources.

Name : **Dr. Masahiro Yamao**
Position : Professor
Organization /Institution : Hiroshima University on Food Resource Economics, Japan
E-mail : yamao@hiroshima-u.ac.jp
Biography : Dr. Masahiro Yamao is a socio-economic scientist from Hokkaido University, Japan. Currently, he is a professor of Hiroshima University on Food Resource Economics. He has numerous publications concentrating on fisheries and rural development in Southeast Asia. His recent survey involves global and regional development in fisheries trade and its effect.

Name : **Dr. Masaya Katoh**
Position : Deputy Chief
Organization /Institution : SEAFDEC Marine Fishery Resources Development and Management Department (SEAFDEC/MFRDMD), Malaysia
E-mail : katoh@seafdec.org.my
Biography : Dr. Masaya Katoh is an ecological geneticist who obtained Ph.D. in Zoology from Louisiana State University, U.S.A. His first research position in Japan was at the Seikai National Fisheries Research Institute (SNFRI) of the Fisheries Agency. He worked as a Senior Researcher of Coastal Biology Section and Chief of Aquaculture and Resources Enhancement Section at Ishigaki Tropical Station of SNFRI, Fisheries Research Agency in Okinawa from 1997 to 2009. He was also appointed as an Adjunct Professor at Nagasaki University in 2001 and enjoyed teaching Japanese and international graduate students until 2009. He served as a member of Working Group 21 (Non-indigenous Aquatic Species) of the North Pacific Marine Science Organization (PICES) in 2008-09. He is now the Deputy Chief of MFRDMD in Terengganu, Malaysia.

Name : **Dr. Melanie R. Guerra**
Position : Supervising Aquaculturist
Organization /Institution : Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR), the Philippines
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Biography : Dr. Melanie R. Guerra is Supervising Aquaculturist of the Bureau of Fisheries and Aquatic Resources (BFAR), the Philippine She is currently the chairperson of the Sub-Committee on Fish and Fishery Products of the Philippine National Codex Organization. Her responsibility at BFAR is multi-disciplinary which ranges from providing technical services specifically on post-harvest technologies to heading the agency's Information and Public Relations. As a licensed Fishery Technologist, she is a member of Technical Committees on Fisheries of the Philippines.

Name : **Mr. Miao Weimin**
Position : Aquaculture officer
Organization /Institution : FAO Regional Office for Asia and the Pacific, Thailand
E-mail : Weimin.Miao@fao.org

Biography : Mr. Miao Weimin is an Aquaculture Officer at the FAO Regional Office for Asia and the Pacific (RAP). He is responsible for coordinating the FAO aquaculture activities in the region, developing, implementing and providing technical backstopping to FAO field programs in the areas related to aquaculture and inland fisheries. He has an extensive background in aquaculture and has led and participated in over a dozen of research projects sponsored by the Chinese government and international donor agencies concerning studies on carp genetic improvement, fisheries/aquaculture socio-economic and policy, aquaculture environment, community-based fish culture and integrated aquaculture systems.

Name : **Dr. Michael Phillips**
Position : Senior Scientist at the WorldFish Center
Organization /Institution : The WorldFish Center, Malaysia
E-mail : M.Phillips@cgiar.org

Biography : Dr. Michael Phillips is a Senior Scientist at the WorldFish Center and has worked across Asia, from a base in Bangkok, with ocassional short-term projects in Latin America and Africa. His research interests include sustainable aquaculture systems, environmental risks and management, certification, pro-poor farmer institutions and extension, and connecting small-scale producers to markets. He has also been involved in development of aquaculture certification guidelines with FAO, co-managed a multi-donor consortium with the World Bank, WWF, UNEP and FAO to identify better management practices for responsible shrimp farming and has been exploring mechanisms and partners for small-scale aquaculture farmers to access EU and US seafood markets.

Name : **Dr. Michael Pido**
Position : Director/Professor
Organization /Institution : Palawan State University (PSU), Philippines
E-mail : mdpido@yahoo.com

Biography : Dr. Michael Pido is the Director of Center for Strategic Policy and Governance of PSU and currently the Regional Coordinator for the Socio-economic Monitoring Program of the Seas of East Asia (SocMon SEA). His has worked with UNDP/GEF/PEMSEA (Partnerships in Environmental management for the Seas of East Asia) and the WorldFish Center and a

member of Asian Fisheries Society and IUCN Commission on Environmental, Economic and Social Policy and National Research Council of the Philippines. He specializes in rapid/participatory appraisals, management of small-scale fisheries and aquaculture, social/environmental impact assessment, protected area management and policy analysis. He has also participated in various conferences abroad and authored diverse articles, papers.

Name : **Dr. Miki Ogura**
Position : Director
Organization /Institution : Tuna and Skipjack Resources Division, National Research Institute of Far Seas Fisheries, Japan
E-mail : ogura@fra.affrc.go.jp

Biography : Dr. Miki Ogura received his Ph.D. from Hokkaido University on the migratory behavior of pacific salmon. He started his research study on the population dynamics, ecology and stock identification of the Pacific Salmon in the North Pacific Ocean. He also became interested on skipjack as an important species for industries and tropical water ecosystem. After a period of administrative position, he is now in charge of the division dealing with tunas and other large pelagic fish species, except for bluefin tuna, to accomplish sustainable use of tuna stocks and to achieve the stable growth of the fisheries of tunas.

Name : **Mr. Mohd Nor bin Noordin**
Position : Head (Processing & Fish Handling)
Organization /Institution : Department of Fisheries, Malaysia
E-mail : mnn@dof.gov.my

Biography : Mr. Mohd Nor bin Noordin has been serving the DOF Malaysia since the last 28 years. He has been an active member for various technical committees related to fisheries and Aquaculture, SME's, research, development, commercialization and HALAL Issues. He has a strong interest in Fisheries Extension, Aquaculture Planning, Management and Supervision, Consultancy and Technical Advisory, Investment and Trade, Development of SME's, Organic Farming and HALAL Initiatives on Fisheries.

Name : **Dr. Mudjekeewis D. Santos**
Position : Head/OIC, Marine Fisheries Research Division
Organization /Institution : Bureau of Fisheries and Aquatic Resources, Philippines
E-mail : mudjiesantos@gmail.com

Biography : Dr. Mudjekeewis D. Santos currently heads the Marine Fisheries Research Division of the NFRDI, Philippines. He also teaches graduate courses at the Department of Biology of the Ateneo de Manila University, Philippines. He obtained his Ph.D. in Applied Marine Biosciences and M.S. in Aquatic Biosciences from the Tokyo University of Marine Science and Technology (TUMSAT). He has published numerous scientific papers in international journals and books in molecular immunology, molecular ecology, genetics and resource assessment. He is currently implementing various research projects on climate change adaptation in fisheries and aquaculture, ecosystem-approach to fisheries management, stock assessment, genetic stock structures, genetic fingerprinting/ barcoding and biotechnology.

Name : **Dr. Nerissa D. Salayo**
Position : Associate Scientist
Organization /Institution : SEAFDEC Aquaculture Department (SEAFDEC/AQD), the Philippines
E-mail : ndsalayo@seafdec.org.ph

Biography	**:**	Dr. Nerissa D. Salayo is an Associate Scientist and Head of the Socioeconomics Section of SEAFDEC/AQD where she has been leading a study on the Socioeconomic Analysis of Stock Enhancement of Abalone in Sagay Marine Reserve in Sagay City, Philippines. She has held international and local consultancies with WorldFish, ITEM-Philippines, PNOC, PIDS on International Fish Trade. Her research interest include applied fisheries and aquaculture economics; fisheries resource valuation; governance and policy analysis for managing fishery resources; impact assessment of stock enhancement initiatives; management of conflicts and excess fishing capacity; and non-traditional security issues arising from fisheries resource degradation.

Name	**:**	**Mr. Nilim Baruah**
Position	**:**	Chief Technical Advisor
Organization /Institution	**:**	Tripartite Action to Protect Migrant Workers from Labour Exploitation (TRIANGLE Project), International Labour Organization, United Nations
E-mail	**:**	baruah@ilo.org
Biography	**:**	Mr. Nilim Baruah has been working on migration issues since 1998 and earlier in the development field. Before assuming his current responsibilities, he was Chief Technical Adviser to an ILO regional labour migration programme covering Russia, Central Asia and the Caucasus. Prior to that, he headed the International Organization for Migration of the Labour Migration Division in Geneva from 2002 to 2007. He has extensive experience concerning labour migration issues and governance as well as several publications on labour migration and remittances. He is co-author of the OSCE-IOM-ILO Handbook on Establishing Effective Labour Migration Policies (2006) which has been published in several languages. He has a Master's degree in Development Studies from Ottawa, Canada and is a citizen of India.

Name	**:**	**Mrs. Niracha Wongchinda**
Position	**:**	Senior Expert in Fishery Products
Organization /Institution	**:**	Office of Technical Expert, Department of Fisheries**,** Thailand
E-mail	**:**	nirachaw@gmail.com; nirachaw@fisheries.go.th
Biography	**:**	Mrs. Niracha Wongchinda is a Senior Expert in Fishery Products and also the Director of Organic Aquaculture Farm and Product Certification Center, DOF, Thailand. She worked on post-harvest technology in fisheries for more than 30 years. She is a member of National Technical Committee of the Thai Industrial Standards Institute on Agricultural and Food Products-Microbiology. She is also a member of the Steering Committee of the High Level Panel of Experts on Food Security and Nutrition of FAO.

Name	**:**	**Mr. Noel Barut**
Position	**:**	Interim Deputy Executive Director**,** National Fisheries Research and Development Institute
Organization /Institution	**:**	Bureau of Fisheries and Aquatic Resources, the Philippines
E-mail	**:**	nbarut@nfrdi.da.gov.ph**,** noel_c_barut@yahoo.com
Biography	**:**	Mr. Noel Barut is currently the Interim Deputy Executive Director of the National Fisheries Research Development Institute (NFRDI). He is the project leader in many projects of the ASEAN-SEAFDEC collaborative projects, *e.g.* the Development of Indicators for Fisheries in Fisheries Management in the ASEAN Region, Shark Fisheries Management in the ASEAN Region and the National Coordinator of the National Stock Assessment Program (NSAP). He has held Chairmanships in different committees of BFAR and in some Inter-Agency Committees and attended international, regional and national meetings, conferences, workshops and seminars on fisheries-related issues. He authored and co-authored several technical, popular and scientific papers both nationally and regionally published.

Name : **Mr. Pakorn Prasertwong**
Position : Chief, Environment Subdivision
Organization /Institution : Marine Department, Thailand
E-mail : pakornp2002@yahoo.com
Biography : Mr. Pakorn Prasertwong is the Chief of Environment Subdivision, Marine Department of Thailand, where he has been working for 26 years after graduating from Chulalongkorn University, Thailand. Among his major works is the assessment and monitoring of environmental impact caused by marine transportation and construction, and also on preventing and combating marine oil pollution. Since 2000 he was assigned as the Head of Thai delegation in the annual meeting of Marine Environment Protection Committee at International Maritime Organization (IMO).

Name : **Ms. Panitnard Taladon**
Position : Training and Fishery Extension Section Head
Organization /Institution : SEAFDEC Training Department (SEAFDEC/TD), Thailand
E-mail : panitnard@seafdec.org
Biography : Ms. Panitnard obtained her Master's of Science in Ecological Marine Management at the Vrije Universiteit Brussels in Belgium in 2001. She is currently the Head of Training and Fishery Extension Section of the Information and Training Division of SEAFDEC/TD in Thailand.

Name : **Dr. Peter Edwards**
Position : Emeritus Professor
Organization /Institution : Asian Institute of Technology (AIT), Thailand
E-mail : pedwards1943@gmail.com
Biography : Dr. Peter Edwards specializes in education, research and development in the aquatic environment with emphasis on aquaculture. He has published over 100 papers, half in refereed international journals, several reviews, and 2 authored and 3 edited books. His major consultancies include those with UNDP/FAO, UNDP/World Bank Chair of Working Group on Research Needs in Aquaculture in Developing Countries through the World Bank; Aquaculture Specialist for the DANIDA in 1991/2; FAO/APFIC Ad Hoc Working Group of Experts on Rural Aquaculture in Bangkok in 1999; Aquaculture Development Specialist for the ADB in 2004; member of the working group to revise the WHO Guidelines for the Safe Use of Wastewater and Excreta in Aquaculture in 2005; FAO working group to develop guidelines for an ecosystem approach to aquaculture, 2007-2010.

Name : **Dr. Phattareeya Suanrattanachai**
Position : Fishery Governance and Management System Section Head
Organization /Institution : SEAFDEC Training Department (SEAFDEC/TD), Thailand
E-mail : phattareeya@seafdec.org
Biography : Dr. Phattareeya Suanrattanachai finished her doctoral program from Kagoshima University, Japan. Her major field experience has been on the research and project implementation on coastal resource management with community-based management and co-management approaches for marine and inland fisheries, specifically promoting gender and development under the One Village, one Fisheries product (FOVOP) project in Thailand, Lao PDR, Myanmar, Cambodia, Vietnam

Name : **Mr. Pirochana Saikliang**
Position : Director of Deep Sea Fisheries Research and Technology Development Institute
Organization /Institution : Department of Fisheries, Thailand
E-mail : pirochas@hotmail.com

Biography : Mr. Pirochana Saikliang is the Director of Deep Sea Fishery Technology Research and Development Institute of the Department of Fisheries (DOF) of Thailand. He has been working on pelagic fish stock analysis and assessment section under Marine Fisheries Division of the DOF since 1981. He also worked on small pelagic fish stock analysis and status of marine fisheries mainly in the Gulf of Thailand. On 2000-2005 he served as the National Focal Point of the Japanese Trust Fund Project on "Information Collection for Sustainable Pelagic Fisheries in South China Sea. From 2002 to 2006 he worked with the UNEP GEF SCS Programme as National Focal Point of UNEP GEF South China Sea and Gulf of Thailand project. He is one of the members of the Regional Advisory Committee (RAC) of SEAFDEC.

Name : **Dr. Putth Songsangjinda**
Position : Director
Organization /Institution : Marine Shrimp Culture Research Institute, Coastal Fisheries Research and Development Bureau, Department of Fisheries, Thailand
E-mail : putthsj@yahoo.com

Biography : Dr. Putth Songsangjinda is a senior biologist with a Ph.D. in Applied Biological Science from Hiroshima University, Japan. His research experiences include water and sediment quality in shrimp farming, nitrogen budget and management, water recirculation, modeling of nutrient cycling in coastal and aquaculture pond ecosystems and eutrophication. He has also been involved as a member of the working committee of the FAO-Department of Fisheries, Thailand on the Technical Cooperation Program in Aquaculture Information System and in the development of aquaculture certification system and standards in Thailand particularly for shrimp farming.

Name : **Mr. Raja Mohammad Noordin Raja Omar**
Position : Director of Research
Organization /Institution : Fisheries Research Institute (FRI) Batu Maung, 11960 Pulau Pinang, Malaysia
E-mail : rnoordin@fri.gov.my

Biography : Mr. Raja Mohammad Noordin Raja Omar has started his career with the Department of Fisheries Malaysia in 1978. His vast experience on fisheries research has led him to his current position as the Director of Fisheries Research Institute of the Department of Fisheries Malaysia. He led the task force to formulate the National Plan of Actions for Sharks, Fishing Capacity, Sea Turtles and Invasive Alien Species.

Name : **Dr. Ratana Chuenpagdee**
Position : Associate Professor
Organization /Institution : Department of Geography, Memorial University of Newfoundland, St. John's, Canada
E-mail : ratanac@mun.ca

Biography	**:**	Dr. Ratana Chuenpagdee is a fisheries scientist with a Ph.D. in Resource Management and Environmental Studies. She is currently holding 5 positions: one in research at the International Ocean Institute of Canada and mostly in the field of education in Memorial University Newfoundland, St. John's Canada, University of British Columbia, Canada and at Kasetsart University in Bangkok. She has also established the Coastal Development Centre in Bangkok in 1999 for which she still co-directs.

Name	**:**	**Dr. Relicardo M. Coloso**
Position	**:**	Scientist at the Nutrition and Feed Development Section
Organization /Institution	**:**	SEAFDEC Aquaculture Department (SEAFDEC/AQD), the Philippines
E-mail	**:**	colosor@seafdec.org.ph
Biography	**:**	Dr. Relicardo M. Coloso is a Scientist at the Nutrition and Feed Development Section at SEAFDEC/AQD. His areas of specialization are on fish nutrition, nutritional biochemistry, amino acid and phosphorus metabolism, nutrition of and feed development for milkfish, tiger shrimp, Asian sea bass, grouper, molluscicides, and environmental contamination and toxicology. He was a recipient of various awards and member of prominent institutions in the country. Presently, he conducts studies on the use of soy products as alternatives to fishmeal in milkfish feed. He has authored and co-authored more than 35 scientific papers published in international journals and proceedings.

Name	**:**	**Mr. Renato F. Agbayani**
Position	**:**	Head, Training & Information Division, Cum Consultant on International Relations & Networking
Organization /Institution	**:**	SEAFDEC Aquaculture Department (SEAFDEC/AQD), the Philippines
E-mail	**:**	ragbayani@seafdec.org.ph
Biography	**:**	Mr. Renato F. Agbayani has conducted social science research and technology transfer activities including capacity development of various stakeholders in aquaculture in Southeast Asian countries. He served as a Regional Consultant of SEAFDEC on Human Resources Development on Rural Aquaculture. He has co-authored more than 10 international journal publications and published in scientific conference proceedings in many international conferences in aquaculture and fisheries management. One of these papers has won Best Paper award given by the Department of Agriculture and Department of Science and Technology. He is a member of the Asian Fisheries Social Science Research Network, Asian Fisheries Society and the Philippines Aquaculture Society

Name	**:**	**Dr. Rudolf Hermes**
Position	**:**	Chief Technical Advisor
Organization /Institution	**:**	Bay of Bengal Large Marine Ecosystem (BOBLME) Project, Thailand
E-mail	**:**	Rudolf.hermes@boblme.org
Biography	**:**	Dr. Rudolf Hermes is the Chief Technical Advisor of the Bay of Bengal Large Marine Ecosystem (BOBLME) Project, based at the Project's Regional Coordination Unit in Phuket, Thailand. From 1979 until 2004, he worked in fisheries and coastal resources development, research and management in several projects of bilateral cooperation, seconded through the German Technical Cooperation (GTZ).

Name : **Dr. Sam Nuov**

Position : Deputy Director General, Vice Secretary General

Organization /Institution : Fisheries Administration, Tonle Sap Authority , Cambodia

E-mail : samnuov.fia@maff.gov.kh; snuov@yahoo.com

Biography : Dr. Sam Nuov is Deputy Director General of the Fisheries Administration of Cambodia and Vice Secretary General of Tonle Sap Authority. He is also National Programme Director for Fisheries Programme activities of the MRC, where he collaborates and cooperates with all riparian countries line agencies for fisheries. Moreover, he was also appointed as the member of the Technical Advisory Body of MRC Fisheries Development Programme.

Name : **Dr. Satoshi Ishikawa**

Position : Visiting Associate Professor (Project Leader)

Organization /Institution : Research Institute of Humanity and Nature
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Biography : Dr. Satoshi Ishikawa is a fisheries scientist. He is an Associate Professor at Tokai University and also the Visiting Associate Professor (Project Leader) at the Research Institute of Humanity and Nature (RIHN) in Japan. He specializes in population genetics, conservation ecology and rural development. He had also written articles and books on inland fisheries in Southeast Asia.

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Biography : Since joining the Directorate General of Fisheries, the Ministry of Agriculture in 1983, he has spent mostly in planning and policy development. The last 5 years he has been dealing with data, marketing and trade. His major responsibility is to develop policy related to export and import of seafood, export promotion, trade facilitation and improve market access. Currently, he is in charge of APEC as Focal Point of Fisheries Working Group for Indonesia, Focal Point of Tuna Product under ASEAN TUNA Working Group as well as WTO negotiations.

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Name : **Dr. Tatsuro Matsuoka**
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Biography : Dr. Tatsuro Matsuoka finished his doctoral degree from Hokkaido University, Japan. His academic career focuses in the areas of anthropology, archaeology, naval architecture, and fishing technology. He has also extensive experience in academic and technical cooperation in the South Pacific, Southeast Asia, Africa, as well as in South American and Caribbean countries. His current research interest is in the formulation of a scientific basis for policies in fishery development and management with particular emphasis on logical origins of fishers' rights and participatory approach in decision making in fishery management. He was awarded twice by the Japan Society of Fisheries Science from his studies on by-catch and discards and ghost fishing mortality. He was also awarded by Japan International Cooperation Agency (JICA) for his long-term distinguished contributions to international cooperation.

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Biography : Dr. Xaypladeth Choulamany has actively developed numerous community fisheries programmes in the Lower Mekong Basin. His understanding of the importance of fisheries for the livelihoods of people is invaluable as the MRC undertakes strategic assessments of the development options for the water resources of the Mekong River. He is also member of the Board of Trustees of the Regional Community Forestry Training Center (RECOFT) Headquarters based in Bangkok, Thailand since 2006.

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Biography : Mr. Yeap Soon Eong has been the Chief of MFRD since November 2009. He has more than 18 years of work experience in the inspection and licensing of fish processing plants, inspection of imported fish and fishery products, health certification of exported fish and fishery products and, GMP and HACCP application and implementation. As Chief, he is responsible for planning and implementing MFRD/SEAFDEC's regional programmes and activities in fisheries post-harvest technology.

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Biography : Dr. Yugraj Singh Yadava has had about 35 years of experience in fisheries and aquaculture. He started his career as a Scientist with the Indian Council of Agricultural Research, and has held important positions that include as Advisor Fisheries, Fisheries Development Commissioner and Member Secretary, and Coastal Aquaculture Authority of the Government of India. He is a well-known face in the national and international fisheries, having contributed to several expert consultations, ad-hoc working groups, inter-governmental meetings, regional and global conferences, GEF-funded Large Marine Ecosystem Project. He is now heading a Regional Fishery Body, the Bay of Bengal Programme Inter-Governmental Organization (BOBP-IGO).

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Annex 3

ENHANCING GOVERNANCE IN FISHERIES MANAGEMENT IN SOUTHEAST ASIA TOWARDS 2020: ISSUES AND PERSPECTIVES

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ASEAN and SEAFDEC have been paving the way for enhancing better governance of the region's fisheries within the context of an ecosystems approach and have articulated the approach through the Code of Conduct for Responsible Fisheries (CCRF) adopted in 1995 and in their regionalized CCRF (SEAFDEC, 2003) incorporating internationally accepted set of principles and guidelines for governance and best practices in fisheries development and management. ASEAN and SEAFDEC have also been responding to the other international instruments such as the International Plan of Action (IPOAs) on management of fishing capacity, conservation and management of sharks, reducing the incidental catch of seabirds, and illegal, unreported, and unregulated (IUU) fishing, all of which are aimed at enhancing governance in fisheries management (Mahyam *et al.*, 2011).

Fisheries and the welfare of the people involved in fishing has been my interest for the past three decades. During the past three decades there have been impressive improvements in the wealth of people in Southeast Asia as the case in the various parts of the world. This is however not true for small-scale fishers, many of whom still linger in poverty eking out a living on less that USD1 a day. Why the condition of fishers in small-scale fisheries has not responded to the developments in the economy as a whole? This question has attracted my attention over the years and the answer seems to lay in the difficulty in governing fisheries resources.

Weak governance has been recognized as the main cause of overfishing in the waters of Southeast Asian region although the rise in population and the poverty levels of fishers with limited alternative employment are important drivers for the overfishing pressure. Promoting effective governance which will encompass new and more effective institutional arrangements for the sustainable exploitation of the fisheries resource is thus an urgent requirement. The first step in managing stressed and over-fished stocks is to reduce effort. The next challenge is to control and reduce fishing power in overall fishing effort. Any functioning governance system must be able to address this fundamental requirement for reducing fishing effort in the Southeast Asian fisheries.

Around 90 percent of the 38 million people recorded globally as fishers are classified as small-scale, and an additional 100 million or more people are estimated to be involved in the small-scale post-harvest sector (Béné, Macfadyen and Allison, 2007). Management of small-scale fisheries is therefore very critical, and poses an extraordinary challenge both for local communities and governments. Unlike large-scale fisheries, small-scale fisheries at the national level are difficult to manage for the following reasons:

1) Limiting the effort of small-scale fishermen means lower incomes and fewer job opportunities for them.
2) Removing free and open access to fishery resources, and imposing management control, often leads to serious short term economic and social problems for fishing communities with limited alternative opportunities
3) If the open-access is not controlled, resources get depleted quickly, economic returns fall, and community stability is endangered.

This essentially is the dilemma with small-scale fisheries.

Throughout human history, human wellbeing measured in terms of economic growth and wealth accumulation appears to be driven by three factors; 1) the capacity to develop democratic institutions for collective action, 2) the ability to develop and use new technologies and innovations, and 3) on the willingness and ability to harness the power of markets.

We have done pretty well in the area of developing new technologies and realizing innovations. In addition, more recently, most nations have embraced markets and have opened up to the ideas of free trade and have reduced regulations in the market place. All of these have lead to increased economic growth and well being for their citizens.

Human civilization as a whole however has done badly in the area of natural resources management. Taking fisheries as a key example, a third of fish stocks worldwide are overexploited or even depleted yet more than one billion people depend on seafood as their primary source of protein. (FAO, 2009 and Worm *et al*., 2009). Within Southeast Asia the state of fisheries resources are only some 8-12 % of those at the pre-fishing state. The figures point to the dire state people who depend on these resources are in and will be facing in the future if constructive efforts are not taken to reverse the trends in over fishing and stock depletion.

The key to halting the dangerous trend in overfishing and stock depletion is effective governance of the fishers who are withdrawing the resource from a system that is exposed to overexploitation and collapse in the long term. Yet governance of natural resources is one area our modern civilization as a whole has failed miserably. We are still struggling with how to manage exhaustible resources and are crafting new institutions to deal with resources open to the problems of open access and weak property rights entitlement. Community based/co-management has been part of this new institutions development and it took some time before it obtained the recognition it deserves.

The idea of fisheries co-management is that communities and the state should work together to manage fisheries and such a cooperation will lead to a more effective governance of the resource by the people dependent on the resource. This involves the fishers and the resource managers working together to improve the regulatory process for governing the resource.

What have we learned?

Over the last 50 years, we have witnessed a systematic disillusion with centralized management of fisheries. We have shifted form a belief in central authorities for managing natural resources to the distribution of power and authority to a range of stakeholders. This has been driven primarily by the hard reality that fisheries resources are declining rapidly both in developed and developing countries. Fisheries management policies also shifted from favoring the state as the resource manager to market and community orientated management approaches. In developed countries market oriented, Individual Transferable Quotas (ITQs), which sets the limit to individual fisher and fishing firms on the amount of fish that may be taken from the fishery in any one year, were established. In the developing countries community management and co-management approaches that involved the crafting of new institutions at the local and community level appeared. These movements reflects a paradigmatic shift in fisheries management, both in terms of balance between overall goals and balance in the distribution of authority and power (Siar *et al.* 2006; Jentoft and Mccay, 2003; Hanna, 2003).

The context of the Asian developing nations is much more complex. We are dealing with small scale fisheries. Small-scale fisheries is characterized by a dynamic and evolving sector employing labor intensive harvesting, processing and distribution technologies to exploit marine and inland water fishery resources scattered along the coastal line. Small-scale fisheries operate at widely differing organizational levels ranging from self-employed single operators through informal micro-enterprises to formal sector businesses. This sub-sector, therefore, is not homogenous within and across countries and regions and attention to this fact is warranted when formulating strategies and policies for enhancing its contribution to food security and poverty alleviation (FAO, 2004). The management of such fisheries by centralized authorities has not succeeded and delegation of management of small-scale fisheries to the local resource users is now seen to be the only rational way of obtaining effective governance over such resources. In the Asian developing countries alone, almost 65 percent of the world's fishers, framed as the poorest of the poor, continue to depend on fish for food and livelihood survival. Most are small scale fishers who catch fish in near shore waters and inland water bodies and rely on labour intensive fishing technologies (The WorldFish Center, 2005). The over populated fishing industry, coupled with poverty issues and open access characteristic of water bodies, made Individual Transferable Quotas (ITQ) which are used in Developed countries as an impossible management tool in the Asian context.

Top down legislative changes which focused on regulation and enforcement to control fishing efforts has failed to prevent over-exploitation of fisheries resources. Pomeroy and Viswanathan (2003) pointed out that most of the coastal and inland fisheries in Asia are still over-fished. It is argued that the failure is because this form of management is very much still a centralized top-down approach, focusing on objectives relating to fish resources and based exclusively on formal biological science (Viswanathan *et al*., 2003) and mostly disregards the experiences of fishers (Degnbol, 2003). As a result, the modern laws and regulations that have been put in place to manage fisheries, has not been well received by resource users, leading to the violation of these regulations by fishers whether they are industrial, medium scale or individuals fishing for their daily food and income and the practical failure of governments to enforce the regulations due to a lack of resources (Viswanathan and Sutinen, 1998).

The recognition of the failures of exclusively government managed fisheries led to the emergence of co-management and community based management as options to improve fisheries management. However, a key constraint lies in creating institutional arrangements that can sustain community participation to ensure the benefits really reach the poorer sections of the community and that the institutions are sustainable.

The broader governance approach needed to sustain community participation in fisheries management in the Asian countries thus will have to focus on the crafting of institutional arrangement that are fully nested at all levels of governance from community level to the various levels of powers of government. This will be seen through the role of the government in delivering net benefits and the need to set up legal frameworks for community based management.

Since the 1960's the participation of local resource users and communities in development and management has become part of the development process in Southeast Asia. There is also an increasing commitment of governments to policies of decentralization and community-based resource management. This is seen in a variety of policies and programmes in the Philippines, Thailand, Malaysia, Indonesia, Laos and Vietnam. (Pomeroy, 1996)

It is now clear that for fisheries co-management/community-based resource management initiatives to be successful, the basic requirement is for government policy to establish supportive legal rights and authority framework. Effective community-based resource management is dependent upon the strength of the local organization and its ability to command respect from its members and enforce institutional arrangements. Success is often simply due to the leadership of the local organization. One important question for revitalization of community-based resource management systems is whether leadership qualities can be transferred to other locations, individuals and organizations.

The future of fisheries governance

What is the best approach or way to govern fisheries? This is a challenging question as our experience from both the developed and developing world shows us that success stories are few and failures are plenty. A consensus is however emerging with regard to how should fisheries be governed. The vision most people agree on regarding what fisheries management should deliver are as stated in Degnbol, 2009.

- Healthy marine ecosystems
- A profitable and economically independent sector
- Supply of sea seafood to consumers originating from sustainable fisheries and aquaculture
- Contribution to development and alleviation of poverty in the coastal regions
- Simple and cost effective policy with implementation close to the people

Co-management and community based management of fisheries is becoming central to the idea of effective governance of fisheries. Gutierrez, Hilborn and Defeo (2010) in their examination of 130 co-managed fisheries from 44 countries with different degrees of development, ecosystems, fishing sectors and type of resources concluded that strong leadership as the most important attribute contributing to success of co-management. Their study, the first comprehensive global assessment of social, economic and ecological attributes contributing to fisheries co-management success shows that co-management holds great promise for better governance of fisheries worldwide in terms of realizing the outcome of sustainable fisheries. The potential for any governance structure for improving fisheries management depends on proper incentives, decentralized institutional arrangements and cohesive social organizations. All of these are more likely to happen under well-established co-management regimes.

The analysis of governance of fisheries and co-management worldwide has generated a body of general knowledge useful for the design of effective institutions for fisheries governance. (Wilson *et al*, 2006). Sustaining fisheries co-management/community management as a governance approach in a particular setting will also dependent on a process of learning and adaptation in place.

Challenges Ahead

Developing co-management institutions on a larger scale

Many of the problems and issues facing fisheries can be solved only on provincial, national, or even international levels. Fishery resources are generally too large to be entirely within the control of a few communities. In these cases it is imperative to provide for representation of fishery groups at different levels.

Reconciling local and global agendas

Often international agreements on fisheries and local environmental management contradict each other. The government needs to meet its double obligation of attending to international agreements while sharing decision making power for fisheries management with communities.

Identifying a management knowledge base acceptable to stakeholders

To maintain scientific validity and achieve wide acceptance, co-management systems need to reconcile both formal scientific knowledge and fishers' knowledge. One approach may be to identify science-based indicators of the status of the resource system that also reflect fishers' observations.

Developing approaches to manage conflicts

Management arrangements may require access rights to be limited to some resource users and to exclude others, often resulting in conflicts. Participatory approaches for managing such conflicts are crucial for successful co-management.

Reforming existing institutions to empower local communities to participate in determining management objectives

This step may require substantial changes in governmental fisheries management agencies and in stakeholders' perceptions of their respective roles. These issues must be addressed in practical experiments with collective action and co-management. The results need to be documented and the experiences communicated to others who may be in the process of establishing or developing collective action capacity among fishers

Conclusion

The increasing population of Southeast Asia coupled with a stagnation of production in capture fisheries and ineffective governance of coastal resources will result in dire consequence for the poor fishers of the region. Centralized fisheries management systems, which consist of fisheries policies, institutions, and support systems burdened by bureaucratic inefficiency, institutional weaknesses, and fragile human resource bases, will not be able to govern the coastal resources of Southeast Asia to deliver on the vision of a healthy coastal ecosystem. Since the centralized, government-led system of protecting and managing fisheries resources is not working effectively in most cases, alternative approaches are necessary. In addition, there is an increasing consensus that fish and fisheries must be properly harnessed so that they will continue to provide sustenance for present and future generations. Community based management and co-managed arrangements in fisheries management are seen to be feasible options for bringing together the relevant levels of government and the users in pursuing a common set of goals to improve resource conditions and socioeconomic conditions of the community.

More than two decades of research have provided sufficient conclusive support for co-management and community based management as approaches for effective enforcement and equitable access for the poor and often voiceless fishers (Dey and Kanagaratnam, 2008). However, it must be emphasized that a community based fisheries approach may not be applicable everywhere. It cannot succeed in isolation. It is a complex process involving continuous consultation, negotiations, information sharing, and conflict management between stakeholders for improving existing management systems. There is a need to scale up the process to sustain institutions developed under community based management. This includes understanding the role of the government as partners in delivering a net benefit rather than just delegation of powers.

The success of co-managed partnerships depends heavily on political will. Hence developing a legal framework for community level management in that partnership is important in sustaining community based organizations. Community participation in decision-making is as crucial as government support and political influence in ensuring improved policies, fair regulations, and effective enforcement.

The context of small scale fisheries in Southeast Asia is complex. The issues of commercial fisheries versus small-scale fisheries and their co-existence while maintaining healthy resource conditions will be an important consideration.

The need to reduce fishing capacity to sustain the resource and rebuilt stocks will be another important objective of governance.

The development of an effective Monitoring, Control and Surveillance (MCS) programme will be part of enhancing good governance.

Embracing the co-management/community management approach will improve governance and develop capacity for self-governance. The empowering of communities to participate and contribute to the governance of the resources on which they depend will be the new shift in the governance approach in much of Southeast Asia. This shift will represent a new and improved facet of governance of fisheries in the region. Good governance will also require complying with global instruments and regional agreements on fisheries and countries in Southeast Asia will have to take into account their specific conditions and problems of their fishers such as the poverty of small scale fishers, the multi-species and multi-gear conditions within their governance framework.

We have come to recognize that the ecological, political and economic complexity of aquatic resource management will require an approach to governance that cannot be free from the cross-scale linkage of communities and active civil society engagement in the governance of the resource. From a governance perspective fisheries co-management fits in well with the adaptive ecosystem management approach that is now part of the International Plan of Action for fisheries management. Without the active participation of fishers in management it is very difficult to see how information could be gathered and decisions made and implemented in a sufficiently timely fashion for an ecosystem approach to fisheries to be implemented. The flexibility of co-management is an important factor in making it attractive as a governance approach for managing small scale fisheries of Southeast Asia.

I am an optimist and I believe there are good prospects within Southeast Asia over the next decade to improve the governance of the fisheries. The involvement of communities and civil society with government for managing these complex resources will be the secret for successful governance of these resources. Co-management and community based management will be in the forefront for governing the fisheries resources effectively. Thank you.

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Annex 4

CAN SMALL-SCALE AND COMMERCIAL FISHERIES CO-EXIST?

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General description

Small-scale and large-scale, commercial fisheries have co-existed since the major modernization of fishing gears and technology in the beginning of the 20th century, which enabled the rapid and widespread development of large-scale fishing sector. The existence of these two fishing sectors is, however, not even. In many parts of the world, large-scale fisheries dominate in terms of catches and revenues. Yet, the significant contribution of small-scale fisheries to food security and livelihoods of millions of people is generally acknowledged. This paper examines the relationship between small-scale and large-scale fisheries, and the conditions for their coexistence. Specifically, it asks what natural and social environments, and governance arrangements, are required to support the viability, and the coexistence, of both sectors.

Background

In current fisheries discourse, we refer to fishing and fisheries mostly in the modern time, without due attention to the fact that fishing is a form of primary production that is as old as humankind (Gabriel *et al*., 2005). Major changes have taken place throughout the history of fishing, affecting aquatic environments, fishing people, and society at large. The distressing state of world fisheries today is likely a reflection of disconnect between fisheries policy and present reality, and the history of their development (McGoodwin, 1990). Without a proper examination of the changes, also of fisheries institutions and governance systems, and how they affect the existence of, and relationship between, small- and large-scale fishing sectors, we may be endorsing policies that inhibit the sustainability of small-scale fisheries, as well as limit their ability to adapt to environmental and economic changes.

According to Gabriel *et al*. (2005), small-scale fishing has long existed well before the establishment of the first large-scale fisheries in the Middle Ages in Europe with bulk demands for salted cod and herring and whale oil. Later in the late 1700s, steam engine was introduced to enable fishing at greater depths, further offshore, with bigger and heavier gear, thus marking a major transformation in fisheries, which later spread to other parts of the world (Smith, 2000). The ocean was then considered an inexhaustible source of wealth that could easily handle the 'blue revolution,' shown for instance in tropical fisheries (Bailey, 1985), the United States of America (McEvoy, 1986), India (Bavinck, 2001), and Southeast Asia (Butcher, 2004). By the time studies suggesting overfishing and unsustainable fishing practices started to emerge, it was much too late. Large-scale, industrialized fisheries have, literally and figuratively speaking, gained important grounds. As shown in Pauly *et al*. (2003), fishing areas have expanded over the past 50 years, farther from shore and into deeper waters.

In *The Closing of the Frontier*, Butcher (2004) provided a vivid and comprehensive description of how fisheries in Southeast Asia went through a series of changes. As in other areas of the world, the abundance of resources in the sea was the main impetus for the intensification of fish harvesting and major developments in fishing technology, which led to the 'great fish race,' and the eventual closing of the frontier. But even before the mechanization of fishing boats and technological advancement in fishing methods, fishing areas were expanded to increase catch levels, thus supporting the view that small-scale fisheries can also cause resource degradation, if equipped with effective and non-selective fishing gears. The most drastic change in the South China Sea area was caused by the introduction of trawls from the 1950s to the late 1970s; first in the Philippines, then later in Thailand, Malaysia and Indonesia, which contributed to over-exploitation of fisheries in the region.

In the book, *Fish for Life* (Kooiman *et al*., 2005), we identified ecosystem health as one of the key concerns facing world fisheries. This issue well illustrates how small-scale fisheries are compromised by their large-scale counterpart. Large-scale, industrialized fisheries cause greater ecological impacts than small-scale fisheries, with the high volume of fish they remove from the sea, and severe habitat damages and high percentage of by-catch and discards when certain gears are employed (Chuenpagdee *et al*., 2003). Although thousands of small-scale fishing units may cause equivalent damage to a few large-scale fishing vessels, the latter still dominate world fisheries, taking in over 70% of the total production. The poor health of the oceans

creates more hardship to small-scale fishers due to their high dependency on fisheries resources, and their limited options to improve their efficiency or alter their fishing activities, like fishing further offshore.

There is considerably less documentation of what happened to traditional small-scale fishers and their communities, who dominated fisheries prior to the blue revolution. Although large-scale fisheries came into existence much later and have managed to take over the small-scale counterpart in many cases, small-scale fisheries are still very important, especially in developing and less-developed countries. As reported by the FAO (2010), only about 2% of fishers and fish farmers are in Europe and North America, but their average annual production per capita is about 24 tonnes in Europe and 18 tonnes in North America. In contrast, Asia has about 85% of the world's fishers and fish farmers, whose individual production averages about one-tenth of those in the North. Put simply, large-scale, industrial fisheries dominate in developed countries, while small-scale fisheries hold prominence in other parts of the world.

In sum, while small- and large-scale fisheries have long coexisted, their relationship has never been straightforward. In a few places where fisheries consist mainly of either industrialized fisheries enterprises or traditional subsistence fisheries, sector interaction (in harvest and post-harvest activities) is minimized. For the most part, mid- to large-size and small-scale, commercial and livelihood fishing sectors coexist in a complex relationship since they share fishing grounds, use similar gears that differ in power and efficiency, often target the same species, and sometimes compete in the same markets. These issues are important to examine and discussed in fisheries governance.

Issues

The livelihood dependency of small-scale fishers to fisheries is generally high. When resources become scarce, and other livelihood options are not available, small-scale fishers are under pressure to modernize their gears, increase the power of their vessels, take high interest loans, sell at low prices, or employ illegal and/or destructive gears. These are short-term solutions at best since, in the long run, they contribute to pushing small-scale fishers into the vicious circle of poverty, rather than improving their well-being. As illustrated in Chuenpagdee and Jentoft (forthcoming), there are several conditions throughout the fish chain, *i.e.*, in the aquatic environment, harvest and post-harvest activities, that make small-scale fishers vulnerable to poverty. These include natural disasters, unfavorable environmental conditions, perturbations affecting fisheries productivity caused mainly by large-scale fishing gears, as well as climate change. Other issues related to safety at sea, cost of fishing, market accessibility, inappropriate post-harvest handling, and poor processing facilities worsen the situation of small-scale fishers. Moreover, it is far too common in developing countries that small-scale fishing people are at the mercy of moneylenders, who have full control over the prices and marketing of their products. The difference between small- and large-scale fisheries is obvious with regards to access to major domestic and international fish and seafood markets. Only in some niche markets, such as those catering to cultural-based tourism supporting local harvests, are small-scale fisheries well positioned to benefit.

Pauly (1997; 2006) has long argued that small-scale fisheries fare much better than the large-scale sector in several key areas, such as contribution to job and food security, fuel consumption, and environmental sustainability. Yet, they are largely marginalized, not only socially and economically, but also institutionally. If the FAO recognizes that small-scale fisheries contribute more than half of the world's fisheries catch and that the majority of the world's fishers are small-scale, we must ask why there is no comparable data collection system to that of large-scale fisheries, and thus no official statistics that properly differentiate the two sectors. The general omission of the roles of women in fisheries is even more disturbing. The reasons may be related to the characteristics of small-scale fisheries, that they are highly diverse and numerous, are often located in remote areas, with poor infrastructure, and that records of their fishing activities and marketing do not always exist. Nevertheless, these reasons are not sufficient to abandon any attempt to verify this work. Some efforts have indeed been made to systematically document and examine the extent of small-scale fisheries (see, for instance, the global database of small-scale fisheries by Chuenpagdee *et al*., 2006), but more can be done, especially by intergovernmental organizations like the FAO, to help provide policy balance to these fisheries sectors.

"Fishing is a living occupation" (Gabriel *et al*., 2005, p. 2). This statement emphasizes how changes take place throughout history. Although it may not alter how fish is caught, as in some traditional small-scale fisheries, the efficiency of catching and handling fish has greatly improved, particularly in the commercialized and industrialized sector, both large and small. This also implies that what dominates fisheries economies today, like trawl fishing, may lose significance in the future with increasing oil prices and other policies to reduce carbon emissions. Concurrently, small-scale fishing gears and devices employed in some parts of the world are

becoming more sophisticated with the use of global positioning systems (GPS), and almost everywhere information technology, especially mobile phones, has enabled efficient marketing of small-scale fisheries catches. In the same way that small-scale fishers are affected by different conditions throughout the fish chain, which may result in increasing their marginality, restoring balance in fisheries requires an understanding of the entire fish chain, as well as anticipated changes, for effective governance interventions.

Some governance arrangements, regardless of their original intention, serve in favor of large-scale fisheries. Government subsidies for modernization of fishing vessels and gears, as well as for offsetting fishing costs (*e.g.*, fuel subsidies) have encouraged the growth and expansion of domestic and distant water fleets. Despite implementation challenges, removal of subsidies and reducing fishing capacities has already been suggested as the way forward (see Swan and Gréboval, 2004; Sumaila *et al*., 2008). Channelling these subsidies to support sustainable fisheries, whether large or small, is another option. The challenge is in determining what sustainable fisheries, or the contrary, look like.

Recommendations

Fisheries governance is a main area of research and policy development that can support the viability of small-scale fisheries and their coexistence with large-scale fishing sector. The interactive governance theory posits that careful examination of the underlying values, principles and images held by public and private actors in the state, market and society is required (Kooiman *et al*., 2005). This departs from the existing approach of applying indicators to assess various dimensions of sustainability, in that it encourages interaction among actors in the deliberation of what these meta-elements may be, and how best to negotiate them when they do not align. In other words, interactive governance focuses on process more than tools, and outcomes more than outputs, and it pays close attention to interactions among fisheries stakeholders and between stakeholders and the natural environment. Making values, principles and images explicit is essential in dealing with fisheries issues because of the broad range of stakeholders with divergent, if not conflicting, interests. It helps provide transparency to management and decision-making, thus encouraging stakeholder participation in the process. Governance is obviously not only about these meta-elements. Fisheries managers are often occupied with first-order (daily actions and problem-solving), and occasionally with second-order (design and setting of institutions) governance issues. Spending time discussing meta-order governance may be considered too much of a luxury, especially when crisis management is a permanent feature. The argument for moving governance discussion to the meta-level is based on the premise that knowledge about values, principles and images can help make fisheries more governable, thus easing the governing tasks. Put differently, knowing what matters to small-scale fishers and large-scale fishing industries can help reduce tension and misunderstanding between them, and build legitimacy into management decisions.

What should a governance arrangement that fosters the coexistence and viability of small-scale and large-scale, commercial fisheries look like? In saying that fisheries governance is a wicked problem (Jentoft and Chuenpagdee, 2009), we suggest that there is no simple answer to this question since there is no one size fits all solution or technical quick fix. But, talking about governance as a holistic concept that goes beyond management does not imply that governments have no roles to play. Instead, it calls for small- and large-scale fishers, fishing communities, industries, environmental organizations and governments to take part in governance, playing different roles and having various levels of engagement, according to the conditions, demands and challenges that they face. Power differential between these governing actors needs to be recognized and adjusted to enable marginalized groups to fully participate in a democratic, transparent and accountable process. This implies that governance may not yield outcomes that are equally acceptable to all involved. Further argument can be made that governance performance cannot be judged as good or bad. Measurement instruments useful in examining governance are those that illuminate both potentials and limitations of governance arrangements, and suggest innovative ways to enhance its performance. The importance of exploring other livelihood opportunities to either replace or supplement fisheries means that a broad framework like integrated coastal management needs to be drawn upon.

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Annex 5

MANAGEMENT OF FISHING CAPACITY

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Introduction

The ASEAN-SEAFDEC RTC on the Management of Fishing Capacity and Human Resource Development in Support of Fisheries Management (Phuket, September 2006) and the preceding ASEAN-SEAFDEC Expert Meeting on Management of Fishing Capacity in Southeast Asia (Sihanoukville, July 2006) emphasized strongly that the management of fishing capacity (and combating illegal fishing) is key to fisheries management. Similar message were emphasized during the FAO/APFIC consultation on management of fishing capacity and to address IUU fishing held in Phuket, 13 – 17 July 2007. Already at the September 2006 Consultation regional and sub-regional cooperation was called for. The outcomes of these events and events organized since then have provided guidance to SEAFDEC and others to promote the development of regional and sub-regional initiatives to improve fisheries management arrangements and to directly address fishing capacity and to combat illegal and destructive fishing.

The latest event "The Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia" was organized in Bangkok, Thailand from 15 to 17 September 2010. The Consultation turned out to be an important event based on inputs from participating countries and regional and international experts. The Consultation successfully followed up on the recommendations by ASEAN and SEAFDEC member countries on the need to look beyond international agreements and conventions relevant to combating IUU fishing and to identify elements for sustainable fisheries management and to control fishing efforts in the Southeast Asian region-and not to look at the instruments as such. The consultation came up with an important set of recommendations and action points. These points are reflected below.

This document provides a recollection of discussions and trends in the regional dialogue on the need to manage fishing capacity and to combat IUU fishing. The references are based on discussions and recommendations emerging out of events organized by SEAFDEC under the ASEAN-SEAFDEC umbrella in cooperation with FAO, IMO, RPOA and others. RPOA countries not members of ASEAN have been invited to several of the events organized by SEAFDEC (references from RPOA and FAO will be included in other presentations).

The Consultation came up with an important set of recommendations and action points. These points are reflected below.

Background

Over the last decades there have been alarming reports in Southeast Asia on depletion of fish stocks and on diminishing catches with too many vessels looking for decreasing amounts of fish. To reverse the trend far-reaching actions is an imperative to sustainability. Effective interventions to manage fishing capacity are urgently needed!! Another critical element is that available information is not providing accurate pictures on number of vessels, types and number of gear and people involved in fishing. There is a large variety among countries in the region with regards to the quality and accuracy of available information on fishing capacity. Efforts to improve fisheries management and to reduce Illegal, Unreported and Unregulated (IUU) and destructive fishing has so far not had any major region-wide impact and the levels of implementation is generally low. Building upon and involving ASEAN in processes to combat illegal fishing is important and key to long term success. The commitment by ASEAN Member Countries is well documented and emphasized at the highest possible level. In November 2007 ASEAN Heads of State signed the Declaration on the ***ASEAN Economic Community Blueprint*** and the need to "***strengthen efforts to combat illegal fishing***" was clearly stated among indicated priority actions. Indications are given by ASEAN-SEAFDEC Member Countries to prioritise solutions to the management of fishing capacity through the SEAFDEC Council and the ASEAN Fisheries Consultative Forum). This together with the launching of the Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region by eight ASEAN states together with Australia, Papua-New Guinea and Timor-Leste are clear indications of the political trend and interest.

The importance to manage fishing capacity is also of central importance in efforts to manage and conserve important habitats. There is a need to eliminate destructive fishing, to combat encroachment of larger vessels into coastal waters. Strong enforcement are needed to ensure that regulations around different types of protected areas (MPA's, etc), closed seasons and fisheries resources conservation areas (*refugia*) are observed in order to protect the habitats and the sustainability of fisheries as such. There is a need to integrate fisheries and habitat management and to build awareness among people involved in fisheries that the management of fishing capacity is an important element in an ecosystems approach to fisheries.

Key to any attempt to manage the effective fishing capacity is an urgent need, in each of the countries and the region as a whole, to get a clear picture of the size and structure of the sector – both large scale and small scale – in terms of numbers and size of vessels together with the number of people that is actually involved.

GROWING CONCERNS AND REGIONAL RESPONSES

The deteriorating situation has led to a growing concern among ASEAN-SEAFDEC Member States on the need improve fisheries management in order to combat illegal and IUU fisheries in the Southeast Asian region. During the ASEAN-SEAFDEC Regional Technical Consultation on International Fisheries Related Issues in February 2010 in Bangkok, Thailand, Member Countries started to take a more proactive view on requirements contained among the provisions of the *Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing* as well as the *EC Regulation No 1005/2008 establishing a Community System to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing* by indicating that it was time to build up capacity and structures to live up to the requirements also among ASEAN countries rather than to try to avoid implementation of the new regulations.

Subsequently, countries are having a more pragmatic view of these regulations, be it on FAO Port State Measures or EC Catch Documentation, and while "agreeing that IUU Fishing adversely affects the ability of countries to manage sustainably their fisheries resources" views are expressed that it could be "considered as an opportunity for Member Countries to further strengthen their existing national initiatives and efforts in sustainable fisheries management and combating IUU fishing". The 42nd Meeting of the SEAFDEC Council held in Luang Prabang, Lao PDR in April 2010 expressed similar opinions to the views expressed in the February 2010 Consultation and emphasized that measures to combat IUU fishing is very important while indicating that countries should come up with the optimum combination of measures that are most suitable for the region, considering the specificity of the region.

In addressing illegal and unsustainable fishing practices calls are being made, as reflected during SEAFDEC Council Meetings in 2009 and 2010, that aspects such as safety at sea (IMO Conventions) and working conditions (ILO Conventions) should be addressed. Predictions of increases in storms, typhoons and hurricanes due to climate change indicate the need to look into safety at sea aspects and related working conditions. FAO, SEAFDEC and related agencies should collaborate to provide better understanding among Member Countries on the benefits and rationale of IMO and ILO Conventions and relevant guidelines. In the process the relevance to artisanal fisheries operations should be explained. It is recommended that the relevance and scope of a regional and sub-regional approach should be considered for the interpretation of legal and practical requirements and preparedness for the implementation of relevant actions.

The Agreement on Port State Measures and the EC Catch Documentation feature the same basic requirements with a similar aim to deter and combat IUU fishing. The main difference lies in their structure or legal foundation: The Agreement on Port State Measures is a globally negotiated and legally binding instrument (once it enters into force), while the EC Catch Documentation is an unilaterally developed regulation (and in that sense not legally binding to others). The common element is that they are applicable to "all" fishing vessels and landing places (including trans-shipment vessels). In moving towards the build-up of functions to live up to international and regional requirements it is important not to look these instruments or other international agreements/conventions as such, but rather by looking "beyond" the documents and look at the elements needed to improve fisheries management, to control fishing efforts and to combat IUU fisheries while at the same time continue the process already started in 2006 to address fishing capacity, vessel registrations and vessel records.

Countries in the region have expressed the view that in improving national (and regional) capacities to monitor, record and control fishing activities and landings it is important not only to meet standards for the international market/trade but also to ensure that the trade of fish and raw materials among the ASEAN-SEAFDEC countries meet international standards and that certificates and other related documents can be provided regardless of the origin or final trade destination. To secure that the trade flow among the Southeast

Asian countries is maintained, there is a need to develop regional approaches, and support in terms of national capacity building activities of the respective countries to meet the requirements and to promote and facilitate the development of the ASEAN Economic Community and the integration of the fishing sector into the ASEAN Community.

Growing commitment events and consultations since 2006

The introductory part (Background) of this paper has already referred to commitments by ASEAN Member Countries and recommendations and requests by participants at the ASEAN-SEAFDEC Regional Technical Consultation on International Fisheries Related Issues (2010), February 2010, and the 42nd Meeting of the SEAFDEC Council, April 2010 and the emphasis given by Member Countries to the need to address IUU fisheries and active fishing capacity.

The ASEAN-SEAFDEC RTC on the Management of Fishing Capacity and Human Resource Development in Support of Fisheries Management (Phuket, September 2006) and the preceding ASEAN-SEAFDEC Expert Meeting on Management of Fishing Capacity in Southeast Asia (Sihanoukville, July 2006) emphasized strongly that the management of fishing capacity (and combating illegal fishing) is key to fisheries management. Similar message was emphasized during the FAO/APFIC consultation on management of fishing capacity and to address IUU fishing held in Phuket, 13-17 July 2007. It is repeatedly emphasized that legal, environmental and social aspects need to be addressed in the process. Already at the September 2006 Consultation regional cooperation was called for and countries were recommended to start looking into prospects of developing a "Regional Fisheries Management Mechanism" and to promote regional and sub-regional cooperation. The outcomes of these events have provided guidance on continued work by SEAFDEC and others to promote the development of regional and sub-regional fisheries management arrangements and to directly address fishing capacity and to combat illegal and destructive fishing.

Main points discussed during consultations/meetings referred to below and other events are summarized below under thematic headings to allow for focused information on key aspects in the process to promote effective management of fishing capacity and to combat IUU fishing. The events and consultations indicated below are events organized by SEAFDEC and ASEAN-SEAFDEC as other events such as those organized by the FAO, FAO/APFIC and the RPOA will be highlighted during other presentations including the plenary session on the first day.

Expert Meeting on Fishing Vessel Registration, 30 June – 2 July, 2008, Phuket, Thailand

Eight ASEAN countries Brunei Darussalam, Cambodia, Indonesia, Malaysia, the Philippines, Thailand and Vietnam plus Australia, Papua New Guinea and Timor-Leste participated together with experts from IMO and SBF, Sweden.

An important message during this event was that, based on the background information provided, there was a general understanding that the information provided in available documents did not provide an accurate picture on the numbers of vessels and people involved in fishing in the region. This lead to questions on the relative size of fishing fleets among countries. Furthermore there is an underestimation on the number of people involved as indicated when comparing number of people with the number of vessels. This statement is important to keep in focus when addressing the management of fishing capacity.

Workshop on Fishing Vessel Record and Inventory, 27 – 29 July 2009, Satun, Thailand

The ASEAN Member States Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam together with Papua New Guinea participated in the meeting. Furthermore there were participants from the FAO, IMO and ICSF.

The main "new" element to the workshop was the introduction by FAO on the proposed "Comprehensive Global Record of Fishing Vessels, Refrigerated Transported Vessels and Supply Vessels". The "Global Record" is an International response to the growing Illegal, Unregulated and Unreported (IUU) fishing and was designed to enhance the existing Monitoring, Control and Surveillance (MCS) tools and available strategies. It was emphasized that national records will have to be the foundation for regional and global record. ***Any global or regional record cannot get better than the inputs from the countries allow it to be***.

(First) Sub-regional Meeting on the Gulf of Thailand in follow up to the RPOA-IUU MCS Meeting in Bali, 28 – 29 March 2008

Four SEAFDEC member countries, Cambodia, Malaysia, Thailand and Vietnam participated together with resource persons from FAO/RAP and UNEP/GEF South China Sea.

The meeting was organized in follow up to the RPOA MCS event held in Bali during 4-6 of March 2008 with an aim to agree on MCS needs/gaps and actions for the Gulf of Thailand and to provide room to discuss specific points concerning the Gulf of Thailand and future collaboration and coordination among countries and organizations in the Gulf of Thailand.

Second Sub-regional Meeting on the Gulf of Thailand, 24 – 26 February 2009, Bangkok, Thailand

Participants from the Gulf of Thailand Sub-region, namely: Cambodia, Malaysia, Thailand, and Vietnam attended the meeting as well as representatives from COBSEA, IMO, and fisheries focal points of the UNEP/GEF/SCS Project.

The recommendations from the July 2008 *Expert Meeting on Fishing Vessel Registration* on Monitoring – Control – and Surveillance specifically on the need to establish cooperation among agencies responsible for the registration of fishing vessels and those that grant the license to fish as well as to develop a mechanism of information sharing was re-emphasised.

A strong emphasis was made on the "need to have good port monitoring". The meeting suggested that a cooperation mechanism for port monitoring among the countries around the Gulf of Thailand should be established. This mechanism should also address and monitor the landings of "neighbouring Gulf of Thailand countries' vessels" and landing across boundaries.

First Meeting on the Andaman Sea Sub-Region, 20 – 22 October 2009, Phuket, Thailand

Representatives from all countries of the Andaman Sea Sub-region, namely: India, Indonesia, Malaysia, Myanmar, and Thailand attended the meeting as well as collaborating partners such as the BOBLME Project, FAO/RAP, ICSF, Mangroves for the Future (MFF/IUCN) and SBF.

The Meeting agreed to initiate a process similar to that of the Gulf of Thailand Sub-region members, to establish a MCS network (including aspects of Monitoring, Control and Surveillance, respectively, vessel record and inventory, port monitoring). The network will initially have its focus on information sharing, such as on the number and types of boats, people involved in fishing, landings among others. The Meeting also followed up on the process to develop a fishing vessel record and inventory in Southeast Asia. There was a general opinion that effective implementation of MCS would depend on the fisheries management policy of each country.

The Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia was organized in Bangkok, Thailand from 15 to 17 September 2010

The Consultation was attended by participants from the ASEAN countries, namely: Brunei Darussalam, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam as well as from non-ASEAN countries, namely: Australia and Timor-Leste. The Consultation was also attended by participants from regional and international organizations, namely: the FAO Regional Office for Asia and the Pacific (FAO/RAP) who also represented the Asia-Pacific Fisheries Commission (APFIC); the International Maritime Organization (IMO); the Secretariat of the Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices including Combating Illegal, Unreported and Unregulated (IUU) Fishing in the Region; and the Swedish Board of Fisheries (SBF).

The Consultation was mainly aimed at following up on the recommendations by ASEAN and SEAFDEC member countries on the need to look beyond international agreements and conventions relevant to combating IUU fishing and to identify elements for sustainable fisheries management and the control of fishing efforts in order to combat IUU fishing in the Southeast Asian region. The consultation came up with an important set of recommendations and action points. These points are reflected below.

Summary of aspects to be considered in managing fishing capacity and to combat IUU fishing (as indicated by Southeast Asian and ASEAN countries)

Regional cooperation on fishing vessel registration and processes to issue licenses to fish

Fishing vessel registration could be an important area for regional cooperation, while taking note that diversity and limitations of national structures would be something to address. A first step could be to find out common elements and information that is publicly available and to establish a mechanism to share information among ASEAN countries and other countries in the region in order to make information easily available. To move towards common approaches and regional dialogue there is a need to review existing laws and regulations at national level, ideally with a purpose to streamline the functions of fishing vessel registration and the process to provide fishing licenses into one institutional framework.

It should be emphasized that national records will have to be the foundation for regional and global record and any global or regional record cannot get better than the inputs from the countries allow it to be. A difficulty to approach is that in many countries the mandate to register vessels and to issue fishing licenses are tasks that are the responsibility of different institutions and even different ministries, while in other countries the mandate is within one and the same agency. When adding the perspective of smaller scale vessels the institutional profiles are complex. Local authorities are sometimes required to have records of smaller vessels but the information on the local records is often not easily available.

The national structures of vessel registration and licensing systems differ between the ASEAN countries and are based on specific legal requirements involving not only the fisheries' agencies. Fishing vessel registration, fishing licensing and related legal framework have to work in parallel to be an efficient tool for fisheries management and to combat illegal fisheries. There is an outspoken need to facilitate and establish cooperation between agencies responsible for the registration of fishing vessels (as vessels) and those that are providing the licenses to fish.

Malaysia and the Philippines provide two good examples on differences in the process to register vessels and to issue licenses to fish. The whole sequence of fishing vessel registration and the process to issue fishing licenses is under responsible of the Department of Fisheries in Malaysia. The fishing vessel registration and fishing licensing are processed in a continued flow based on one application. The Fishing Vessel Register that is maintained by The DOF of Malaysia with the details of the vessel including completed inspections is a basis for the steps to process issuance of a fishing license. In the Philippines there are two categories of fishing vessels, the first be commercial fishing vessels which should operates in waters open to commercial fishing beyond 15 kilometers and, the second, municipal fishing vessels that involves the fishing vessels of three gross tons or less and is allowed to operate within a distance of 15 kilometers from the shoreline. There are two key responsible institutions with regards to commercial fisheries, namely BFAR (commercial vessel and gear licenses) and MARINA (register the vessel, certificate of ownership, vessel safety certificate). For municipal fisheries the responsibility for registration and licensing rests with the Local Government Unit (LGU).

Still there is a problem in that not all vessels are covered by records/statistics, registration schemes or processes to issue licenses to fish. Countries respond positively to the need to come up with a regional "vessel record". Comments have been provided to draft "vessel record and inventory survey" forms including the FAO Global Record requirements. So far it has been difficult to get any entries into these forms. However, for the common purpose of both SEAFDEC and FAO, it is important to assess how large part of the available vessels that is actually covered by existing registers and records. To move ahead it is important to establish, or further define, some minimum requirements for the region that would be needed in order to collect information for a first draft record of fishing vessel information in the region. In developing a Regional Standard for vessel inventory, safety requirements would be important information to include. This information could be referred to when addressing prevention of accidents and rescue schemes (mitigation against effects of climate change).

To support a process to build up a common regional standard for a regional vessel record one approach to take is to analyze information available in existing registers and record and based on assessments of the coverage of these follow up by supporting countries that a weaker records than others. This process could initially start at sub-regional basis and build upon promotion of cooperation in the sub-region. The existing RPOA framework and the involvement in the RPOA process as such is a useful basis for the continued formulation of sub-regional mechanisms for managing fishing capacity and to combat IUU fishing throughout Southeast Asia. Apart from the contextual framework it facilitates reporting to the RPOA and to get feedback from countries, based on their experiences, from the different sub-regions.

Authority to register smaller vessels

Discussion on fishing vessel registers has also addressed ***small-scale fisheries***. In a number of countries the authority to register/record smaller vessels rests with the local government or other local bodies – in the Philippines the local government unit (LGU) and in Vietnam the local People's Committee. In other, more case by case situations, references can be made to local, village based initiatives such as in Satun Province, Thailand and in Lombok Timur in Indonesia. However, on small-scale fisheries, no clear recommendations are provided, but suggestions has been made to follow up on local system/initiatives as well as (legal) requirements/expectations on the Local Governments, Districts, People's Committees in terms of registration/listing of boats (and gear) with their respective areas. It could be explored to see how these systems could be aggregated to provide a national (and regional) picture.

The actual benefit to the small-scale fishermen and fisher-folk of having their vessels and gear registered and/recorded could be diverse but a basic benefit is to help assert, maintain and claim fishing rights in relation to time, space and resources as well as to negotiate with other sectors in protecting fishing rights. The group in La-Ngu district was clear in that they saw several benefits of having vessels and registered at the district and province and they emphasized that they now had much better access to government support services.

It has been pointed out that coastal fisheries of smaller scale would be referred to differently among the countries. In general, the term "small-scale fisheries" is not used in the national records or in regulation on areas to be reserved for smaller vessels. Instead other expressions are used, such as traditional fisheries, municipal fisheries, family fisheries, etc. All countries have an established zone along the coasts reserving the area for coastal fisheries (with smaller vessels) and/or exclude larger vessels.

MCS Networks and MCS institutional matrix

The countries in sub-regions such the Gulf of Thailand, Andaman Sea, Arafura and Timor Sea and Sulu-Sulawesi Seas are in general positive to initiate a process to develop a sub- regional MCS Network. In the process due recognition should be made to the differences and levels of institutional capacity between countries and the need to set up national framework and MCS system (in-country coordination, etc). The MCS and its function should be clarified clearly in order to improve awareness among institutions and to let the policy maker understand the real issues. It has been highlighted that regarding MCS, the efficiency of each country is different as is the elements and profile of IUU fishing. It has been recommended to develop a "matrix" on Monitoring, Control and Surveillance – respectively – indicating institutional responsibility for key elements (adding the legal framework that indicates responsibility). Each country should identify the institutions working on M, C and S, respectively and provide information on the relevant laws and regulations. From such information, the common concern, concept, practice or common legal framework would be synthesized to form a basis for the development of the MCS Networks in the sub-region.

In setting up, or initiating MCS network the countries around Gulf of Thailand and Andaman Sea, respectively, have agreed that MCS networks for the respective sub-regions should be established which, initially, could facilitate the sharing of information and institutional cooperation, specific aspects to be included should include:

1. Vessel record and inventory
2. Port monitoring mechanism and information on landings
3. Other points that could be considered (based on later agenda points) was to include information sharing on the monitoring of:
   - gear and licenses
   - catches/catch documentation
4. Special attention need to be made on ways to include information from community fisheries and community based fisheries management

In a meeting with the Andaman Sea Countries (October 2009) the importance to include "stock assessments" and "ecosystems health monitoring" among areas for information sharing was highlighted.

An area of special concern is the monitoring of small-scale and community fisheries. It has been suggested that efforts should be made to strengthen community participation specifically in the M and S activities. A general recognition is that local knowledge, traditional practices and local organisations could provide important inputs in the development of M, C and S at local level specifically on the monitoring and control as indicated by experiences in Indonesia and La-Ngu District in Satun as well as from earlier references to the

CHARM project in Thailand. Possibilities to build local MCS systems at community level including incorporation of traditional knowledge and local organization should be explored. The need for capacity building through on-site training for local communities should be explored and in the process recognise the need to ensure improved understanding among government agencies on aspects of local knowledge and local organizations as applied in community-based fisheries management.

Port monitoring

The importance of good port monitoring is of increasing priority and recent instruments like those regarding the FAO Agreement on Port State Measures and the EC Catch Documentation require good port monitoring to be implemented as a tool to control fishing capacity and to combat IUU fishing. In the sub-regions of Gulf of Thailand and Andaman Sea the importance of port monitoring was also raised in terms of a need to monitor catches landed in neighbouring harbours and ways to monitor landings by vessels from neighbouring countries should be developed. There is a common understanding that "Port monitoring" is something that is of continued and growing priority.

Improved working conditions and Safety at Sea

The importance to improve safety at sea has been on the agenda since the launching of the Code of Conduct for Responsible Fisheries (CCRF) in 1995 (and earlier). International initiatives and conventions relevant to fisheries such as the IMO Conventions (emphasizing safety aspects and pollution prevention for smaller and larger fishing vessels) and the ILO Conventions (addressing labour rights, rights of fishing communities and fishermen, including migratory fishermen and safety at work) gives the basis for an international commitment to improve working conditions and safety at sea. Improved working conditions are indicated as one key element in improving safety at sea. Improved safety at sea has also been stressed as necessary to mitigate effects of climate change such as increased and more severe storms and typhoons.

The importance to address safety and safety at sea aspects and good working as a requirement in registration and licensing procedures has been highlighted by a representative from IMO during events in 2008, 2009 and 2010. Specifically there are a number of instruments which deal with safety of fishing vessels, namely the Torremolinos Protocol (1993), International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel, STCW-F, 1995, the ILO/FAO/IMO Document for Guidance on Training and Certification of Fishing Vessel Personnel (published in 1985 revised in 2000) and the Safety of Life at Sea Convention (SOLAS), 1974 as amended, as well as other related IMO conventions. In general, based on the requirements of the IMO Conventions, there tend to be a focus on bigger boats (more than 24 meters or larger than the average small-scale boat). However, some countries, like Vietnam, when incorporating the provisions of the IMO Conventions into national laws have made some of the rules to become applicable also to smaller vessels.

Habitats, fisheries resources conservation areas and migration paths

In the perspective of habitat management and the protection of fisheries resources conservation areas, MPA's, *refugia* and the migration paths of fish it is clear that IUU fisheries and destructive fishing are a big problem and in all/most of the sites that has been monitored by the UNEP/GEF/SCS project and other projects. The UNEP/GEF/SCS and SEAFDEC has been actively promoting bilateral and regional cooperation among countries in the Gulf of Thailand and the Andaman Sea in the context of environmental and natural resources management to solve trans-boundary problems including illegal and destructive fishing.

Efforts should be made to promote and support the development of a range of bi-lateral (and if feasible/applicable tri-lateral) agreements. A range of such bi-lateral agreements could provide a basis for sub-regional management decision, including the reduction of illegal and destructive fishing. In moving towards more regulated management arrangements for sub-regions like the Gulf of Thailand and the Andaman Sea it could be important to revisit the institutional (and legal) foundations for institutional responsibilities (fisheries, marine environment, etc) in each of the sub-regions. Agreements made will need to be implemented by the countries within the framework of their legal systems and expectations cannot go beyond what is constituted in relevant legal documents in each of the participating countries.

Sub-regional definition on IUU fishing

In both of Gulf of Thailand and Andaman Sea sub-regions the countries reviewed the "global" definition on IUU fishing to provide a condensed definition relevant to the sub-regions as a working reference. The

definitions was considered relevant only for the specific sub-regions unless or until recognition is being made also by other groups and in other *fora* to be applicable to other groups. The Andaman Sea countries shared the opinion with the Gulf of Thailand countries and it was agreed that the definition of IUU fishing applicable to the two sub-regions should be:

- Conducted by national or foreign vessels in waters under the jurisdiction of a state, without the permission of that state, or in contravention of its laws and regulations
- In violation of national laws or relevant international obligations
- Which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws or regulations
- In areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in manner inconsistent with State responsibilities for the conservation of living marine resources under international law

Management of fishing capacity and efforts to combat IUU fishing

Attempts to improve fisheries management and to reduce Illegal, Unreported and Unregulated (IUU) and destructive fishing are urgently called for. The seriousness of this wish has been expressed through the SEAFDEC Council, the ASEAN Fisheries Consultative Forum (AFCF), the Regional Plan of Action (RPOA) to combat IUU fisheries, by ASEAN Heads of State in the launching of the ASEAN Economic Community Blueprint and by APFIC/FAO.

It is necessary that authorities should have better control of the fishing effort and vessels involved in fishing and in the process have a better record on boats and gear available for fishing – both small and large scale. In the medium term a well functioning fishing vessel register, or registers/records, which includes all vessels and are well managed is essential. Several meetings, including the RPOA Meeting in Bali (4-6 of March 2008), have clearly indicated that a functioning licensing system would depend on solid vessel registration system(s). However, a difficulty that is well recognized is to coordinate registration and licensing as these tasks are often the mandate of different institutions, belonging to different ministries. In order to control the fishing effort functioning vessel registration system(s) implemented together with records on fishing gear and fishing boats would provide a more solid base for other tools applied to help manage the fishing capacity, *e.g.* licensing, closed seasons and zoning systems.

The legal framework for fishing vessel registration, fishing licensing and related actions cannot (should not) be applied separately; they have to work in parallel to be efficient tools for fisheries management and to combat illegal fisheries. In view of national fisheries management, a clear political view, national policy and clear legal framework are needed. To provide an authority with power to do registration and licensing without a legal framework and a specific law is fruitless. Moreover, the legal references and institutional framework for fisheries management needs to be strengthened and harmonized in a regional context.

Furthermore, there is a continuous need to follow up, and study, the treaties and conventions to clarify changes in requirements to be observed by countries in the region, what provisions are mandatory, for what types of vessels, what is considered to be voluntary, etc. It should be noted that to ensure effective implementation provisions of ratified conventions need to be incorporated into national legislation. In this process countries might wish to apply the provisions of conventions to also cover vessels smaller, larger groups of people involved in fishing than that stipulated in the conventions. There are also certain, requirements, obligation and duties to be enforced by the "flag state" with regards to registered vessels granted the right to fly its flag. These specific requirements might be different than those that would be needed for fisheries management as such.

ASEAN Fisheries Consultative Forum (AFCF)

The strengthening of efforts to combat IUU fishing is one of the priority actions for ASEAN and ASEAN Member Countries in the development of the ASEAN Economic Community. This is also reflected in the activity plan that was developed, agreed upon and adopted by the AFCF in Hoi An 1-2 June 2009 and by ASWGFi also in Hoi An 3- 5 June 2009. The activity plan was later endorsed by the SOM 30th AMAF in the end of October 2009. The activity plan indicates a number of **"key cluster areas**" for cooperation under the AFCF each of which is linked to a lead country. Efforts to combat IUU Fishing, to promote sustainable fishing practices and management of fishing capacity are all indicated as high priority areas.

The key cluster areas for cooperation under the AFCF established so far (with lead country in brackets), include:

- Combating IUU Fishing (Indonesia)
- Promoting sustainable fishing practices
  - Fishing Capacity and responsible fishing practices (Malaysia)
  - Conservation of biodiversity and enhancing fisheries resources (Vietnam)
  - Fish for Aquaculture Feed (Vietnam)
- Fisheries co-management (Cambodia)
- Adaptation and mitigation of impacts of climate change (the Philippines)
- Fisheries post-harvest and food safety (Singapore)
- Strengthening ASEAN joint approaches/positions on international trade related issues (Thailand)
- Information, education and communication to support development and management of fisheries (Brunei Darussalam)
- Capacity building (Lao PDR)

Following the Expert Consultation on managing fishing capacity to combat IUU fishing (September 2010) SEAFDEC and others are advised to explore how to build upon the role of lead countries for "key clusters" in the process of follow up actions and recommendations from the meeting as well as in support to their "responsibility" as a lead country. The lead countries to initially be called upon for the management of fishing capacity and to combat IUU fishing would be Indonesia (Combating IUU Fishing) and Malaysia (Fishing Capacity and Responsible Fishing Practices). The role of Indonesia is further strengthened by the hosting of the RPOA Secretariat.

The Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia was organized in Bangkok, Thailand from 15 to 17 September 2010 is the latest events organized with countries in the region and international experts to address the importance to manage fishing capacity to be able to combat IUU fishing. An important entry point to this event is the views expressed by Southeast Asian countries on the recent regulations, be it on Port State Measures or Catch Documentations, that the situation that has emerged could be "considered as an opportunity for Member Countries to further strengthen their existing national initiatives and efforts in sustainable fisheries management and combating IUU fishing".

The Consultation looked "beyond" the instruments and looked at the elements needed to improve fisheries management, to control fishing efforts and to combat IUU fisheries while at the same time continue the process already started in 2006 and onwards to address fishing capacity, vessel registrations and vessel records instead of looking at the FAO Agreement on Port State Measures and EC Catch Documentation or other international agreements/conventions as such. This filled the purpose to meet a need to get a broader recognition of the importance of improved monitoring and control based on efficient and transparent information sharing to deter IUU Fisheries. To effectively manage fishing capacity and to combat IUU fishing the countries in the region must to live up to their responsibilities as "flag state" and "port state". In a Southeast Asian context all countries are both flag state and port state.

Another important target was to provide an understanding that the basic requirements of the Port State Measures and the EC Catch Documentation are the same with a similar aim to deter and combat IUU fisheries. The main difference lies in their structure or legal foundation: The Agreement on Port State Measures is a globally negotiated and legally binding instrument (once it enters into force), while the EC Catch Documentation is an unilaterally developed regulation (and in that sense not legally binding to others). The common element is that they are applicable to "all" fishing vessels and landing places (including trans-shipment vessels). Managing fishing activities and people involved in fishing through improved vessel registration, fishing licenses and improved working conditions will in fact help to support the implementation also of other international agreements/conventions (IMO, ILO, etc.).

Countries should come up with the optimum combination of measures that are most suitable for the region, considering the specificity of the region in order to manage fishing capacity and to combat IUU fishing. It was shown that there is a need for discussions among the countries on definitions, legal implication in each of the countries to live up to the scope of a regional approach and regional (and sub-regional) cooperation including development of initiatives to establish MCS-networks in the region and sub-regions. In addressing illegal and unsustainable fishing practices calls are increasingly being made, as reflected during SEAFDEC Council Meetings in 2009 and in 2010, that aspects such as safety at sea (IMO Conventions) and working conditions (ILO Conventions) should be addressed. Predictions of increases in storms, typhoons and hurricanes due to climate change indicate the need to look into safety at sea aspects and related working conditions and it is shown how these aspects needs to be addressed in the process of managing fishing capacity.

The September 2010 Consultation provided an opportunity to promote regional cooperation and indications were given to SEAFDEC and other participants on the importance to maintain a dialogue with ASEAN mechanisms such as the ASEAN Secretariat, the ASEAN Fisheries Consultative Forum (AFCF) and ASWGFi. Furthermore, the importance of the RPOA and the role of the RPOA Secretariat were underlined in addition to the central role and responsibility of FAO/APFIC. The Consultation came up with an important set of recommendations and action points. These points are reflected below.

Recommendations, summary and follow up: Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia, 15-17 September 2010, Bangkok, Thailand

1. Regional and sub-regional cooperation/coordination

All through the consultation, the importance of regional approaches have been emphasized with an additional weight being given to the importance of developing agreements at sub-regional level including the development of MCS networks. This is further underlined by comments made that in the region and in sub-regions countries are both "port states" and "flag states" and both aspects need to be addresses in developing a common understanding-and by doing that countries will be better placed to live up to the new "requirements" to combat IUU fishing.

In processes to strengthen the regional and sub-regional cooperation the weak institutional links, at national and regional level should be addressed. Building upon existing sub-regional initiatives/frameworks is a starting point by strengthening institutions and institutional cooperation within those frameworks. In other sub-regions, where appropriate, similar processes could be initiated.

Efforts should be made to have different initiatives (SEAFDEC, RPOA, ASEAN, APFIC, etc) working with or promoting sub-regional level cooperation and to refer to sub-regions based on similar set-up of countries involved.

Specific matters and recommendations from the consultation to follow up with the RPOA Secretariat

- Prioritization of the issues of the Regional Plan of Action (RPOA) to combat IUU fishing in the region.
- To follow up with the RPOA, and its steering committee on the inclusion of countries to be involved in established sub-regional groupings, including *considerations to establish more "sub-regions" where there are common needs to implement MCS-networks among concerned countries such as possibly the area around South West South China Sea and Southern Malacca Straits*
- The establishment of a regional network/hub to facilitate the compilation of information on blacklisted vessels or vessels that are known to practice IUU fishing should be considered

Efforts should be made to initiate the formulation of national plans of action (NPOAs) to Promote Responsible Fishing Practices including Combating IUU Fishing, by among other things enhance monitoring of landings at key ports in each of the countries of the region. In the process SEAFDEC is encouraged to take initial actions taking by working with countries and encourage them through cooperation within existing sub-regional initiatives Involvement of concerned agencies from a range of sectors should be ensured.

Cooperation need to be boosted among neighboring countries through bilateral and trilateral agreements in order to strengthen the implementation and enforcement of legislations related to combating IUU fishing as well as in support of the implementation of relevant international instruments and conventions.

The increasing attention being given to social aspects (in communities and among the migratory work force) and working conditions (on vessels, in post-harvest and processing industry) has a regional and sub-regional dimension and to be addressed. This could, based on information provided during the Consultation, be done in different ways, such as:

- Require a guarantee, like in the Philippines, that crew on fishing vessels will be treated in accordance national labor laws before issuing a license to fish.
- Include, as suggested by a participant from Malaysia, "social certification" in the routines of countries in the region considering that there are social requirements in a range of international/national instruments IMO, ILO and the EC with regards to regulations pertaining to hygiene onboard (HOB) as well as other social/labor aspect.

- Take measures to ensure that the fishing sector/industry can adapt to priority concerns of the ASEAN Socio-Cultural Community such as labor requirements and requirements on the status of migratory workforce to prepare for the ASEAN Community by 2015 and onwards.

Inland fisheries: Distinction should be made with regards to marine and inland fisheries, respectively, considering that measures to combat IUU fishing are also needed for inland fisheries. A review, or survey, should be made to assess and describe the features of IUU fishing in inland waters. Promote measures to combat IUU fishing in inland fisheries.

2. Review legislation

The readiness of the countries to implement the Agreement on Port State Measures and other relevant instruments to combat IUU fishing should be assessed taking into consideration the existing laws and regulations of the respective countries and the extent to which these regulations provide a basis for countries to act. In this context there is a need to evaluate/assess the limitations of, and options for national laws to deal with the combating of IUU fishing. Countries need to review what's already there in existing regulatory framework and adjust as needed in order to build up a structure that fits their own regulatory framework. Sharing of information on legal matters should be further enhanced while capacity building should be continuously improved.

Participation should be ensured at all levels and participation should be an integrated part in policy-making processes by allowing the stakeholders including (local) fisher-folk to take part in consultative processes leading to drafting of relevant regulations. Similarly, a strong emphasis was given to processes that will ensure the involvement of fishing industry in the development of the relevant regulations.

A continued process to facilitate consultative dialogue among legal officers to share, at sub-regional/regional basis, perspectives of the respective legal and regulatory framework in terms of developing MCS-networks and to implement efforts to combating IUU fishing should be promoted and ensured.

3. Lead countries for AFCF key clusters

In follow up to the Consultation the responsible lead countries for AFCF "Key clusters" should be mobilized in follow up of the recommendations of this Consultation which implies the involvement of, at least, the following lead countries:

- Indonesia – combat IUU fishing;
- Malaysia – fishing capacity and responsible fishing practices;
- Thailand – strengthening ASEAN joint approaches/position on international fish trade related issues; and;
- Lao PDR – capacity building (cross-cutting)

SEAFDEC will communicate with those lead countries to discuss further steps and it is envisaged that other lead countries might also be approached. The lead countries would also be responsible to report back on progress to the AFCF. The process would include the involvement of the RPOA SEC and other units as suitable.

Assistance would need to be provided to Lao PDR. Lao PDR is in a central and important position as lead country for "capacity" considering that "capacity building" has been identified as one of the most important aspects in order to strengthen the positions of countries in the region to improve fisheries management and to combat IUU fishing. Specifically support to Lao PDR would be needed to monitor events in marine and coastal fisheries.

4. Training/capacity building

In the discussion the need for capacity building were raised, all through the Consultation, and SEAFDEC, FAO/RAP-APFIC, RPOA Secretariat and other organizations were asked to consider providing capacity building activities to enhance the capabilities of the countries in promoting sustainable fisheries management and eventually in combating IUU fishing. The specific needs of developing countries for strengthened capacity are also recognized in the two new instruments (FAO and EC respectively) that both are aiming at combating IUU fishing.

To improve the expertise of the region a program should be developed to promote capacity building of all stakeholders including technical persons, scientists, policy makers, legal officers, inspectors, economists, and the like. Personal and institutional capacity in all aspects especially in terms of improving fisheries management including port monitoring, MCS related matters, etc should be strengthened.

Guidance and capacity building would be needed for countries in the region to relate the scope of their own regulations to needed common approaches to combat IUU fishing in line with the Agreement on Port State Measures and the EC Regulation (with a common purpose to combat IUU fishing). Considering the present status of the national policies and procedures, there is a need for capacity building, and strengthening of relevant institutions, to enable the countries to implement the necessary measures and requirements with the aim of elimination IUU fishing.

National capacity should be built to improve the port management capacity including port inspections as needed from time to time and the need to develop a relevant training program, building upon the "guidelines for training of port inspectors" that is annexed to the FAO Agreement on Port State Measures, is emphasized in order to improve the capacity of personnel, including port inspectors, working at key fishing ports in the region.

Based on the information from SEAFDEC/TD the Consultation encouraged TD to continue the preparation for a project, or initiative, that would have a major focus on the development of guidelines suitable to processes to combat IUU fishing (with possible support from the Japanese Trust Fund). The information on training provided by TD was welcomed by the Consultation.

5. Information sharing

Development of a network or working group taking into consideration the various sub-regional initiatives of SEAFDEC, and others, in order that sharing of relevant information could be facilitated, with the assistance of the RPOA and the ASEAN mechanisms. The RPOA "issues based matrix" and the SEAFDEC "institutional/legal based matrix" that has been developed to support the building-up of MCS-networks in sub-regions could be useful references in the network development.

Information sharing in the region should be further improved, among other things on procedures relevant to the small-scale fisheries in the region to verify the legality of artisanal/small-scale fisheries. The prime priority would not be to try to "classify" artisanal/small-scale fisheries but rather to review of the existing formats used in monitoring fishing activities in the region and coordinate among countries (bilaterally or in sub-regions) to be able to agree on the validation/certification routines, including landings across boundaries, to ensure a transparent and just confirmation that catches and landings are not subject to IUU fishing.

Strengthen information sharing on the initiatives of the countries in combating IUU fishing, especially on classification, procedures, etc. relevant to SSF in the region.

Information should be collected on local initiatives, both traditional and project based, aiming to monitor and policing illegal fishing activities in order to provide information to the countries in the region on best/good practices that work at a given local area, as well as practices that have not worked at a given local area.

Vessel record and inventory as an input to information sharing

In support of a process to develop the regional fishing record and inventory, SEAFDEC has introduced two survey forms for fishing vessel record and inventory (large and small scale) to the countries in the region. Initial feedback from the survey indicated differences in systems for fishing vessel registration and for the issuing of licenses to fish (vessels, gear and people) among countries in the region. These differences have led to a difficulty in coordinating the gathering of information on registration and licenses, especially in countries with divided institutional responsibilities.

Considering the differences in the countries' structures, attempts should be made to "build upon the existing information based on the formats available in each country" as suggested during the Consultation. In the process however, there is a need to look into the elements of information provided in existing frameworks with a view to harmonize the formats. Furthermore, there is a need to find a common understanding on definitions and especially on the descriptions of "vessels" taking into consideration the FAO definitions shown in the Agreement on Port State Measures.

The countries should submit the available information on their respective total aggregated numbers of fishing vessels based on the existing format and reporting routines in order that SEAFDEC could shape a general picture of the available vessels in the region.

The countries were also requested to submit to SEAFDEC and RPOA SEC their existing available formats for consolidation before 15 October 2010 and for SEAFDEC to harmonize the format and send back to the SEAFDEC Member Countries for their consideration before the next FAO Technical Consultation on Global Record of Fishing Vessel in November 2010. The countries were also encouraged to submit their inputs to the FAO Global Record as requested from FAO.

In the development of fishing vessel record and inventory ambition should be made to involve a group of multi-sector concerned agencies, such as maritime department.

Establish criteria and/or standards, including definitions

There is a need to promote a focus on common criteria to combat IUU fishing in which case there is a need to establish a regional standard for combating IUU fishing in the region. This should build upon the value and opportunities in developing criteria, standards or guidelines applicable to the region taking into account the common characteristics of fisheries in the region while recognizing the specifics of the sub-regions (as indicated by the sub-regional "issue" matrices developed under the RPOA). The Consultation recognized this as an important process to facilitate common approaches to combat IUU fishing and improved fisheries management.

The process to define suitable criteria to promote cooperation among countries in the region to combat IUU should build upon dialogues in the sub-regional areas (defined by SEAFDEC and/or RPOA), taking into consideration the unique characteristics of fisheries in the region.

In the process of establishing criteria, standards or guidelines there is a need to review the definitions building upon definitions provided by FAO and EC. Furthermore, there is a special request that RPOA and SEAFDEC should provide a clear definition of fishing vessels, refrigerated transport vessel, supply vessels, transshipment vessels, and reefers.

Fishing vessel registration and fishing license (vessel, gear and people) and institutional and legal responsibilities including safety at sea aspects

It is well recognized that the implementation of reliable systems for fishing vessel registration and the processes to issue licenses to fish (vessel, gear and people) is central to flag state responsibilities. The validity of registration documents and licenses, including documents on crew members, are among the basic documents to be provided at fishing ports, together with the catch documents. These documents will also be scrutinized during port inspection with a purpose combat IUU fishing. Considering that some countries are more far ahead and advanced in initiating the implementation of processes to register fishing vessels and to issue licenses to fish (vessel, gear and people) the Consultation suggested that the experiences of such countries could be shared with other countries in support of efforts to update and modify their respective registration and licensing systems.

Legal provisions and requirements of countries should be reviewed to establish the legal and institutional arrangements that should be the focus in the process of providing support to the development of national systems for registration and licenses. The Consultation indicated that the establishment of "one-stop center" for registration of fishing vessels and licensing would facilitate coordination and implementation of actions to combat IUU fishing. On the other hand it is important to recognize the extent to which the mandates are divided between different agencies to handle fishing vessel registration and the process to issue licenses to fish or if it could be handled within one agency.

Irrespective of system, it was stressed that close linkage and cooperation among the agencies concerned should be strengthened. SEAFDEC should update the fishing vessel registration and fishing license flowchart on institutional responsibilities to cover all the ASEAN member countries to indicate key institutions to be included in the process.

Increased advocacy should be promoted for the fisheries sector specifically in the registration of fishing vessels as means of reducing IUU fishing in the region. The review of existing legislations, institutions and legal structures of the countries and the institutional "flowchart" should form a basis for enhance cooperation

among the agencies involved in regulating the fisheries-related activities. To facilitate cooperation definitions on matters related to fishing vessel registration and the process to issue fishing licenses (vessels, gear and people) should be clearly defined.

The increasing attention being given to social aspects referred to earlier (regional cooperation) has direct implication to the process fishing vessel registration and the issuing of licenses to fish (vessels, gear and people) in that social aspects and labor conditions guarantees becomes part of the process, in that there will be need to:

- Require a guarantee, like in the Philippines, that crew on fishing vessels will be treated in accordance national labor laws before issuing a license to fish.
- Include, as suggested by a participant from Malaysia, "social certification" in the routines of countries in the region considering that there are social requirements in a range of international/national instruments IMO, ILO and the EC with regards to regulations pertaining to hygiene onboard (HOB) as well as other social/labor aspect.
- Pay increased attention to safety at sea aspect in the registration to ensure the safety and well-being of crew such as stipulated in IMO Conventions.

Catch documentation schemes available to register catches (log books, etc.)

Catch documentation is a key to effective fisheries management and for traceability of fishery products. In order to respond to stronger international requirements (FAO and EU) for validated catch documentation the countries are encouraged to review, and as necessary to strengthen the requirements for catch documentation in the respective countries' national regulations (or legislations as appropriate), including processes to validate the information in the documents. The responsibility for the implementation of rules to ensure that fishing vessels provide necessary catch documents rests with the flag state-a main task for port managers and port inspectors in the port state is to check the availability of catch documents and the validity of the documents and contained information with regards to licenses, catches, species, fishing area, etc. One of the critical elements is to be able to provide reliable and trustworthy validation of catch documents and other required documents.

Immediate action and support is needed to further develop catch documents that are suitable to monitor fishing activities and as a tool in tracing the fishing area, involved vessels and composition of catches. Where suitable documents are available further action is needed to implement and monitor the use.

Several countries in the region are working on developing new, simplified, catch documents (log books, etc), such as Indonesia, Thailand (reintroducing the log book) and opportunities should be provided (at sub-regional level) to share the results and experiences-including experiences from fishing operators and industry as such on the usefulness to their needs of different catch documentation schemes (improved traceability, etc). The responses from the fishing industry should be sought on successful applications of catch documentations-and validation of the information contained SEAFDEC, RPOA and/or together with others, should develop appropriate training program for trainers on the development, application and implementation of catch documentation schemes-training provided should be linked to the development of a transparent process/system to validate the information contained in the catch documents (and the information needed during port inspections).

A special area for follow up action is catch documentation (and validation) of catches being landed in neighboring country ports-SEAFDEC (Sida) will follow-up on this as suggested in follow up to the presentation by participants from Thailand and Myanmar, respectively, through a sequence of on-site events in border provinces. Similar efforts should be developed for other border areas in sub-regions of South China Sea. In this context attempts should be made to look into the applicability of the special provisions applying to artisanal fishing vessels landing their catches across neighboring borders through agreements between the two neighboring countries.

Port Monitoring (Including of landings by vessels from neighboring countries)

The Agreement on Port State Measure is highlighting the **role of the port State** in the adoption of effective measures-through effective port monitoring and stringent inspections as needed from time to time to control the legality of catches being landed – to promote the sustainable use and the long-term conservation of living marine resources and to combat IUU fishing. At the same time it is recognised that measures to combat illegal, unreported and unregulated fishing should build on the **primary responsibility of flag States.**

To establish and enhance port monitoring mechanisms, it is necessary to establish good cooperation among all relevant sectors and institutions, as well as among neighboring countries. It is important to recognize that during port monitoring it is required that both local and foreign vessels are monitored to be able to validate and support the increasing requirements for catch traceability and other documentations.

To facilitate the process support could be provided for countries to build upon existing well-managed ports to be developed as a model for the country and establish protocols relevant to the laws and regulations to each country on how to manage fishing ports in support of efforts to combat IUU fishing.

Landings in neighboring ports require special consideration in the process of validation of the legal status of landed catches, especially with regards to artisanal fisheries as indicated in the FAO Agreement on Port State Measures. Initially this will be/should be followed in relation to cross-boundary relations with regards to Thailand and Myanmar. Similar efforts should be explored for other border areas.

A relevant training program needs to be developed, building upon the "guidelines for training of port inspectors" that is annexed to the FAO Agreement on Port State Measures. This was emphasized during the Consultation in order to improve the capacity of personnel, including port inspectors, working at key fishing ports in the region. This is also in line with indications in both of the recent instruments (FAO and EC) that recognize the need to assist developing countries in building up capacity.

In support of strengthening institutional capacity there is a need to develop a mechanism or set of standards for port inspection and port monitoring that would clarify the measures the port states have to take, and how that relates to the measures that the flag states of the region has to take in order to combat IUU fishing.

Certification schemes to address the range of items that might need to be certified, by whom and how (catches, landings, environmental, social/labor, etc.)

The increasing requirements to be able to certify the origin, quality, sustainability, legality of production, production methods, treatment of labor force and social equity among other things are now well recognized among countries in the region. The main emphasis in the context of catch documentation is to be able to "validate" that the information contained in the documents are reliable. Countries should take the opportunity and consider market-based measures as tools to combat IUU fishing such as certification and labeling schemes including the process of validation of information provided. The promotion of "branding" could be an option to promote products that are produced legally with environmentally and socially sound practices.

Countries should consider and examine the social and working conditions of all those producing fish and fishery products, subsequently, where social certification might be option to indicate the legal status of fisheries operation such certification schemes should be developed.

In the perspective of the future outlook of fisheries in the region a number actions could be considered. These include the adoption of generic audit schemes for the implementation existing system food safety requirements; promotion of social certification by educating the stakeholders on how to fish responsibly; using a branding system to promote sustainable fisheries, among others.

Monitor, Control and Surveillance-development of MCS Networks (based on existing initiatives in sub-region of Southeast Asia, linking with RPOA, ASEAN and SEAFDEC)

All through the consultation the importance of regional approaches have been emphasized - with an additional weight being given to the importance of developing agreements at sub-regional level where MCS networks should be built to promote common understanding among involved countries. This is further underlined by the fact that in the region and in sub-regions countries are both "port states" and "flag states" and both aspects need to be addresses in developing a common understanding-and by doing that countries will be better placed to live up to the new "requirements" to combat IUU fishing.

In the Southeast Asian region it could be considered to establish more "sub-regions" where there are common needs to implement MCS-networks to facilitate cooperation among countries in order to combat IUU fishing.

To be effective MCS system, or network, should be developed based on not only the traditional monitoring and enforcement activities but also the development and management of modern data collection techniques in addition to the importance to build upon local organization and traditional knowledge to be effective at community level. The cooperation among ASEAN countries at regional and sub-regional level should be

strengthened as well as with neighboring countries such as Indonesia, Australia, Timor Leste and Papua New Guinea. In other sub-regions cooperation with India (Andaman Sea) and China (North South China Sea/Gulf of Tonkin) should be explored.

SEAFDEC and RPOA should come up with a synthesis on the common requirements for a MCS system that are taking into consideration the legal and institutional requirements or limitations facing each of the countries. A matrix on the institutional and legal arrangements in each of the countries could be useful in this process-as initiated by SEAFDEC.

Both of the RPOA (issues based matrix) and SEAFDEC (institutional/legal based matrix) initiatives are valuable tools in further developing MCS-networks in sub-regions and should be further developed. RPOA and SEAFDEC should provide recommendations on the further steps to be taken regarding the implementation of MCS network at the sub-regions.

A continued process should be strengthened to facilitate consultative dialogue among legal officers to share, at sub-regional/regional basis, perspectives of the respective legal and regulatory framework in terms of developing MCS-networks and to implement efforts to combating IUU fishing.

The importance to strengthen regional cooperation and to build up MCS-networks to combat IUU fishing has been emphasized during the Consultation. They also reiterated earlier point raised during the Consultation in that there is a need to evaluate/assess the limitations of, and options for national laws to deal with the combating of IUU fishing.

Although MCS could be difficult to implement, the involvement of all stakeholders in the process could promote better understanding of the need to implement the MCS. However, it would also be necessary to adjust the envisaged MCS activities to be suitable to the local level for the benefit of all stakeholders in the communities. In efforts to build systems for M, C and S ways of including local level practices and the promotion of community-based MCS should be explored.

While recognizing the existence of a whole range of local level initiatives aiming to monitor and policing illegal fishing activities suggested that it would be useful to collect information on such local initiatives, both traditional and project based, in order to provide information to the countries in the region on best/good practices that work at a given local area, as well as practices that have not worked at a given local area.

Participation should be ensured at all levels and participation should be an integrated part in policy-making processes by allowing the stakeholders including (local) fisher-folk to take part in consultative processes leading to drafting of relevant regulations. Furthermore the need to involve the fishing industry in the development of the relevant regulations should be emphasized.

In improving the expertise of the region a program should be developed to promote capacity building of all stakeholders including technical persons, scientists, policy makers, legal officers, inspectors, economists, and the like. SEAFDEC should conduct training on MCS using as reference the RPOA-endorsed curriculum or other suitable modules and in the process aim to strengthen inter-agencies cooperation at country level.

Annex 6

FISHERIES CO-MANAGEMENT: CASE OF SOUTHEAST ASIA

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Introduction

The fisheries of Southeast Asia are among the most productive and biologically diverse resources in the world. More than 300 million people in the region depend significantly on fish as a source of protein (SEAFDEC, 2001) and approximately 35 percent live below the poverty line (Pomeroy and Viswanathan, 2008). The fisheries in the Southeast Asia are characterized by small-scale, subsistence-based fishers, entrenched in the local community traditions and their social and political structures. They are also responding to the political and economic restructuring that is occurring in the region, and is responding to the need for food security. It is well accepted that the coastal regions of Southeast Asia have been overfished. The governments of these countries (Brunei Darussalam, Indonesia, Malaysia, Myanmar, the Philippines, Singapore and Thailand) are working to attain sustainable improvements in the socio-economic conditions of small-scale fishing communities. Most governments see the need for a well managed fishery with reduced internal conflict as a basis for alleviating poverty among fishermen and at the same time increasing society's overall return from the fishery.

The top-down centralized management of the fisheries has been proved unsuccessful in managing fisheries in Southeast Asia. Institutional arrangements for better fishery management and for stakeholder participation received limited attention in the past. From the 1980s this changed, at least on a pilot scale, and initiatives to empower fishing communities and enable them to take management decisions themselves for sustainable use of these fisheries have moved forward. Co-management and community based management are increasingly seen as an option for sustainable management of fisheries.

Co-management and community based management

Fisheries co-management is defined as an arrangement where management responsibility is shared between the government and fishing communities (Brown *et al*., 2005; Neilson *et al.* 2004; Kuperan *et al*. 2003). There are confusions and overlaps about the concepts of community based fisheries management (CBFM) and co-management. Under the CBFM, management decisions are made by the community, with no clear role of government. In Southeast Asian countries and Bangladesh, a focus on CBFM means developing greater community participation in management.

Fisheries co-management can be defined as a partnership arrangement in which government, the community of local resource users (fishers), external agents (non-governmental organizations, academic, and research institutions), and other fisheries resource stakeholders share the responsibility for decision making over the management of a fishery (Kuperan *et al*., 2003; Berkes *et al.*, 2001; Pomeroy, 2001; Pomeroy and Williams, 1994; Sen and Nielsen, 1996; Nik Mustapha *et. al*, 1998).

Co-management can be viewed as a set of institutional and organizational arrangements (rights and rules), which define the cooperation among the fishery administrators and relevant fishing communities. This partnership is illustrated in Figure 1.

Community based co-management is used to label a range of institutional arrangements with varying degrees of community participation in management which may vary according to factors such as environment, scale, property rights, and community structure. Abdullah *et al.* (1998) stated that fisheries co-management is a middle course between state-level control in fisheries management for efficiency and equity, and local-level control for self-governance, self-regulation and active participation.

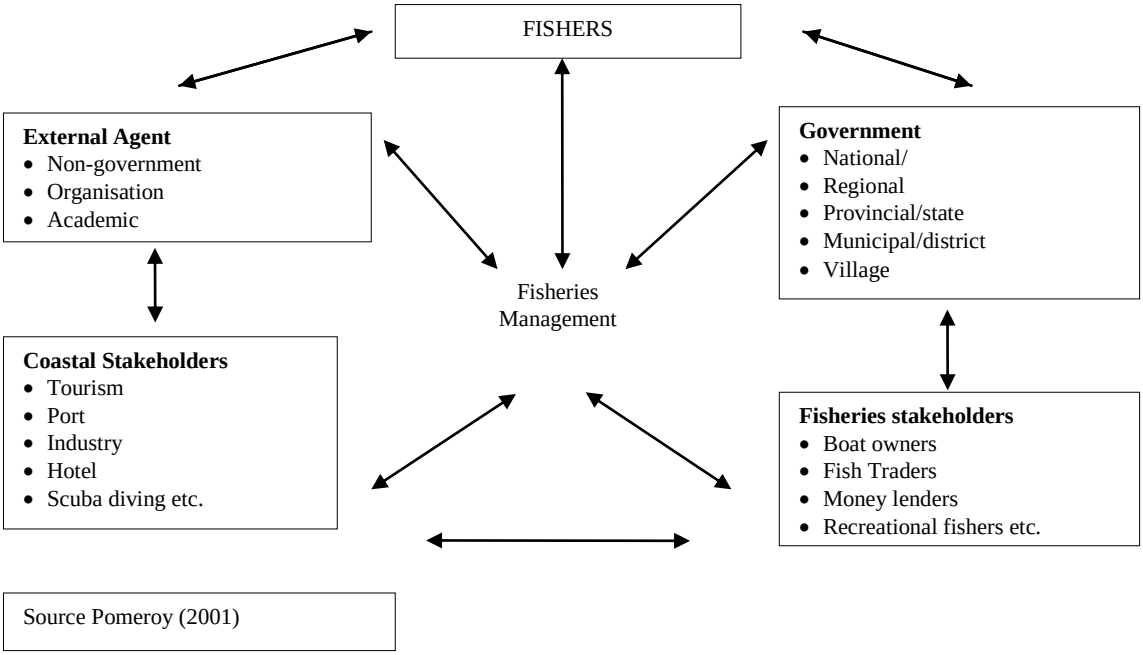

Figure 1. Fisheries co-management is a partnership (Pomeroy 2001)

There is a hierarchy of co-management arrangements from those in which the fishers are merely consulted by the government before regulations are introduced, to those in which fishers design, implement, and enforce laws and regulations with advice and assistance from the government (Figure 2). The planning and implementation of co-management process can be complex, costly and time consuming and varies according to the context in which it is established (Pomeroy and Rivera, 2006). The intention of co-management is to empower fishers in the expectation of better management. "Empowering co-management" (Viswanathan *et al*. 2003) requires major changes in institutions and organisations, in information bases, in attitudes among fishers and government. This requires both political will and capacity building. CBFM can be seen as a process for moving towards a substantial role for fishers in management of the resources they depend on within a framework of government support for that process. Co-management is not an end point but as a process in which relationships among the parties is constantly changing (Pinkerton, 1992).

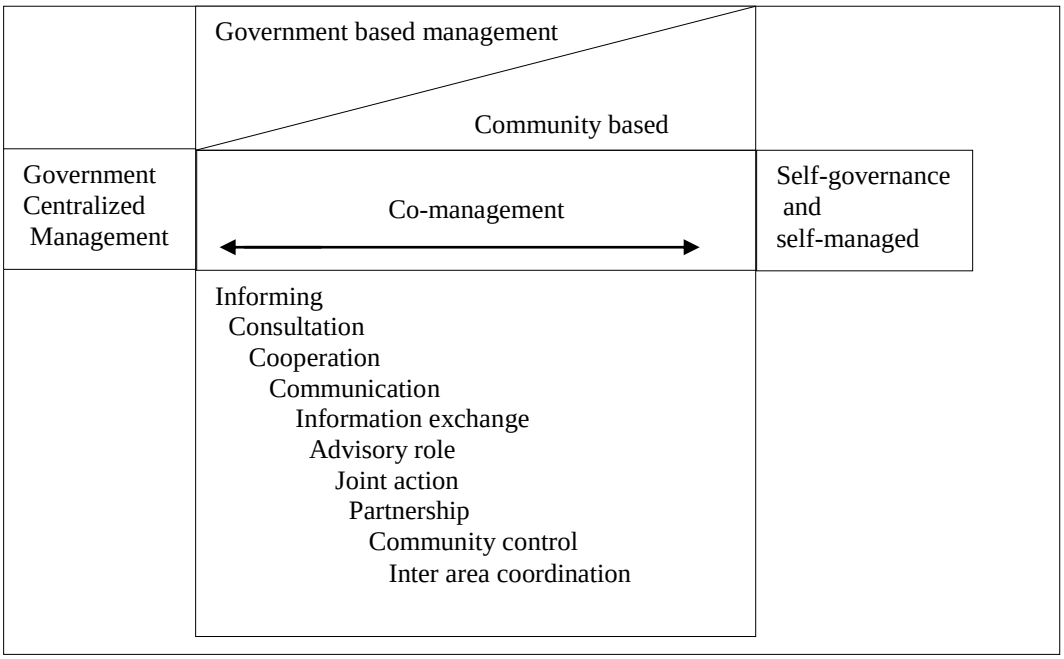

Figure 2. A Hierarchy of Co-management Arrangements (after Berkes 1994)

Benefits of co-management

Local institutions constitute the central element in co-management intervention. Institutions are important prerequisites for effective co-management, through which decisions are made and collective action is taken (Kalikoski *et al.,* 2002; Noble, 2000). Co-management can enhance the participation of various stakeholders in the decision-making process that affect fisher's welfare. The participation of fishers and other stakeholders reduces the negative economic, social and cultural impact that is traditionally borne by the fishing communities (Lane, 2001). Empowerment can be increased through information, training and education, allows the local community to share power with political and economic elites and government. This will minimize social conflicts and would improve the social cohesion in the local community. An effective co-management framework may generate benefits for resource users, local communities' conservation and under this arrangement, poverty and resource degradation can be reduced (Brown *et al.,* 2005).

Co-management takes into account equity, social justice and democracy in natural resource management (Wilson, 2003). Co-management can increase transparency, provide for a wider source of knowledge, more rational regulations, greater legitimization and compliance and reduced costs for gaining information about the resource, reaching agreements and coordinating with others in the group with respect to the use of the resource, and enforcing agreements that have been reached (Abdullah *et al.* 1998; Viswanathan *et al*., 2000). Pomeroy and Ahmed (2006) stated that the potential benefits of co-management include a more open, accountable, transparent and autonomous management process that is more economical as it requires less cost for administration and enforcement.

Co-management in southeast asia

CBFM started in this region in the early 1980s. Consequently co-management had emerged in this region in early 1990s. The history of co-management in this region shows a shift from CBFM to co-management. The scale for co-management arrangements varies a great deal in terms of people, ecology and level of management in South-east Asia. The prospects for adoption of the co-management approach for managing the coastal fisheries of South-east Asian countries vary with the Philippines having good prospects for co-management adoption. It has been observed that in the communities where government has failed to achieve sustainable management, the trust in centralized government-based approaches to managing the fisheries has declined.

The centralized fisheries management system provides limited scope for co-management of the fisheries in Malaysia. Similar management trend exist in countries such as Thailand and Brunei Darussalam where the implementation of co-management approach for resource management is difficult.

Throughout Southeast Asia, co-management and community based natural resource management has reemerged, through the initiation of people, NGO, government and international agencies, as a way to involve resource users and provide control over resources.

Several countries of Southeast Asia and Bangladesh are now recognising the important potential role that community based and co-management systems can play in contemporary fisheries management. Fisheries co-management has progressed in the Philippines and Bangladesh. However, co-management evidences are increasing in Thailand, Malaysia, Laos, Cambodia and Vietnam. However, each country is taking a different approach to co-management.

The good prospects for co-management in the Philippines are largely due to the changed political climate in the country, as there is a move to delegate more responsibilities to local governments and non-governmental agencies are actively involved in community development. In Indonesia, the recent decentralization move has given greater impetus to co-management. The Philippines and Indonesia have better prospects for co-management as these countries are geographically dispersed and are made up of many islands. In the case of Malaysia and Thailand the move towards co-management has been somewhat slower due to a more centralized fisheries management system.

Co-management issues and progress

Property rights

Property rights in fisheries are complex but critical to an understanding of approaches to community empowerment and fishery co-management South-east Asia. In many Asian countries, the local and municipal level government plays an active role in fisheries management. Governments differ greatly in how they handle the problem of legal authority of co-management institutions. The government role of granting the legal authority that is the basis for the 'constitutional rules' that determine who can exercise legitimate local management functions including determining access rights to the resources. The fisheries are often considered as "common property" in Asia. Decentralization trend is growing in Laos, but fishers have little certainty of rights and responsibilities. Exclusive and secure rights have not been established in Thailand, though many Thai fishing communities are restricting open access by allowing only local residents to fish. State involvement in assigning property rights is crucial. In the examination of San Salvador Islands in the Philippines, it was found that purely community based management was not adequate for dealing with problems that arise outside of the community. In-migration had created a heterogeneous population and the villagers need outside legal authority to settle disputes. In Bangladesh, support for co-management is strong where people wanted the state to establish property rights to exclude outsiders.

Facilitation by NGOs

Co-management programmes in Asia are increasingly characterized by multi-faceted networks. The co-management experience suggests that NGOs could play very important role in facilitating to establish local co-management. The focus of co-management is on building fisher community organizations that can themselves manage fisheries through interaction with government. Individual and community empowerment is a central element of co-management. Empowerment allows communities to be free from many of the bureaucratic requirements of government agencies. In the Philippines and other Asian countries, the experience affirms that capability building strengthens the confidence and sense of empowerment of resource users and partners.

NGOs were identified by the Philippine government as the appropriate groups for organizing communities. In Thailand, a complex network of NGOs has emerged and they have found a willingness among local resource users to be organized. However, Thai co-management is heavily dependent on NGOs in both local organization and raising awareness. A similar pattern has emerged in Bangladesh where the NGOs were most successful in organizing the poor. In the Philippines, the successful Malalison Island programme began with a small aquaculture project, but this expanded through local NGO and local government units. Similar stories about the importance of NGOs in fisheries co-management are documented for Bangladesh and Thailand.

The recruitment of external agents, such as NGOs, may not always be equal in establishing co-management. It is expected that individual NGOs would not be rigid to adopt its own approach and making limited modifications to fit with local circumstances. Different NGOs also have different approaches and CBO models for CBFM and this is both a strength and weakness. Most of the NGOs do not want to change their strategy to adjust to local or project needs. Community organizations are rather weak in co-management in Asia. Pomeroy found that few groups of fishers in the Philippines will either formally organize or seek to implement institutional arrangements on their own. Village organizations did not find specific local organizations focused on resource management in Laos.

Homogeneity and Community Characteristics

There are some evidences that communities that are homogeneous are more likely to establish effective community fishery management. It is not an exception in terms of community characteristics-the more successful CBFM sites tend to have homogeneous user communities.

There are many communities in Thailand, Indonesia and the Philippines, where successful co-management was dependent on the high level of socio-economic and cultural homogeneity of the community. However, co-management project was also successful in socio-economically and culturally heterogeneous communities. In the village of San Salvador in Zanbales, Philippines, successful co-management occurred despite marked differences in ethnicity and fishing gear.

Poverty and Co-management

It is also often observed that fishing is the activity of last resort or safety valve for the poor *i.e.* people who fish for subsistence are already poor. Co-management has a strong role in rural poverty reduction. Entries into artisanal fishing for poor people create the aquatic resources vulnerable to biological and economic overexploitation, making them a poor route out of poverty. Panayotou argues that this easy entry and difficult exit causes people to be "trapped" in fisheries.

External forces and conflict

An important limiting factor on establishing CBFM is external forces, threats and conflicts. Political will and commitment are needed to counter pressure from elites, but this needs personal understanding and sacrifice. When locally influential people and local and/or national politicians are involved in the personal gain game and play to control fishing rights, it may be impossible to resolve the problem.

Sustainability and Exit Strategies

The sustainability of the institutional arrangements and the local fisheries under co-management in Southeast Asia are yet to be determined. It is now clear that establishing sustainable co-management in any one fishery requires time. The capacity of the CBO needs to be established as a sustainable organization and a legitimate decision making body deciding on access and use of the fishery. Most importantly an ownership feeling should come through participation. This requires sufficient funds and fund raising systems that can cover likely annual fishery management and organization operating costs. In the communities, where the political elite are not included in the process or were opposed to the project for some reason, the interventions failed to be sustained after the project ended.

Co-management requires financial resources to support the process. Sufficient, timely and sustained funding is critical to the sustainability of co-management efforts. Often co-management projects which are initiated and funded from outside sources fail when the project finishes due o inability of the partners to fund the activities.

Case study

Co-management in the Philippines

The Philippines is home to some of the most diverse and rich coastal ecosystems. Fisheries have traditionally been a major livelihood in coastal rural areas. Although for centuries natural resource management in the Philippines has been centrally determined top-down and non participatory, in reality local level decisions and willingness to recognise the laws and regulations has played a strong role in the use of natural resources such as forestry, fisheries, mining and water. The increasing deterioration of the natural resources in the country has threatened its ability to pursue sustainable development.

The Philippines has a long history of traditional fisheries rights and allocation (Kalagayan, 1991; Lopez, 1983). Between 1975 and 1998, fisheries management in the Philippines has been guided by the fisheries Act of 1975 (Presidential Decree (PD) 704). Under this Act, fisheries management is the responsibility of the government, both national and municipal. Various institutional reforms and policies have been instituted through the Fisheries Sector Programme. The main policy reforms are: decentralisation of authority, strengthen enforcement of fisheries laws, promoting community based initiatives, NGOs were engaged to facilitate community organisation. Community based coastal resource management (CBCRM) started in the early 1980s in the Philippines. Over 180 CBCRM projects have been implemented by the government, NGOs, fishing communities, and academics and research institutions. No country in the world has a range of experiences with CBCRM and co-management as exist in the Philippines (Pomeroy and Carlos, 1997).

In 1991, the government recognised the need to increase participation in management and to devolve control over resource access to local levels through policy and institutional reforms. The good prospects for co-management in the Philippines are largely due to the changed political climate in the country, as there is a move to delegate more responsibilities to local governments and non-governmental agencies are actively involved in community development (Abdullah, 2002). Through several initiatives, the government now actively promotes country based resource management to conserve the coastal resources and diversity of income sources of the low income small scale fisheries.

The local government unit has been involved in marine resource management at Sumilon Island in the Central Philippines with limited participation of resource users. The fishery of San Salvador was subjected to overexploitation in the late 1970s. The fishery was *defacto* open access with virtually no low enforcement. In order to protect livelihoods of poor fishers and the resource, local non-governmental organisation initiated a project in 1989. Resource management partnership between the government and fishers established where NGO played an intermediary role. In this co-management arrangement, municipal government was the main government partner, whereas the national fisheries agency was not active.

In 1991, policy and legal support for co-management was strengthened in the Philippines through introducing local government code (LGC), which gave the municipal government jurisdiction over near shore waters. NGO had organised a village based fisher organisation in San Salvador Island in 1993, then co-management became increasingly visible. Fishers and government shared responsibility for law enforcement, and the government provided funds for local enforcement operations. The San Salvador co-management project gave a motivation for collective action to the village residents.

Co-management in Bangladesh

In Bangladesh, administrative arrangements for inland fisheries management from 1950 to 1986 involved only the leasing of waterbodies. Since 1950 the Ministry of Land (MOL) has managed state owned inland open-water fisheries with the objective of raising revenues by leasing out fishing rights of *jalmahals* (fishing states) to the highest bidder for short term (one to three year) periods. Government introduced New Fishery Management Policy (NFMP) on an experimental basis in some 270 waterbodies (out of total 12000) in 1986. The main objectives of NFMP were; (1) to save the genuine poor fishers from exploitation by intermediaries, lease holders and financiers; (2) to redirect the major benefits of fisheries in order to maximize welfare of fishers; and (3) to ensure proper conservation of fisheries for maximum sustainable catches (Ahmed *et al*., 1997; Siddiqui, 1989).

A number of projects have been implemented since 1991 in inland open-water fisheries giving emphasis on fisher communities and their participation. These projects focused on fisher community development and conservation of fisheries resources. A wide range of co-management arrangements initiated between the governments (DOF), NGOs, and fishers. Three broad categories of co-management arrangements were evolved: (1) NGO led strategy; (2) government led strategy, and (3) government and NGO partnership (Ahmed, Capistrano and Hossain, 1997). Government policy changed in 1995, when MOL circular abolished revenue collection from open *jalmohals* (mainly rivers). This has resulted in open access fishing in rivers. This indicates a contradiction and dilemma in government policies, the DOF, NGOs and development agencies continue to utilize leasing and licensing mechanisms to develop co-management model for fisheries.

CBFM projects were implemented two successive phases: the first phase (CBFM-1, 1995–1999) and the second phase (CBFM-2, 2001–2007). The ownership of project water bodies was formally handed over from the Ministry of Land (MoL) to the Ministry of Fisheries and Livestock (MoFL). The arrangements were tested and extended to a larger number of water bodies (116 sites in 22 districts).

One hundred and thirty community based organizations (CBOs), mainly comprising poor fishers, were created to manage the water bodies assisted by partner NGOs. To strengthen their status, 116 CBOs were registered as cooperatives. During CBFM-2 particular focus and effort was placed on the conditions that are required to ensure that CBOs are sustainable and that inland aquatic resources management is efficient and equitable. Furthermore, a process for the integration of CBFM approaches into official policies was initiated and promoted. However, the sustainability of CBOs is not guaranteed, and coordination across extensive inland floodplains particularly when GO-NGO support ends. It is hard to see how these CBOs can continue on a long-term basis without further incentive based support.

The success of CBFM has been mentioned in major policy documents that the CBFM concept as a viable management approach. It is, however, still too early to assess if this influence will really result in a larger-scale change in how inland water bodies are managed in Bangladesh. It seems that, although major paradigm changes have taken place in the concerned government bodies, especially in technical skills, institutional set-up and financial constraints could hamper future CBFM scaling up.

Conclusion and recommendation

Fisheries co-management as an alternative to centralized command and control fisheries management is often suggested as a solution to the problems of fisheries resource use conflicts and overexploitation. The strategy of co-management not only responds to management crises, they also offer the promise of increased democratization, and empowerment and development of regional and local communities.

The experiences from Southeast Asia indicate that establishment of CBFM and co-management takes time but once established, this management regime can bring about improved efficiency, equity and sustainability of resource use. Effective well-defined partnerships of NGOs and government are not easy to establish but are needed to support new community institutions for fisheries management. The important policy implication of this study is that the fisher groups of co-management organizations need strong facilitation by government and NGOs to establish access to fisheries. Successful co-management is more likely to occur in homogeneous communities.

The long term sustainability of CBOs is not secured when the NGO support ends after the tenure of the project. After many years and many projects have been implemented in the Philippines, it is not clear whether CB-CRM has helped to increase the livelihood prospects and incomes of small fishers as a sector at large. Many co-management projects have been supported by donors for extended periods-the cases of ICLARM's programme in Bangladesh. Sustainability of co-management projects is often an issue when they are donor-driven and heavily dependent on external funding.

Annex 7

APPLICATION OF GLOBAL INSTRUMENTS AND REGIONAL AGREEMENTS

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Background

As the title of the sub-theme seems to be developed on the assumption that global Instruments and Regional Agreements can be applied as they are, technical paper wished to first make some questions on such aspect. SEAFDEC and ASEAN countries has exerted their efforts on the clarifications against the blind application of western technologies that have been used as theoretical backbone in the global instruments such as CCRF and regional agreements such as RPOA on IUU to the region. Those regional activities include the development of Resolution and Plan of Action adopted in the Millennium Conference (2001) and series of Regional guidelines for CCRF to develop regional policy frameworks. However, persistent promotional works using external technologies have never been modified taking into account the regional specificities and provided great confusions to the region in achieving sustainable fisheries. It is therefore the paper clarify the issues again with possible alternative ways based on the regional aspects to promote sustainable fisheries in the region.

Issues

There are few issues that have been repeatedly discussed in the regional fora along line with above concerns. First issue can be the issue on the word of "resource management". Global fisheries society must believe that as the ecological characteristics of resource are universally similar, methodologies to understand the resources can be applicable to anywhere in the world. Is it true? The different natures of the fisheries in different ecosystems have never been widely recognized, as those in temperate areas mainly target to the small numbers of species with a large amount of yields, while those in tropical areas target a large numbers of species with small amount of yields. Despite different ecological natures of fisheries resource in various part of the world, terms of resource management with a single menu has been globally used as a word in promoting sustainable fisheries. Second issue can be a lack of understanding on the different fisheries structures. Although fisheries management system using western management methodologies including ITQs applied for small number of fishing units in the maximum order of thousands in offshore fisheries, Southeast Asian countries has to consider millions or at least few hundred thousand fishing units in their sustainable fisheries policy mainly in coastal area. People's factor is therefore more important than ecological resource factor in achieving sustainable fisheries, considering close linkage with respective fishing communities in the region. As the target to manage is not the resource but people in tropical areas such as Southeast Asian countries, terminology on "resource management" has to be modified as "fisheries management" clearly identifying the target to be managed, if sustainable fisheries are considered in such region together with applicable methodology.

"Encourage effective management of fisheries through delegation of selected management function to the local level" can be considered as one of the most important policies in Resolution and Plan of Action adopted at the 2001 Millennium Conference. The points that the capture fisheries is the only one industry that still uses public resources and is managed by the government agency should be carefully considered. Use of public resources in competitive manner might lead to irresponsible manner of exploitation due to the lack of appropriate ownership for the resources by the users if the exploitation pattern is not properly managed, while management of a huge number of fishing units might be difficult by the weak and comparatively small sized government related agency. A lack of appropriate ownership over the fisheries resources and ineffective government management intervention for fisheries can be analyzed as two major constraints for the management of huge number of fishers such as in the region. It has been, however, observed that the implementation of above policy on the delegation of management functions to local level is not effectively promoted by some reasons including the influence of existing global concept.

Third issue is the sophisticated "Monitor, Control and Surveillance (MCS) system that has been frequently promoted by global and regional instruments and agreements without clarifying the reality of the regional fisheries. The promotion and establishment of such effective MCS system might be the required tool for such top-down approach as ITQs. There might be, however, a basic difference for the necessities of MCS in the region compared with temperate areas. The one of the constraints can be attributed to a general lack of agreements between government agency and fishers on the fisheries regulations except some zoning arrangements and illegal fishing. If the objects of MCS system is not clearly defined, such establishment and

maintenance of national system can be a great burden of most of the countries, a simple effective enforcement system on fisheries regulation can be enough until when more sophisticated but different management system can be developed.

What can be more sophisticated and different management system in the region? It is unfortunately not generally observed such system in the region recognizing some effects on the resource recovery by the fisheries management intervention. It should be also recognized that such situation cannot be attributed to the government fault. The requirement of the fisheries management has only be globally recognized in 1980s and 1990s after reviewing the impact of fisheries on fisheries resources. Despite 30 years experience on the fisheries management, global fishery society could not yet identify the methodology to manage a large number of fisheries units as in Southeast Asia region. Challenge for the fisheries sector in Southeast Asian is to encounter such difficult problem and find the way to improve the situation on both recovery of fisheries resources and livelihood of a large number of people who are involved in the fisheries using hints that cannot be easily available.

Focus should therefore be given to the system that can manage a huge number of people along line with the regional policy on the delegation of management functions to local level. The delegation of management function to local level together with the introduction of appropriate right-based fisheries, but not ITQs but fishing right over the designated areas as promoted by SEAFDEC through "Guidelines on Co-Management Using group User rights". The system can delegate fishing and management rights to the fishers groups on the designated area, while the government agency develop enabling environment to implement the system. New challenge to the government can be to develop such enabling environment including clarification of legal support, institutional building exercises among huge number of fisheries sector and various technical supports, not totally delegate the management functions to the concerned people. Once the fishing rights together with management responsibilities are delegated to the users, it is envisaged that the unclear ownership for the resources can be gradually clarified and irresponsible usage of resources would be gradually corrected in the user side. Delegation of management functions through co-management arrangement to the local level might greatly reduce the government burden and shift government services toward technical services for the fishers who need in their course of management actions.

Conclusion

It might be envisaged that the change of management responsibility through delegation of management functions to the local resource users cause confusions to the people including fishing communities along the coast in view of redistribution of wealth in the fisheries for the short term. Such envisaged social difficulty in the drastic change of system lead to the general reluctance of the government side to take modification of fisheries management system, also provide the impression that they are shifting their focus from capture fisheries to aquaculture that might have more potential and management options using scientific and technical inputs. However, government agency should seriously consider the current status of fisheries resources and livelihood of the people involved, take courageous and innovative steps toward sustainable fisheries. It is also very challenging steps that there is no model and only a few hints available in any place in the world to manage a large number of people. It should also be noted that if we retain the current fisheries policies that have generally been developed mixing the global theory with regional concerns and reality, they would not clarify the real issues and not lead any good steps toward sustainable fisheries development in the region.

Annex 8

SUSTAINABLE AQUACULTURE DEVELOPMENT FOR FOOD SECURITY IN SOUTHEAST ASIA TOWARDS 2020: ISSUES AND PERSPECTIVES

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Aquaculture, though originated and practiced as an art over millennia, became a major food fish provider in the last three decades or so, and currently accounts for nearly 50 percent of global food fish consumption. Importantly, the main global aquaculture producing countries are in the Asia-Pacific region (Table), and the great bulk of this production is pre-dominated by small scale farmers- farmer owned/ leased, operated and managed.

The global food fish consumption averages 17 kg caput^{-1} year^{-1}, whilst that in the Asia-Pacific region is around 28 kg caput^{-1} year^{-1}, and in some countries in the region it could exceed 28 kg caput^{-1} year^{-1}. The global population is destined to reach approximately 9 billion by 2050, and this increase is also accompanied with a distinct increase in food fish consumption, thereby requiring an upsurge in food fish supplies, which has to be primarily met through aquaculture. It is estimated that the region will require an extra 25 to 30 million t of food fish to meet this demand, and hence aquaculture developments in the region become paramount to meet this demand.

Year	Global (t)	A-P (t)
1987	13,961,611	11,939,706 (85.5%)
1997	34,261,739	31,075,412 (90.7%)
2007	65,190,029	59,568,049 (91.4%)

Over the last two decades many global strategies in respect of development and poverty alleviation have been agreed upon, the notable ones among these being the global adoption of the Bruntland Report (1987)-Our Common Future-, which in turn lead to the Convention on Biological Diversity (1992) and the Millennium Development Goal. Concurrent to these global strategies agreed upon, was globalization and liberalization of trade. Fish in the last two decades have become the most traded food commodity, for developing countries, bypassing the more traditionally traded produce such as rice, rubber, tea etc. to name a few. Globalization and the expanding trade have impacted significantly on the aquaculture sector also with increasing emphasis on food quality and safety that calls for ecolabelling and certification and compliance to varying standards set up by numerous bodies.

The small-scale farming sector confronts many a problem to comply with the above needs, as well as access to markets in a competing scenario. There have been a mushrooming of many certification procedures and standards developed for some of the major cultured export commodities, bringing about confusion among small scale farmers and moreover the cost of certification being prohibitively costly to individual farmers. Accordingly, small scale farmers are advised to adopt Better Management Practices (BMPs), developed scientifically, and a cluster approach, which by implication enable farmers to comply to food quality and food safety requirements as well as be socially responsible; the cluster approach providing a path to attain certification at a reduced cost to individual farmers, and also bring about synergies within the group enabling better market access among other economically viable gains, such as for example, based on collective feed purchases, etc.

Aquaculture also will need to be adaptive to climate change impacts. In the region the impacts of climate change will vary with the farming system and the geographical location, and each will require a different set of adaptabilities and mitigating measures. In certain instances, in order to implement the relevant adaptabilities, there will be a need for appropriate policy changes, and also a holistic approach that includes all stakeholders within a watershed for example. Equally, and importantly, aquaculture will have to make use of opportunities that could arise from climate change impacts such as the loss of rice paddy land in deltaic areas, as an alternative livelihood provider for poor communities.

Overall, there needs to be a gradual paradigm change in cultured commodities accompanied by a shift on consumption habits, which will be driven by the need to reduce the green house gas emissions from the food production sector. In this regard, aquaculture is best equipped among all food production sectors, with the bulk of production being of food fish species feeding low in the food chain.

Annex 9

MEETING SOCIAL AND ECONOMIC CHALLENGES IN AQUACULTURE

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General Description

With the development of aquaculture technologies in Southeast Asia and the rapid response of entrepreneurs in the region, aquaculture has enabled most countries to benefit from higher fish production volumes and gains from trade of aquaculture products within and outside the region. Vietnam, Thailand, Indonesia, the Philippines, Cambodia and Singapore are among the world's top twenty producers of fish food supply from aquaculture in 2006 and in the previous years. Most of these countries recorded double digit growth rates, ranging from 10 to 28 percent from 2004 to 2006.[1]

Achieving this milestone for Southeast Asia was not an easy feat. In spite of the technological improvements and overall economic performance of the aquaculture sector, it has been facing a number of challenges which need to be addressed to attain sustainable development. These include: 1) enhancing the role of aquaculture in addressing food, income and livelihood security through improved governance, multi-agency collaboration, and comprehensive and inter-disciplinary approaches; 2) promoting sustainable aquaculture through enabling policies that support the management of natural and environmental resources; 3) enabling mechanisms, institutions and infrastructure to encourage adoption of better aquaculture practices; 4) understanding and improving linkages in the production, marketing and trade of fishery products to support small and medium enterprise development; and 5) strengthening the capacity of small-scale fish farmers, local government units and other stakeholders by mainstreaming specific rural and peri-urban aquaculture programs and policies in local, national and international development programs.

The above-mentioned challenges or issues need critical analysis given the competing use of resources across various uses and industries. The aquaculture sector in Southeast Asia therefore has to deal with these issues/challenges which range from ecological, technological, social and economic. This paper will deal with the social and economic challenges.

Background

Southeast Asia has been dealing with rapid increases in population and need for food and livelihood for over a few decades now. While big countries such as China and India are the world's top two producers of fish from aquaculture, the small developing countries in Southeast Asia are likewise major producers.[2] Growth in aquaculture came about in the region due to the scientific and technological breakthroughs, and the adoption of these culture technologies. These volumes of production for domestic consumption and for export continue to generate substantial financial returns for efficient entrepreneurs, and consequently, contributed to economic growth for most countries in the region.

However, the development of aquaculture in Southeast Asia has brought and caused a number of unintended problematic scenarios. The sector is confronted with complex and interconnected social and economic challenges in response to or as consequences of the technical and biophysical constraints in aquaculture. First, there is the polarity of status among stakeholders in aquaculture (*i.e.* inequitable distribution of opportunities and benefits), especially in rural areas of most developing countries where food security, nutritional inadequacies, poverty and unemployment issues persist. Commercial aquaculture has grown tremendously and successfully, leaving behind the many small-scale operators in the region.

Associated with the first scenario is the concern that aquaculture industries in the region are characterized by technology and production cost dualism. That is, the costs of large operators are minimized through improved technologies and economies of scale. Meanwhile, access to such improved techniques and support services,

[1] FAO. The State of World Fisheries and Aquaculture 2008. FAO, Rome 2009. 176p.
[2] The FAO reported that among the top 20 producers in the world, Vietnam ranked third with 1.7 million tonnes (mt) and 17.6% growth; Thailand ranked fourth with 1.4 million mt and 4.9 % growth; Indonesia ranked fifth with 1.3 million mt and 11.2 % growth; the Philippines ranked tenth with 623 thousand mt and 10.3% growth; Cambodia ranked fourteenth with 34.2 thousand mt and 28.6% growth; and finally, Singapore ranked seventeenth with 8.57 thousand mt and 25.9% growth. China's production grew only by 6.0 % and India at 5.7%.

such as loans and subsidies from rental of large parcels of land/water areas in lakes and shore, are limited for small-scale producers.

Third, social conflicts and economic losses arise from competing uses of resources for aquaculture and other purposes. For example, fish is used either as component of fish feeds or for human food, especially in nutrient-deficit areas. There are also more difficult debates on the need to conserve and preserve invaluable ecosystems *e.g.* mangrove areas, seagrass beds and coral reefs for intra- and inter-generational needs.

Fourth, the cost of rehabilitation of most habitats affected by misuse of aquatic and related resources for aquaculture is often beyond the capacity of most Southeast Asian governments. Most governments resort to loans to rehabilitate environments where the supposed developmental activities were also often funded by similar loans. An example is the conversion of mangroves into fishponds. The economic gains from aquaculture production were not managed properly and such profits were not even commensurate with the enormous non-tradable ecological benefits previously obtained from these habitat. The lack of proper valuation of the various tradable and non-tradable benefits and values of these resources led to indiscriminate use of these resources for aquaculture.

Nevertheless, the projected scenario shows confidence. That in 2020 and beyond, the growing population in Southeast Asia will remain as fish-eating with estimated increase in annual consumption from 26 to 28 kg per person or a total fish consumption at 16.7 million MT.[3,4] With fish production projected at 17.5 million MT, the region is expected to have one million MT supply surplus. This projection speaks for the present and future role of Southeast Asia in global fish trade and in securing food for the region and other deficit areas.

Issues and Challenges

The following are the persistent and emerging social and economic issues in aquaculture in Southeast Asia. A critical analysis of these issues will guide research and development (R&D) activities in the region. These issues were identified during the Regional Technical Consultation for Sustainable Aquaculture Development of Southeast Asia Towards 2020 held in Bangkok, Thailand on 17-19 March 2010. These were further evaluated and verified to be priority research concerns during the 2010 Annual Strategic Planning Workshop of SEAFDEC/AQD held in Tigbauan, Iloilo on 28-30 September 2010.

Enhancing the role of aquaculture in addressing food, income and livelihood security through improved governance, multi-agency collaboration, and comprehensive and inter-disciplinary approaches

While aquaculture has successfully produced half of the world fish supply, sustained production from freshwater, brackishwater and marine areas remains top priority to secure food, income and livelihoods of the poor communities in most developing countries in Southeast Asia. Improving fishery governance through decentralized management arrangements is imperative to encourage active participation among the stakeholders. This will require strong collaboration among government agencies, NGOs, the private sector, and investor-donor agencies in the conduct of R&D activities. The R&D plan of action to address food, income and livelihood issues in the region include: a) development of economically viable small & medium aquaculture enterprises (SMEs) through capacity building and provision of support systems for these industries; b) price, market and value-chain studies to support development of new niche for aquaculture species, including options to enhance participation in export markets to obtain benefits from globalization of fish trade; c) addressing training needs, capitalization and other production factors of diverse types of aquaculture stakeholders (*i.e.* smallholder, family, coops, to commercial scale operators); d) enhancing public-private partnership especially in capital investments and market development; and e) conduct of relevant policy research to identify effective regulations that support socially equitable fish production and livelihood programs (*i.e.* development of markets and distribution system of quality seeds, and maintenance of broodstocks in public facilities to support livelihood development).

Promoting sustainable aquaculture through enabling polices that support the management of natural and environmental resources

Policies, regulations and holistic governance systems to support sustainable aquatic production systems without compromising these natural and environmental resources should take into account the externalities, costs, resource use conflicts, and environmental impacts associated with aquaculture. Examples are policies to

[3] FAO. The State of World Fisheries and Aquaculture 2008. FAO, Rome 2009. 176p.
[4] Delgado CL, Wada N, Rosegrant MW, Meijer S, Ahmed M. Fish to 2020: Supply and Demand in Changing Global Markets. 2003. International Food Policy Research Institute and The WorldFish Center. Penang, Malaysia. 226pp.

address inefficient use of resources due to conflicts arising from unclear property rights; and policies that motivate increasing "clean" production and waste recycling systems starting at the farm level. Aquaculture may also fast-track its complementary role in fisheries conservation and management strategies by producing regular supply of healthy juveniles for stock enhancement. Review and direction-setting of existing policies are necessary in such areas as certification schemes and standards at the national (*e.g*. Good Management Practices or GMPs) and regional/international level (*e.g.* HACCP). There is also a need for policies that will address the lack or ineffective rules on hazardous chemicals. Policies to support the development of diagnostic laboratory services are critical in providing technical support to aquaculture operators. Training on socioeconomics of aquaculture for policy makers through the SEAFDEC-ASEAN Project in collaboration with other national, regional and international agencies are relevant to ensure the development of sustainable aquaculture production systems.

In promoting such sustainable aquaculture technologies, the conduct of valuation studies (*i.e.* internalization of production cost and comprehensive identification and valuation of benefits) is necessary. Valuation analysis will provide bases and will facilitate policy decisions towards regulation and governance of institutions and markets relevant in the development of sustainable aquaculture production systems. Some examples are valuation of impacts of diseases and valuation of bio-security cost and its benefits.

Enabling mechanisms, institutions and infrastructure to encourage adoption of better aquaculture practices

The adoption of better aquaculture practices will be enhanced if the mechanisms, institutions and infrastructure are made available and accessible to aquaculture operators. This will help aquaculture adopters in meeting the market demand for aquaculture produce and products. It will also support the development of various aquaculture certification schemes that will benefit producers at all scales of operations and consumers in local and international markets. Under this priority issue, the institutionalization of and compliance to the Code of Conduct for Responsible Fisheries-Aquaculture in the performance of the mandates of fisheries and aquaculture agencies of member countries would be instrumental in ensuring the adoption of better aquaculture practices. In addition, the adoption of ecosystems approach to fisheries and aquaculture which adheres and promotes the balanced interaction of the ecological and human dimensions in the management of fisheries and aquaculture is a recent challenge for member countries. To address this priority issue, the R&D plan of action would include: 1) developing policies to assess compliance to CCRF-Aquaculture, 2) bio-economic modeling to evaluate sustainability of aquaculture systems, and 3) comparative cost-benefit analysis of improved aquaculture systems (*e.g.* bio-security measures, re-circulating system). The performance of these plans would require inter-agency collaboration involving international, regional and national fisheries and aquaculture agencies.

Understanding and improving linkages from production to marketing and trade of fishery products to support small and medium enterprise (SME) development

The development of SMEs basically involves the transformation of subsistence farmers into specialized aquabusiness-oriented fish producers operating competitively and efficiently in segmented markets (*e.g.* hatchery, nursery and grow-out). They are also expected to be demand- rather than supply-driven fish producers. Therefore, there is the need to improve the linkages from production to marketing and trade of fisheries and aquaculture products by creating an enabling environment with policies and institutions supportive of these SMEs. Specific challenges will involve: 1) improving technical capacity of aquaculture operators and market access through sustained training in aquaculture technologies and entrepreneurship; 2) improving aquaculture's production efficiency to meet increasing demand for quantities (volume to secure food and nutritional needs of low-income urban and rural population in South East Asia) and qualities (food safety, hygiene, convenience and high-value products in the case of high-income metropolitan areas and export market); 3) improving aquaculture's economies of scale to offset increasing cost of local (land rent, labor, cost of money or interest on capital) and imported inputs (feed components, engineering and equipment); 4) improving profitability of aquaculture to encourage more investors, creditors, fish farmers and workers and other primary stakeholders to participate progressively in the sector; and 5) reducing risks and uncertainties to improve credit-worthiness of aquaculture operators.

Strengthening the capacity of aquaculture stakeholders by mainstreaming specific rural and peri-urban aquaculture programs and policies in local, national and international development programs

Programs and policies that will improve the capacity of small-scale fish farmers, farmers organizations, local government units and other aquaculture stakeholders will also directly address the needs of aquaculture producers to gain access to (*e.g.* territorial use rights in fisheries) and improve availability of inputs/resources

(*e.g.* credit, seeds from government and private hatcheries). It will also improve resiliency and absorptive capacity of aquaculture stakeholders to respond to market and global climate change scenarios (*e.g.* through crop insurance systems). The ability of all aquaculture stakeholders to participate in the market chain could reverse the inequitable distribution of benefits (*i.e.* distribution of profits and minimization of risks) and stop marginalization of small-scale operators.

Further government support for aquaculture is needed in terms of capacity development to adapt to climate change and improve understanding of climate change and their impacts on aquaculture and fishing households should also be addressed. The challenges will include seeking avenues for aquaculture as an option for improving resilience of fishers to climate change by building on alternative food sources and livelihoods through economic diversification. Research to better understand human health and gender development in relation to climate change in aquaculture environments are needed. Assessment of the vulnerability and resiliency of small holder aquaculture farmers in various aquaculture systems (*i.e.* freshwater, brackish water, marine) in relation to climate change are important considerations.

Recommendations

In view of the status, issues, prospects and the important role of aquaculture in Southeast Asia in global fish food trade, the following recommendations are intended to address social and economic challenges towards sustainable aquaculture development in the region.

1. On a regional basis, R&D in aquaculture should be prioritized to address the social and economic issues and challenges to ensure food security, income and livelihood of the poor communities. Collaborative R&D should be pursued among the Member Countries in the region in order to have a clear regional assessment of the role of aquaculture in poverty alleviation and provide basis for policy formulation.

2. The emerging issues on the impacts of climate change and global trade on aquaculture with emphasis on small-holder fish farmers should be prioritized in the provision of budget and logistics for research, adaptive measures and mitigating negative impacts. There is a need to carefully assess the contribution and impact of aquaculture on addressing poverty, food security and livelihood within each Member Country and across the region. Various R&D, training and extension activities were identified in this paper to provide options for Member Countries in formulating specific and local strategies that are congruent to the overall goals and priorities of the region.

3. Multi-agency collaboration between and among SEAFDEC and its Member Countries, other regional organizations such as NACA, MRC, FAO-RAP and the WorldFish Center will enhance sharing of information and resources in addressing the common problems of alleviating the socio-economic conditions of the poor sector of region.

Annex 10

SUPPLY OF GOOD QUALITY SEED FOR SUSTAINABLE AQUACULTURE

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General Description

An essential prerequisite for a sustainable aquaculture industry is the assurance of sufficient and stable supply of quality seedstock. Quality seedstock simply means fit, 'clean', ideally uniformly-sized seeds which could be eggs, fry, fingerling, juveniles and/or plantlets (for seaweeds) that subsequently express good performance traits during culture. Beneficial traits refer to good color, shape, growth, efficient feed conversion, high reproduction, tolerance and survival to stressors (*e.g.* diseases, poor and/or extreme environmental conditions). Such traits are mostly heritable hence quality seeds are usually assumed as produced mainly by mating stocks perceived or proven to be genetically superior. Some broodstocks may be genetically mediocre but if bred and managed through efficient farm protocols (suitable hatchery, nursery feeding and water quality management methods), may also produce good quality seeds.

Success in the production of aquatic species for human consumption depends primarily on the availability of quality or genetically superior seedstock, adoption of optimal husbandry techniques, among others. With the intensification of aquaculture systems and the environmental challenges such as those resulting from climate change, it is wise to consider both factors-genetic quality and culture management as equally important for the steady production of good quality seeds and later, marketable products from aquaculture.

Views on what, how and why better quality aquaculture seeds should be produced evolve as times change. To enable a clear understanding of the impact of seed quality in aquaculture, a brief review of factors that affect seedstock quality as well as issues and recommendations on how to further enhance aquaculture production in the region in the next decade through better quality seedstock are herewith presented.

Background

Success in the commercial production of any aquaculture species rely heavily on whether the technology for breeding captive aquatic stocks and modes of hatchery, nursery and grow-out operations are well established. Species that have long been domesticated *e.g.* tilapia, carp and penaied shrimps, show how important quality is in terms of whether seedstock from hatcheries, when on-grown, result to increased production within a shorter culture period and are able to adapt to or withstand handling stress, diseases and water quality changes in the culture environment. In the mid-90s the tilapia industry was saturated with strains purportedly superior than usual farm stocks. An introduced fish in most of the countries where it is now commercially farmed, genetically enhanced Nile tilapia stocks were developed and produced through internationally funded selective breeding programs based in the Philippines. Novel, improved seedstock strains such as the GIFT Tilapia, Genomar Supreme Tilapia and other GIFT-derived strains, YY supermale tilapia etc. are currently available and some of them have been disseminated globally. Soon thereafter, assessments of the need to improve other fish and crustacean genetic resources were made by international and local research agencies including those involved in the GIFT Project. For the latter, the ultimate aim was to identify and address research gaps for the production of improved seedstock for different carp species namely silver barb (*Barbodes gonionotus*), rohu (*Labeo rohita*), common carp (*Cyprinus carpio*), mrigal (*Cirrhinus mrigala*) and blunt snout seabream (*Megalobrama amblycephala*) from selected Asian countries using selective breeding schemes similar to the GIFT technology. For penaeid shrimps, specific pathogen-free larvae and/or high health broodstock are now available from commercial hatcheries in developed countries (*e.g.* Hawaii) and brought to Asia or from hatcheries or research agencies in Asia using locally developed selectively bred stocks that are propagated in biosecure facilities. Apart from marine shrimps, crustaceans like giant freshwater prawns (*Macrobrachium rosenbergii*) and mudcrabs (*Scylla* spp.), molluscs like abalone (*Haliotis* spp.), not to mention aquatic plants like economically valuable seaweed species are now in various stages of domestication and selective breeding. All these examples ultimately point to the current preference for better seeds that perform well having been developed, through proper broodstock management or through selective breeding, and are genetically 'prepared' to tolerate even sub-optimal culture conditions.

What are Quality Seeds?

New or even experienced grow-out operators generally find it difficult to ascertain seedstock quality especially if the assessment happens at the time of pick-up/sale at the hatchery source and at worse, when the

stocks are delivered at the farm site by traders. Evaluation at this level is unreliable especially if the basis for distinguishing good quality from poor seeds is noted only from the fry/juveniles' physical appearance and the manner by which the individuals in the stock move and swim about prior to transport.

Criteria for good quality seedstock are usually based on the aims in producing aquatic organisms. Breeding for ornamental fish production focuses mainly on physical traits such as attractive color and overall morphological attributes such as scale pattern, tail shape, size etc., with greater preference towards unique characteristics. For aquatic food production, the requirement includes not only ideal morphological characters but also the potential for improved production traits such as fast growth, good carcass quality, high fecundity, efficient feed utilization, stress and disease tolerance among others.

Factors that affect seedstock quality

Broodstock source and genetic quality

Founder stocks or genetic materials used for breeding in aquaculture are normally initially sourced from the wild. Subsequent parent stocks in hatcheries are descendants of the original wild stock. Once hatchery-bred and reared broodstock become inefficient in terms of reproduction, these are replaced with new stocks from the wild or from other hatcheries. Although dependence on wild stocks for use as hatchery broodstock vary based on species, it is still necessary to know the genetic quality of parent stocks from which seedstocks are produced. Data on good sources of potential broodstock is very important. Information on the status and use of genetic resources for selected aquaculture species *e.g.* tilapia, carp, catfish, groupers, molluscs, penaeid shrimps have been thoroughly reviewed and are available.

Genetic factors determine the fitness and adaptability of any aquatic organism to the environment hence preserving the genetic make-up of broodstock is paramount in the production of high quality seeds. To a large extent, seed quality is attributable to seeds having been derived from quality parental stocks. With the current technological advancements, the genetic make-up of parent stocks or broodstock can be determined from genetic variability parameters measured from molecular marker variation that are analyzed through polymerase chain reaction (PCR) and DNA-based techniques. These advanced biotechnology methods allow the detection of the levels of genetic diversity and inbreeding in wild and farmed stocks. The higher the level of genetic variability, the more fit or adaptable the stocks are since they individually possess less of the more common alleles for genes in a singular population. If most of the individuals in a population share common alleles, this means that the likelihood of such individuals having come from related parents is high. When closely related individuals are used as parental stocks, they tend to produce progenies that are less resilient, show morphological abnormalities, grow and survive poorly or have traits indicative of inbreeding depression. It is vital that in the absence of information on the genetic quality of broodstock, efficient broodstock management methods (*e.g.* use of rotational mating schemes, high effective population size, programmed renewal or replacement of stocks either sourced from the wild or from different reputable farms producing quality potential broodstock) are adopted in aquaculture seed production farms. Using poorly managed parent stocks and repeatedly producing generations upon generations of seeds from the same hatchery-bred and maintained breeders could ultimately lead to poor quality seedstock.

For some domesticated species, breeding programs have been conducted through conventional selection (*e.g.* mass selection, within and/or between family selection, hybridization etc.) to improve seed quality. Some aquaculture species were enhanced through genetic manipulation but the perceived risks associated with the resulting genetically manipulated organisms or GMOs make these approaches still unacceptable in commercial aquaculture. In all these efforts, it can be noted that genetic improvement of aquaculture stocks depended on agencies/groups with access to technology and funds. Consequently, the genetic strains produced are mostly accessible to and benefit large private farm operators than small-scale farmers.

Broodstock nutrition and health

Given that the broodstock used in a hatchery facility are of good genetic quality, their maintenance involves the provision of a) nutritionally complete diets that can enhance reproductive efficiency and allow breeders to produce good seeds and b) optimal environmental conditions (water quality etc.) that shall minimize their exposure to unnecessary stressors which may otherwise make them and their eggs/hatchlings weak and more susceptible to diseases.

Hatchery and Nursery Protocols

Feeding, health monitoring and water quality management methods during the hatchery and nursery phases are essential. For many commercial species in Asian aquaculture, a lot of these protocols have been developed and are continuously refined to give optimal results. For some (especially freshwater aquatic species), best or better management practices (BMPs) in the hatchery and nursery were devised to help improve seed production.

The hatchery phase especially for newly domesticated species can be considered as a technically challenging phase for producing enough seeds, much less seeds that are of good quality. Larval rearing methods for some of the freshwater aquaculture species are not as complicated as majority of the marine species. Early larval stages for marine species (finfish, crustaceans, and molluscs) usually require natural food organisms (microalgae and rotifers) that need to be cultured in synchrony with the hatchery operations so that food will be readily available for each stage of development. Feeding and water management at this and the ensuing nursery phase need to be as efficient to ensure that seedstock quality and survival will be consistent.

Mode of seed harvesting, marketing and distribution

Improper harvesting, packing and transport can adversely affect seed quality and survival. Farmers as well as traders who are the major players in the distribution phase should know well enough to minimize mortalities that could be caused by stress during handling and movement/transfer. Apart from the technology, the system for marketing and distribution should be well-defined and organized to facilitate the access of culturists to quality seedstock. Finally, although the sustainability of quality seed production operations depends on the technical skills of the farmer to continually produce better seeds, ensuring the economic viability of seed production as an enterprise is also vital.

Issues

After reviewing the current status of aquaculture seedstock production in Southeast Asia through the Regional Technical Consultation workshop held in March 2010 in Bangkok, Thailand, the countries in the region identified the following issues as affecting the production of quality seedstock for aquaculture:

- ***Inadequate and unreliable supply of good quality seeds for stocking***: Although technologies for breeding and larval rearing for many of the commercially important aquaculture species are well-established, problems in seed yield and quality are often encountered. This may be attributed to poor broodstock quality and inefficient reproductive performance.

- ***Seasonality and inconsistency of seed production***: Production of aquaculture seedstocks are influenced by several factors such as seasonal spawning activity apart from the use of insufficient, ageing and/or genetically depauperate broodstock. Sometimes even if the species is biologically known to spawn year-round, deviations from the expected spawning periods may be due to unexpected and extreme modifications in environmental conditions brought about by climate change. The changes that take place in the aquatic environment adversely affect breeding and larval rearing operations

- ***Reliance on wild/hatchery stocks from other countries as main seed supply source***: In some instances, when there is a lack of seedstock from local wild or hatchery sources, the next option is to procure seedstock from neighboring countries. Imported stocks, when obtained in large volumes prove to be less costly but may not be an assurance of good quality. Any likelihood of poor performance (slow growth and/or low survival) in the grow-out phase may be explained either by genotype-environment interaction, inferior genetic quality or by poor fitness/adaptability to local culture conditions.

- ***Inconsistent supply of disease-free fingerlings***: Diseases affect aquaculture stocks in all phases of its life cycle, at varying intensities. If the broodstock, particularly female breeders are exposed to disease-causing agents (especially during translocation of stocks), their reproductive efficiency, the quality of eggs produced and the survival of hatchlings/seedstock are likewise adversely affected.

- ***Limited capacity and knowledge of farmers on broodstock management****:* The farmers' lack of access to or knowledge of appropriate breeding and larval rearing technologies is a constraint to the

production of sufficient quality seeds.; For farmers who are able to obtain genetically improved stocks but are not well informed as to how to maintain their stocks' genetic integrity is also a concern

- ***Government fishery stations are bound to meeting seed production quotas; prioritization of quantity could compromise quality of seed:*** In instances where government operated hatcheries have set seed production targets, a concern is the possibility of producing sufficient seedstock however the quality of the seeds produced may be inferior.

- ***Breeding programs in some member countries are progressing; however, there is lack of funding support for long-term maintenance of genetically improved strains***: Often breeding programs that develop genetically enhanced stocks are long-term, require numerous spawning and larval rearing enclosures apart from other inputs such as feeds, efficient water management equipment and technical manpower. High maintenance and operational costs are expected hence funding support beyond the genetic strain development phase such as strain maintenance may prove to be difficult to obtain.

- ***Lack of mechanism to effectively minimize retrogression or reduction of genetic quality in improved stocks, transfer technologies on strain improvement and distribute improved stocks***: Apart from funds, the lack of mechanism for sharing technologies on stock improvement, disseminating improved strains and maintaining the integrity of the improved stocks also poses a problem.

Conclusion and Recommendations

Conclusion:

Inspire recent advancements in selective breeding and seed production technologies for aquaculture organisms and the availability of genetically improved aquaculture strains, there is still a pressing need to improve seed quality and yield for sustainable aquaculture in the region. Majority of the member countries share the same concerns and therefore issues as presented must be addressed to further boost aquaculture production in the next decade.

Recommendations:

- Grow-out operators to obtain seeds only from certified government and/or private hatcheries that follow Good Management Practices and adopt advanced genetic technologies;

- Small-scale farmers and hatchery operators to seek assistance from the government to: (i) build their capacity in adopting new simple technologies and innovations, (ii) gain access to quality broodstock and seeds produced through farmer-friendly broodstock management methods, and (iii) establish effective marketing or distribution links/ channels;

- Scientists must continue doing research on existing genetic resources and improvement of these for use in aquaculture. Research gaps such as those related to the impact of climate change on the reproductive efficiency of broodstock, feeding and disease management in the breeding and larval rearing phases of aquaculture stocks must be pursued;

- Key players must establish links to collectively address genetic issues, support sound policies and promote implementation of better farm management practices so that supply of quality seeds will be improved and sustained and aquatic food production in the region will be enhanced;

- The governments need to establish, strengthen and maintain links with all major players in seed production and distribution chains; and

- Build and/or further strengthen public-private sector partnerships in research development, dissemination of new technologies and distribution and maintenance of improved genetic strains

Annex 11

HEALTHY AND WHOLESOME AQUACULTURE

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General Description

The consumption of food fish in Southeast Asia is steadily increasing and, as aquaculture continues to provide the deficit in food fish demand because of declining supply from fisheries, the theme of healthy and wholesome aquaculture will become more relevant and significant in the years leading to 2020. The Fish for the People Conference in 2001 guided the R&D strategies for the first decade of the millennium which included among others the important areas of disease control, food safety, and environmental integrity. However, during this period the rapid developments in aquaculture in the region also saw the introduction of major species which drastically altered the regional production scenario. These developments called for the review of developments during the first decade covered by this theme (Lavilla-Pitogo *et al*. 2010) and define the strategies to ensure the sustainable growth of aquaculture in the region.

During the recently concluded RTC for Sustainable Aquaculture Development of Southeast Asia Towards 2020 in Bangkok, Thailand, the session on the sub-theme "Healthy and Wholesome Aquaculture" considered the priority areas on nutrition to promote healthy farmed aquatic animals; disease diagnosis, control, monitoring and surveillance of aquatic animals; and environmental integrity, certification, and food safety. Many studies on fish meal substitutes have emerged in recent years to find solution to over dependence on fish meal as a protein source. Non-conventional methods will be required to find suitable fish feed ingredients that will promote fish health and at the same time preserve the quality of aquaculture products. Furthermore, feed management that will promote profitability and sustainability by reducing environmental pollution as well as human capacity building efforts in extension and technology transfer should continue. In response to recommendations made in 2001, diagnostic methods for effective disease prevention and control have been harmonized and applied in ponds. In addition, disease surveillance and reporting in most countries in the region as well as awareness on trans-boundary diseases have been improved. However, knowledge and information dissemination on the threats that the introduction of new and exotic species poses to the region have to be heightened. Control of pathogens stemming from the introduction of exotic species or the movement of infected animals between facilities or transfer to the wild remain to be problematic. On the control of viral diseases, the development of specific pathogen-free stocks and putting in place bio-security measures significantly contributed to successful production in the region. However, the research and development on vaccines, immunostimulants, chemotherapeutants, and probiotics need to be vigorously pursued. The presence of undesirable residues of antibiotics and chemicals in aquaculture products is a major deterrent to the widespread application of chemicals in aquaculture production and affects the safety of aquaculture products for human consumption. In various countries in the region, efforts in developing and harmonizing standards, and certification and accreditation schemes for aquaculture facilities are presently being undertaken in varying degrees. Lastly, fish health professionals who are knowledgeable on the application of drugs and chemotherapeutants in aquaculture are urgently needed in the region.

The recommended plans of action covered the following aspects: (a) fish meal substitutes (especially for small-scale aquaculture), the social and cultural influences on consumer acceptance of alternative feed ingredients, as well as effective feeding management for desired species for aquaculture that require low fish meal in the diet; (b) widespread use of disease diagnostic tests, wider application of biosecurity to control and monitor the spread of diseases and handle new and emerging diseases, use of probiotics and immunostimulants, and training on fish diseases for small-scale fish farmers and on diagnostic techniques for fish health specialists; (c) environment-friendly aquaculture systems, regulations to avoid conflict in the use of common resources, harmonized regional standards and certification and accreditation schemes, and food safety requirements of aquaculture products, adoption of good aquaculture practices, and food safety assurance programs.

Background

The concept of healthy and wholesome aquaculture was adopted by SEAFDEC as a resolution during the 2001 SEAFDEC/ASEAN Millennium Conference on Fisheries and as a holistic approach to fish disease management for food safety and security (SEAFDEC, 2001). Between then and now, the pressures on aquaculture to provide a reliable supply of safe and quality farmed fish remain as daunting as ever. The

biggest impediments to improved and sustainable aquaculture production remain to be diseases and husbandry issues that will compromise the health and quality of fish. Healthy and wholesome aquaculture will continue to promote the use of efficient feeds that are cost effective and low polluting to optimize the production of robust and healthy farmed aquatic animals with the least negative impact on the environment. It will rectify the practices which, to this day, continue to threaten food security and the sustainability of aquaculture.

The session on the sub-theme "Healthy and Wholesome Aquaculture" will consider the priority areas and recommend plans of action on nutrition to promote healthy farmed aquatic animals; disease diagnosis, control, monitoring and surveillance of aquatic animals; and environmental integrity, certification, and food safety. Yield optimization from various production systems with least impact on the environment shall be based on Best Management and Good Aquaculture Practices. In addition, the International Principles for Responsible Shrimp Farming (FAO/NACA/UNEP/WB/WWF, 2006) provides the basis for collaboration among stakeholders for the sustainable development of shrimp farming.

Issues

Nutrition to promote healthy farmed aquatic animals

- *Effective feed management lacking*. Due to rising costs and shortage of supply of fish-meal based ingredients and environmental degradation caused by excess feeds and heavy organic loading, there is now a pressing need for the aquaculture sector to search for suitable fish meal substitutes and feeds that reduce the ecological impacts of aquaculture.

- *Fish meal substitutes not adequately studied*. Research on fish meal and fish oil substitutes in feed formulations is now gaining importance as a priority area in the region. While successes have been reported at the experimental/laboratory scale, knowledge is still lacking on the emerging feed ingredients, particularly on the nutritive value of non-conventional ingredients that could be used to replace fish meal. Moreover, the goals for large-scale production and application of fish meal substitutes in feed formulations have not been achieved. Non-conventional methods to develop fish meal substitutes and prove them to be useful in aquafeed formulation will most likely be required.

Disease diagnosis, control, monitoring and surveillance of aquatic animals

- *Diagnostic procedures favoring intensive & large-scale operators.* There has been good progress in development of methods for detecting new and emerging pathogens. Also, user-friendly methods have become available for farmers and field use. However, the widespread application of these diagnostic tests is still lacking. The economic affordability of diagnostic procedures by a wide range of farmers is a constraint.

- *Investigations lacking to prove efficacy of probiotics*. The use of probiotics, immunostimulants, particularly in shrimp farming, is gaining wide acceptance in controlling potential pathogens. However, investigations to prove the efficacy of probiotics and immunostimulants are so far largely limited to laboratory-scale trials.

- *Promotion and wider application of biosecurity needed*. There has been good progress to improved farm biosecurity. However, wider adoption of biosecurity protocols is still lacking.

- Trans-boundary diseases. Despite the safety measures that are being implemented by the Member Countries, diseases that emerge from trans-boundary movement of living aquatic animals (*i.e.*, Koi herpes virus) still pose a big threat to aquaculture in the region.

Environmental integrity, certification and food safety

- Over-development of aquaculture that exceeds the carrying capacity of the environment leads to water pollution, fish kills and other environmental problems

- Contamination of fish meat with industrial, agricultural & domestic wastes causes food safety risks and consequently product rejection and other marketing problems

- Emergence of zoonotic[5] disease agents; spread of disease to wild fish populations

Recommendations

Nutrition to promote healthy farmed aquatic animals

- Fast-track the search for suitable alternative fish feed ingredients (for example, plant-based proteins and terrestrial animal by-products), using a combination of biochemical engineering and manufacturing to enhance nutritional composition of non-traditional protein sources;

- Conduct a good and thorough evaluation on the use of fish meal substitutes in artificial feed formulations. More studies are needed on dietary digestible nutrient requirements, particularly micro mineral requirements in the field or at the commercial scale, since most of the findings from the past have been based on laboratory trials;

- Assess viability of alternative protein sources in terms of quantity for commercial production and economic feasibility;

- Social and cultural acceptance of consumers should also be considered in finding alternative feed ingredients for fish and other aquatic animals;

- To get out of the fish meal trap, the aquaculture sector should continue to promote the culture of species that require no or low fish meal in the diet (for example, tilapia, carp, milkfish, and abalone);

- Develop good feeding practice by: (i) evaluating the optimum feed particle size for different species and size of fish, optimum feeding frequency for different species and size of fish, and optimum feeding rate for different species and size of fish, under different water temperatures, salinities; (ii) developing guidelines or codes based on the results of evaluation trials; and (iii) doing demonstration trials using the developed guidelines.

Disease diagnosis, control, monitoring and surveillance for aquatic animals

- Encourage more widespread use of standardized diagnostic tests by bringing down the cost of analysis without compromising its accuracy and sensitivity;

- Heighten understanding and recognition of diseases among small-scale fish farm operators in rural communities through training and provision of simple (*e.g.* cartoon) manuals in local languages;

- Provide affordable and practical methods to support primary health care in rural aquaculture and encourage the use of Levels I and II diagnostic techniques, in small-holder and rural aquaculture. Governments must also give the necessary support/intervention to facilitate the wider application of affordable, field-friendly and rapid diagnostic methods or tests;

- Provide continued support for training of fish health specialists to develop their capability for fish disease diagnostic techniques like general necropsy procedures, histopathology and parasitology;

- Large scale field trials or evaluation surveys are necessary to scientifically assess the efficacy of probiotics and immunostimulants and, if effective, to determine whether their use is economically justified;

- The wider application of the concept of biosecurity (*i.e.* through Good Aquaculture Practices, and compliance to Codes of Conduct) should be promoted. The approach could be through farmer associations or cooperatives and supported by simple (*e.g.*, cartoon) documents in local languages;

- The development of domesticated and genetically improved, specific pathogen-free (SPF) stocks should be promoted for all cultivated species to make their aquaculture truly sustainable;

[5] Zoonotics are the bacteria that can infect both the aquatic animal and humans

- Government should engage in high health broodstock development to facilitate access to small-scale hatchery operators and farmers;

- Collaboration among agencies (public and private, industry stakeholders) should be strengthened to support national efforts to control serious disease outbreaks;

- Member countries should continue to support the NACA initiative on regional disease reporting and also support coordinated regional initiatives for contingency or emergency plans to handle new and emerging diseases. It is urgent that a regional group should be organized to formulate a united policy and act as lobbying force regarding imminent changes being proposed for OIE disease control measures associated with aquatic animal commodities. This is needed to avoid the possibility of specific technical trade barriers arising against Asian aquatic animal commodities; and

- Extend surveillance of diseases to wild population of aquatic animals to avert impending epidemics that could affect the fishery

Environmental integrity, certification and food safety

- Create and enforce regulations (for instance, zoning of aquaculture areas) to avoid conflict in the use of common resources and at the same time promote the farming of healthy and wholesome aquaculture products;

- Members should support and participate in the initiative to set up a coordinated Asian regional standards, certification and accreditation mechanism;

- Develop and promote environment-friendly aquaculture systems (aqua-silviculture, modified polyculture, closed or recirculating system, integrated multi-trophic aquaculture, and organic aquaculture). Identify ASEAN standards that can be used as a benchmark and help guide the development of environmentally-friendly aquaculture;

- Meet food safety requirements and ensure that aquaculture products do not contain biological/ chemical hazards.

    - Food safety assurance programs (*e.g.* HACCP) should be promoted strongly at the farm level. While these programs may not be suitable at all farm levels, the message of meeting food safety standards should be communicated to farmers through the adoption of good aquaculture practices.

    - Minimize the use of drugs and antimicrobials in aquaculture operations; Monitoring of drug residues in aquaculture products should not only focus on those destined for international markets but also on products for domestic consumption.

    - Develop and promote the use of feeds that are less polluting and provide adequate nutrients for the health of aquatic animals.

Conclusion

The concept of healthy and wholesome aquaculture is an integral component in improving and sustaining aquaculture production to provide the protein need for an escalating human population. Research and development efforts in aquaculture have resulted in phenomenal growth of the sector in the last four decades, but more problems need to be studied and solved to attain significant improvements and assure sustainability for future generations in the face of many challenges posed by ecological, economic, and climatic changes, among others, happening in our world today. Vigorous R&D efforts need to be continued in nutrition and control of fish diseases through the dynamic collaboration of public and private sectors of the aquaculture industry to ensure a steady and reliable supply of safe and quality fish beneficial to public health.

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Annex 12

MAINTAINING ENVIRONMENTAL INTEGRITY THROUGH RESPONSIBLE AQUACULTURE

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General Description

Aquaculture development if faced with challenges relating to improving production efficiency whilst maintaining environmental integrity, as well as adapting to and mitigating the impacts of changes in climatic and environmental conditions brought about by global warming.

Despite initiatives to promote the code of conduct for responsible fisheries/regional guidelines for responsible fisheries especially those that are directly related to aquaculture activities, Best Management Practices (BMPs)/Good Management Practices (GMPs) for the culture of specific economically important aquaculture commodities, there are still lingering issues on the real and potential threats of aquaculture activities on the environment and on biodiversity. On the other hand, technologies have been developed and practices refined to reduce the negative impact of aquaculture on the environment.

Climatic changes brought about by global warming pose various threats to the aquaculture industry. Production systems, sustainable supply of inputs in all phases of production as well as the physiological functions of the cultured species are vulnerable to the effects of global warming and climate change. Thus, it is important to understand the specific threats, formulate adaptation measures and strategies to mitigate the impacts of climate change on the aquaculture industry and communities dependent on aquaculture in the region.

Background

The aquaculture industry has shown rapid growth in the last decade and is expected to continue to expand and increase production. However, although aquaculture has contributed significantly to food supply and now provides about half of the global requirements for fish and fishery products, environmental impacts of aquaculture activities have become and continue to be a major concern. Much of the current controversy is centered on the continued misuse of the aquatic environment and resources due to irresponsible aquaculture practices.

SEAFDEC and its Member Countries are strong supporters of the FAO's Code of Conduct for Responsible Fisheries (CCRF) and have committed to responsible aquaculture. Despite the progress on SEAFDEC initiatives that promote the Code of Conduct for Responsible Fisheries, the aquaculture sector in the region is still confronted with issues related to environmental protection and wise use of resources. Improving the efficiency of aquatic resource use and minimizing adverse environmental interactions and impacts will continue to be the priorities for the next decade.

Southeast Asia is a major fisheries and aquaculture production area. At present, as many as four ASEAN Member Countries (Indonesia, the Philippines, Thailand and Vietnam) are among the top ten countries in the world producing fisheries and aquaculture commodities. However, fisheries and aquaculture production in the region is faced with challenges brought about by global climate change. Impacts occur as a result of both gradual warming and associated physical changes such as increased sea surface temperatures, ocean acidification, sea level rise as well as from increased frequency and intensity of extreme events. Additionally, these impacts take place in the context of global socio-economic pressures on natural resources. Thus, urgent adaptation measures are required in response to opportunities and threats to food and livelihood provision due to climatic variations.

Impacts on aquaculture could also be positive or negative, arising from both direct and indirect impacts on the natural resources it requires, primarily water, land, seed, feed and energy. The impacts of climate change on fisheries will in turn have an impact on the productivity and profitability of aquaculture since fisheries provide significant feed and seed inputs for aquaculture production systems. Communities dependent on aquaculture will also be vulnerable to threats on aquaculture as well as through their physical exposure to extreme weather events.

As climatic changes could increase physiological stress on cultured stock this would not only affect productivity but also increase vulnerability to diseases, in turn imposing higher risks and reducing returns to farmers. Interactions between fisheries and aquaculture sub-sector could create other impacts, for example, extreme weather events resulting in escapes of farmed stocks and contributing to potential reductions in genetic diversity of the wild stock affecting biodiversity more widely. Climate change is a compounding threat to the sustainability and development of aquaculture.

The session on the sub-theme will discuss environmental monitoring of water and sediment quality associated with ponds, net cages, and pens to ensure productivity and sustainability as well as minimizing the adverse impacts of and adaptations to climate change. Research needs and strategic actions on aquaculture that will promote the environmental sustainability of the region in the next 10 years will be reviewed and finalized.

Issues

(i) Protecting the Environment

- Excessive use of antibiotics and chemicals. Some chemicals and other anti-microbial agents that are used for human and animal health and welfare are now being used in aquaculture for the prevention, control or treatment of infections in farmed fish. Although it is recognized that some aquaculture operations are reliant to chemical usage and the continued access to these and other effective antimicrobial agents is important, the potential danger associated with misuse of these chemical inputs has led to widespread concern on food safety and environmental issues because residues of these chemical or their metabolites could eventually end up in aquaculture products and persist in the culture environment.

- Abuse in the use of feeds and fertilizer. Nutrients from excess food and fertilizers from aquaculture operations can result in eutrophication of water bodies where there is significant aquaculture activity. There is increasing evidence from research that show that feed inputs can be reduced without negatively affecting production. In the case of striped catfish culture, it was shown that feeding to satiation once daily was a more efficient feed management technique compared to feeding to satiation twice daily which was the "traditional" practice. This refined feeding strategy has been adopted by farmers resulting in better economic returns as well as reduced effluents released by farms into the environment. In tilapia culture in ponds, feed inputs can be reduced by either delaying the onset of supplemental feeding, feeding on alternate days or sub-satiation feeding without compromising growth, survival and production. Production of tilapia grown in cages in lakes and fed on alternate days was also found to be comparable with production in stocks that were fed daily. Similar results were likewise obtained for milkfish grown in brackishwater ponds. Significantly improvements in overall farm productivity can be achieved without necessarily increasing the cost of production by improving FCRs through regulation of rations and optimizing feeding frequency, duration and timing.

- The use of quality feeds along with proper feeding management is important for sustainable aquaculture development. Poor feed utilization and resulting in high Feed Conversion Ratios (FCRs) can be brought about by inappropriate selection of feed type (pellet type, size and formulation), quality and feeding strategy. In turn, the quality of the feed is determined by the quality and digestibility of feed ingredients that were used, the suitability of the formulations in terms of supplying the nutritional requirements of the cultured species, stability of feed in the water, storage conditions and handling of the feeds, and manner of feed preparation (extruded or pelleted). Because fish meal, which is the main protein source in aquaculture feed is becoming increasingly expensive and limiting, feed ingredients that could potentially be used as replacement for fish meal in farmed fish feed has been actively sought for many years. In the same vein, culture of species which require low levels of fish meal in their diets (*e.g.* tilapia, carps, milkfish, rabbitfish and others) is being promoted.

- In Integrated Multi-Trophic Aquaculture systems (IMTA), various organisms having different feeding niches are grown together in one system by combining, in appropriate proportions, the cultivation of fed aquaculture species (*e.g.* fish or shrimp) with inorganic extractive aquaculture species (*e.g.* seaweeds), organic extractive aquaculture species (*e.g.* oysters or mussels) and benthic invertebrates (*e.g.* holothurians, gastropods and aquatic worms) that will feed on uneaten feeds and fecal matter that will accumulate in the sediments of fish ponds or at the bottom of fish pens or fish cages. The aim of IMTA is to increase profitability per cultivation unit as the wastes of one crop (fed species) are converted into fertilizer, food and energy for the other crops (extractive aquatic species), which can in turn be marketed for additional income. Through IMTA, some of the food, nutrients and energy considered lost and polluting in monoculture systems are recaptured and converted into crops of commercial value, while natural bio-mitigation takes place. In this set up, all components in the culture system have an economic value and play key roles in the recycling

processes of the system. Thus, IMTA represents a balanced ecosystem management approach to aquaculture for environmental sustainability, economic stability through improved output, lower production cost, product diversification and risk reduction, and societal acceptability through better management practices.

- Need for better management of the aquaculture sector. The concept of environmental capacity can be used as a strategy to alleviate, if not prevent coastal pollution brought about by intensification of aquaculture activities. For example, based on hydrologic features of the area and trends established through regular monitoring of water and sediment quality parameters, local ordinances can be passed to set limits to the area and/or numbers of pens or cages that can operate in a certain mariculture areas. This can further serve a basis for the issuance of permits to set up structures and operate fish farms. This however, will call for effective monitoring and enforcement of regulations to ensure that the carrying capacity of the environment is not exceeded and activities are carried out in an environment-friendly manner.

- Environmental imbalance due to destruction of mangrove and depletion of fish population/loss of biodiversity. Mangrove areas are known for their important function as nursery grounds for various species of marine organisms as well as their protective function against storm surges. Conservation of remaining mangrove areas and rehabilitation of mangrove forests are being promoted not only to serve as buffer zones for expected increased storm surges with the increase in sea levels due to global warming but also to restore nursery grounds for aquatic species and arrest the loss of biodiversity.

(ii) Adapting to Climate Change

- Tropical sea surface temperature records from the major ocean basins showed a temperature increase of 1-3^{o}C over the past 3.5 million years. Sea surface temperature across much of the tropics has increased by 0.4-1^{o}C since the mid-1970s. Even though warming in the tropics is projected to be relatively small compared with high-latitude regions, tropical animals may bear disproportionally larger impacts of increasing temperatures in their habitats because tropical organisms have narrower thermal tolerance ranges than higher-latitude animals; they also live in temperature ranges closer to their physiological tolerance threshold. Therefore, even small increases in ambient temperature may be critical for some species. The most well known example is probably coral bleaching caused by a few week's thermal anomalies of only 1-2 °C. Thus, aquaculture production in the Southeast Asia may be significantly affected by warming in the area through negative impacts on early development and recruitment of aquatic organisms. Higher temperatures may also increase physiological stress to the cultured stocks thereby making them more susceptible to diseases. Likewise, increases in temperature will also lead to ocean acidification and will impact on calcareous shell forming organisms.

- Acidification may also pose another significant threat to aquaculture (and catch fisheries). Since the oceans serve as a natural carbon sink to the CO_2 gas and other greenhouse gases that are released into the atmosphere, this has caused the decrease in ocean surface pH and it is predicted that by the end of the century (2100), ocean pH will decrease by 0.3-0.5 units from the present level. These changes will affect biological calcification rates and have had negative effects on various marine organisms including calcifying plankton, mollusks, coralline algae, and reef-building corals which are particularly essential for a lot of marine organisms for growth, reproduction and as nursery grounds.

- Increases in the frequency and intensity of extreme weather phenomena such as storms, prolonged droughts or longer than usual rainy season are predicted and are already being felt or experienced. Changes in weather and climatic patterns could potentially disrupt reproductive cycles of aquatic organisms thereby affecting recruitment and availability of wild seeds used for aquaculture. In the same manner, reproductive cycle of captive breeders could also be disrupted thereby further compromising seed supply.

- Extreme weather events like typhoons and flooding and storm surges associated with these weather disturbances can affect aquaculture operations and result in destruction of culture facilities, loss of stocks and consequent production losses. Mass escape of stocks resulting from destruction of culture facilities also poses potential threat to biodiversity. Coastal communities and low-lying inland areas would be especially vulnerable.

- Compared to other animal production systems, the carbon footprint of aquaculture is much lower because most of the production is from freshwater herbivorous or omnivorous species such as carp that are dependent on primary productivity or low levels of supplementary feeding. However, some species (*e.g.* shrimp, salmon and high value marine carnivorous fish) have both high feed energy and system energy

demands and thus high carbon footprints. For some developing countries including those in Southeast Asia, aquaculture production is focused on high value aquaculture species aimed primarily for export.

- Identification of research needs and effective implementation of strategies that could help the region's aquaculture sector/fish farming communities adapt better to climate change are major challenges of the region

Recommendations

(i) Protecting the environment

- Increasing the pressures on natural resources, such as water and habitats, and awareness of the importance of improving environmental management in ASEAN, will continue to drive the aquaculture sectors towards reduction of the impacts of aquaculture on the environment, and making more efficient use of natural resources for aquaculture.

- Whilst there has been significant improvements and move towards more responsible use of antibiotics and chemicals in aquaculture, continued and stringent monitoring and control is still needed to reduce the unnecessary and irresponsible use of such chemicals and drugs in aquaculture. To address food safety issues, an accurate inventory of chemicals and drugs used in aquaculture operations is needed. Data on withdrawal periods for antibiotics and other chemicals commonly used in aquaculture are likewise necessary in order to establish guidelines on the production of safe aquaculture products.

- Improve the management of the aquaculture sector. The concept of environmental capacity can be used as a strategy to alleviate, if not prevent aquatic pollution brought about by intensification of aquaculture activities. Local ordinances can be passed to set limits to the area and/or numbers of pens or cages that can operate in a certain aquaculture area. This can further serve a basis for the issuance of permits to set up structures and operate fish farms. Zoning regulations should also be in place to ensure that there is no over-development of aquaculture in certain areas. These however, will call for effective monitoring and enforcement of regulations to ensure that the carrying capacity of the environment is not exceeded and activities are carried out in an environment-friendly manner.

- Following is an operational scheme where an aquaculture facility is allowed some period of rest. Breaks in aquaculture production are important in that it allows the immediate aquaculture environment to recover from environmental stressors. For example, monitoring of water and sediment quality parameters reveal that levels of nutrients are high during the culture period but tend to decrease during the fallow period. Fallowing is also an important strategy in breaking infection and re-infection cycles.

- There should be wider and more intensified information dissemination with regards to feeding management schemes that could reduce the environment impacts of aquaculture without negatively affecting production efficiency. The following are primary issues that currently constrain feed use and management in aquaculture: 1) limited access to information on feed and feed ingredients (availability, prices and quality), 2) poor feed preparation, processing, handling and storage at the farm level, 3) inadequate monitoring of feed and farm performances, 4) low impact of current dissemination strategies on improved feeding and feed management, 5) gaps in the understanding in the economic aspects of feed management, 6) health aspects and their implications on feed management, and 7) lack of regulatory mechanisms for feed quality.

- Various culture technologies that integrate aquaculture with the environment have been developed (*e.g.* aqua-silviculture, poly-culture, closed or re-circulating systems, etc). Recently, the concept of integrated multitrophic aquaculture (IMTA) systems that combine aquaculture species (finfish or mollusc) which are fed artificial or natural diets, and suspension extractive species like mussels or oysters (organic extractive) and seaweeds (inorganic extractive) or deposit extractive species like sea cucumbers or sea urchins has become quite popular. This culture system has the unique characteristic of reducing the negative impacts of aquaculture on the surrounding environment while increasing the profitability of an aquaculture operation by having multiple crops instead of just one. IMTA therefore promotes economic and environmental sustainability.

- The aquatic environment offers enormously rich resources; hence, it is crucial that activities are directed towards achieving a balance between aquaculture development and protection of the environment and aquatic biodiversity. Mangrove conservation and rehabilitation are being promoted in recognition of the important function of mangroves as nursery grounds for myriad species, as well as their protective function.

On the other hand, selection of sites for mariculture should ensure that potential negative impact of aquaculture activities on nearby sensitive ecosystems such as coral reefs, seagrass beds are minimized if not totally avoided.

- Several guidelines are in place to ensure that aquaculture development is undertaken in a sustainable and environment-friendly manner including the Regional Guidelines for Responsible Fisheries in Southeast Asia-Responsible Aquaculture. Several other codes of conduct/practice, best management practices (BMPs), Good Management Practices (GMPs) for the culture of specific economically important commodities have been formulated. These, along with certification schemes are important for increasing public and consumer confidence in aquaculture production practices and products and are widely recognized by international organizations and many non-governmental bodies.

(ii) Adapting to Climate Change

Mitigating the impacts

- Selection of some strains that are better adapted to warming and acidification will be an important adaptation measure. Some animals, including fish, show thermal plasticity and can adapt to higher than usual temperatures suggesting the possibility of successfully establishing thermal-tolerant aquaculture animals through selective breeding.

- Some freshwater animals, particularly those inhabiting stagnant lakes and ponds, are probably less affected by high CO_2, because these water bodies usually have high CO_2 levels. Dissolved oxygen concentrations in these water bodies will also likely be low, hence the culture of air-breathing fish species such as *Anabas* spp., *Boleophthalmus* spp., *Channa* spp., *Clarias* spp., *Monopterus* spp., and *Sccobranchus* spp. which are already cultured in southeast Asia should be promoted further.

- Early developmental stages of most organisms seem particularly vulnerable to temperature rises and acidification. Thus, it is most essential to raise embryos and larvae under conditions favorable for their development. To reduce impacts of acidification, excess CO_2 in air supply could be absorbed into an alkaline solution before being delivered to rearing tanks. Some alkalizing agents such as soda lime could be directly added to rearing water, but their biological toxicity must be carefully tested before application. If possible, larval rearing should better be conducted under favorable temperature conditions. Once larvae have grown up to a stage that is more tolerant to environmental stress, they could be transferred to usual aquaculture grounds. This might be applicable to bivalves such as clams, mussels and oysters, and crustacean species.

- Define strategies for mitigating greenhouse gas emissions from aquaculture (for instance, finding alternative energy sources). The use of algae/seaweeds as bio-fuel could be an area of study.

- Review energy consumption (*i.e*. taking into consideration the life cycle approach) in aquaculture and greenhouse gas emissions associated with direct energy inputs for aquaculture systems, covering farm sitting and operations, and value chains.

Adaptation Measures

- Aquaculture can also be an adaptation solution, for example as a livelihood option for agriculture farmers in coastal areas affected by saline intrusion due to sea-level rise, for water storage in drought affected regions.

- The following were also identified as adaptation techniques that could be taken by the Member countries and the fish farming communities:

  - *Mapping of sites that are vulnerable to effects of climate change*. Identify areas or sites that are vulnerable to effects of climate change. This also involves mapping or assessing the vulnerability of aquaculture dependent communities to climate change.
  - *Research areas for climate change adaptation*. Conduct studies on areas of aquaculture that would lead to identification and promotion of aquaculture species, strains, farming systems and techniques that will adapt better to climate change.
  - *Investments on infrastructures/habitat.* Assess and improve the existing infrastructures/habitat to ensure safety of coastal fish farming and fishing communities and enhance their adaptive capacity to climate change. The following measures were suggested:

- ✓ Invest on infrastructures such as early warning systems and other safety measures.
- ✓ Restore and maintain mangrove forests as a strategy to reduce greenhouse gas emissions and provide the first line of defense during flooding and possible erosion.

- *National plans for climate change adaptation.* Strategy that aims to avert the impacts of climate change in the Member Countries must be put in place. This also includes ensuring that the needs of aquaculture and fisheries are incorporated into the government's plans for climate change adaptation and that these sectors are involved in the planning, development and implementation of activities that pertain to climate change.
- *Awareness building.* The participants noted that aquaculture and fisheries attract little attention in the bigger fora/initiatives on climate change. For instance, these are barely mentioned in the report of the Inter-Governmental Panel on Climate Change (IPCC). The recommendations were for the aquaculture/fisheries sectors to raise 'voice', be visible and get engaged in the bigger fora and initiatives on climate change. Such actions are important to ensure that aquaculture and fisheries are accorded due attention in climate change initiatives and also, so that resources can be directed to these sectors to help the people adapt to climate change.
- *Institutional strengthening*. Institutional strengthening must be pursued to increase the resilience and overall capacity of various stakeholder groups on aquaculture (including farmers) and to enable them to adapt to the challenges of climate change. Empowering various stakeholder groups through capacity building and knowledge transfer were identified as key elements that could strengthen these stakeholders.

- *Improve cooperation within the aquaculture sector and with other sectors*. Institutional cooperation or institutions working together at all levels is of utmost importance to effectively address issues on climate change. One issue within the aquaculture sector that has become more challenging in light of the impacts created by climate change (*e.g.* drought) is the multiple use/demands on water. The participants noted that in view of the increasing demands for water for human use, the more integrated approaches within the sector and between sectors and the promotion of these approaches are needed.

Annex 13

UNDERSTANDING THE ECOSYSTEM APPROACH TO FISHERIES AND ITS APPLICABILITY IN SOUTHEAST ASIA

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What is the ecosystem approach?

In order to understand the concepts of ecosystem approach, one must first understand the concept of sustainable development which replaced all previous policies of development that were based on economic growth only. Sustainable development can be summarized as the balance between ecological well-being and human well-being that does not compromise the needs of future generations. In its simplest form, this can be thought of as a process for finding development without destroying the natural resource base on which such depends on and at the same time optimize the utilization of such resources for rational development (Figure 1).

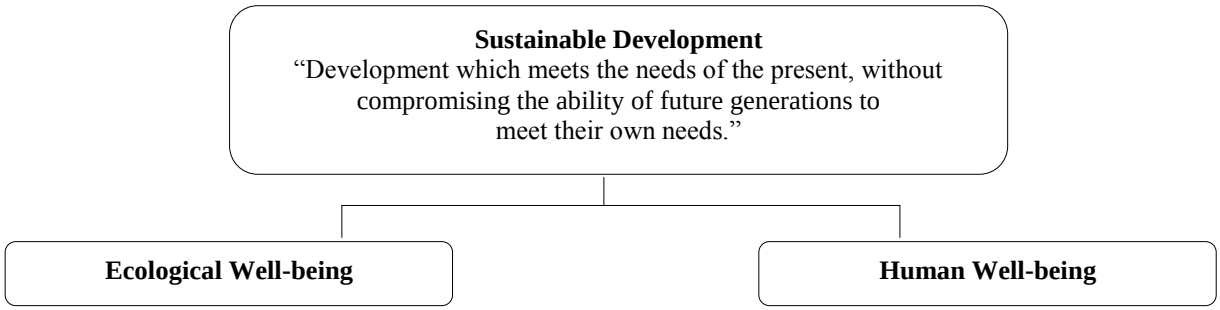

Figure 1. present the concept of sustainable development-a balance between ecological well-being and human well-being. The phrase "ecosystem approach" was first coined in the early 1980s, but found formal acceptance during the Earth Summit in Rio in 1992 where it became an underpinning concept of the Convention on Biological Diversity (CBD), and was later described as:

> *A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way*

In other words, ecosystem approach is a strategy to promote sustainable development. The application of the ecosystem approach helps reach a balance of the three objectives of the CBD: conservation, sustainable use, fair, and equitable sharing of the benefits arising from the utilization of genetic resources.

The EAF has three main objectives within a hierarchical tree framework:

1. ensuring human well-being;
2. ensuring ecological well-being; and
3. facilitation the achievement of EAF, *i.e.* effective governance of the sector/areas where ecosystem occurs and has potential for management

The EAF is based on the principles of sustainable development, where "sustainable" is not restricted to ecological considerations, but includes economic and social considerations and their interaction with ecological ones. Both the social and biophysical or ecological dimensions of ecosystems are tightly linked, so that disruption in one is likely to cause a disruption or change in the other.

Ecosystem approach to fisheries

The Ecosystem Approach to Fisheries (EAF) was developed when fisheries managers and the society at large realized that the single-species approach seemed to ignore the interactions between the species themselves as well as their interactions with the broader ecosystem. It also became apparent that single-species management often did not result in optimizing the economic and social benefits of the fishery as a whole, especially in tropical multi-species/multi-gear fisheries where implementation of the single-species approach was difficult to carry out.

While various fisheries managements systems were evolving, aquatic environmental agencies were promoting the conservation of the ecosystem and their inherent biodiversity, through ecosystem management approaches and interventions such as the advancement of marine protected areas (MPAs).

Over time, the concepts of single-species fishery management and ecosystem management evolved and blended into a single concept. This merged concept is referred to as EAF by fishery managers and "Ecosystem-Based Fisheries Management" (EBFM) by environmental managers. Although these terms are often used interchangeably, but in many cases they are quite different. To assess the real meaning of these terms, one has to read the "fine print" that defined and elaborated the concepts. However, the main difference could be on the fact that EBFM seems to consider only the ecological impacts of fishing, whereas EAF is a broader concept that also considers the impact of the environment on fishing, the impact of fishing on the environment and the socio-economic benefits that can be gained from fishing and post-harvest activities.

Framework for EAF

As described above, the main objective of EAF is to sustain the fishery systems not just considering single aquatic species. EAF aims to increase the contribution of fisheries to sustainable development by considering the ecological constraints (*e.g.* habitat protection and restoration, pollution reduction and waste management, sustainable harvesting of fishery resources) as well as its socio-economic benefits to humans (*e.g.* increased and equitably distributed wealth and sustainable livelihoods).

Why Ecosystem Approach?

The EAF considers the inherent uncertainly and complexity of ecology and society in general and natural resources management in particular. It has been said that "Coastal zones are not only more complex than we think, but more complex than we *can* think" and the EAF enables fisheries managers and fishing communities to learn and live with such uncertainty, through participatory, adaptive management approaches and practices.

In EAF, while focus is placed on the marine ecosystems, it ensures that all components of the fishery system are considered, including the use of integrative scientific assessment which is aimed at increasing awareness of the relationships among the ecosystem elements and processes. In a comprehensive plan of EAF, it also has the consistent goal of promoting coordination among agencies and jurisdictions.

The EAF is participatory at all levels from planning to implementation, thus promoting stakeholders cooperation by building their trust, transforming their interests towards the innovative plans for the EAF. To make EAF management feasible, the use of local knowledge is being promoted in combination with agreements justified by scientific means. The EAF also promotes participatory planning to take into consideration the perceptions of stakeholders and the legitimacy of such perceptions.

Thus, under the concept of EAF, decision-making and management would best be placed at local level stakeholders. However, in the process there are relevant constraints that persist and need to be addressed, which could include:

- lack of awareness and understanding of ecosystem processes;
- lack of appropriate understanding of connections between ecological and social processes;
- lack of local institutions to agree upon appropriate standards and mechanisms to uphold them for aquatic systems or farm groups;
- lack of institutions capable of implementing more strategic approaches;
- priority afforded to short-term interests by many business enterprises and not to the poor;
- lack of consideration of relevant boundaries and multiple-scale approaches, when appropriate; and
- lack of integrated multi-sectoral planning and management.

Applicability of the ecosystem approach to fisheries in Southeast Asia

For the Southeast Asian region, the most urgent and necessary requirement for adopting an ecosystem approach to fisheries is adequate understanding of the ecosystems. In addition, a common understanding of EAF as a process and strategy that are part of sustainable development is also very crucial.

As a matter of fact, many projects in Southeast Asia either focus on ecosystem conservation and the establishment of marine reserves or protected areas. Rarely have these efforts been intended as supporting

fisheries management as the focus mainly is on conservation. In the process, fisheries management is adjusted accordingly to such conservation needs, *e.g.* the closure of marine areas for fishing.

In an EAF fisheries and conservation objectives are balanced and conservation mechanisms and activities designed to support both fishing as well as conservation.

Thus, successful implementation of ecosystem-based approaches require unprecedented changes in communication, that lead to a better understanding of fisheries needs by conservationists and conservation needs by fisheries managers and fishing communities.

Since "environmental" management is shared among agencies and all levels of government and further separated by various specialized disciplines, effective and proactive interagency cooperation is very important. It is desirable, and may be cost-effective, for agencies to compare and prioritize environmental management problems and efforts needed to resolve them, through a process that avoids any circumstances that create adversarial relationships. Secondly, effective management requires public understanding, trust, and support, especially when resources are to be rebuilt and/or when competing users desire the same resources. Essentially, implementing an ecosystem-based approach requires an open process that actively seeks interagency and public input and support. Therefore, a key challenge is to achieve a greatly improved interagency coordination and to enhance the exchange of information between regulators and constituents during all stages of management.

For fisheries managers the challenge lies in demonstrating to other agencies and stakeholders on how they could derive the benefits from the closer cooperation and integration with the fisheries sector.

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Annex 14

IMPLEMENTING THE ECOSYSTEM APPROACH TO FISHERIES (EAF) IN THE BAY OF BENGAL LARGE MARINE ECOSYSTEM (BOBLME) PROJECT

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Summary

This Bay of Bengal Large Marine Ecosystem Project is assisting the eight countries in the Bay of Bengal to implement an ***Ecosystem Approach to Fisheries management.*** The BOBLME Project is attempting to integrate ecological, economic, social and governance elements into the management platforms it is developing for the transboundary fisheries for hilsa, Indian mackerel and shark and, overall, into a Strategic Action Plan for the ongoing coordinated management of the Bay of Bengal marine ecosystem. The BOBLME Project faces major challenges because while it was designed to operate in a multisectoral manner, the government infrastructures are highly sectoral or "silo-based" – addressing this situation is crucial to the ultimate success of the work. To begin mitigate this issue; the BOBLME Project is working with partners to develop knowledge and skills in EAF and promote EAF in general.

Introduction

Rapid population growth and high dependence on aquatic resources for food, trade, livelihoods, and increased land use are having major impacts on the marine ecosystem of the Bay of Bengal Large Marine Ecosystem (BOBLME). The Bay of Bengal is experiencing over-exploitation of fish stocks, habitat degradation, and land based pollution, resulting in uncertainty whether the ecosystem will be able to support livelihoods in the future.

Fisheries are of considerable economic importance for the countries bordering the Bay of Bengal and, in general, in most countries of the Asia and Pacific region. A high proportion of small-scale artisanal fishers are competing with industrial large scale fishers for often already overfished resources, which are also under stress because of habitat loss, pollution and other negative impacts on the ocean environment.

Fisheries policies need to be adapted and implemented to respond to the challenges facing the fish stocks, the environment and the fishers; *e.g.* moving away from the "production increase mantra" towards increases in value and therefore social and economic benefits. This requires the implementation of an approach to fisheries management and development, which promotes this paradigm shift and incorporates participatory planning, implementation, and monitoring – the Ecosystem Approach to Fisheries (EAF).

The EAF is a management framework to achieve sustainable development in fisheries through the implementation of the Code of Conduct for Responsible Fisheries (CCRF). The CCRF is a global set of recommendations about how responsible fisheries (and aquaculture) can be conducted in a manner that contributes to sustainable development.

"Sustainable Development" is defined as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" or a process of finding a balance between human well-being and ecological well-being. The EAF is directly linked to this definition as it is defined as "an approach to fisheries management and development that strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecological meaningful boundaries (FAO, 2003).

The EAF should be applied to entire management systems, from planning to implementation and to monitoring and evaluation. A key feature is integration of fisheries and environment, with a focus on people and their activities, habitats and resources. The EAF is also scalable and compatible with broader ecosystem management, *e.g.* from local or district level to Regional Seas, or from coastal zone management to Large Marine Ecosystems.

The Ecosystem Approach to Fisheries and the BOBLME Project

The BOBLME Project is a five year (2009-2014), $31 million collaboration involving Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand. These eight countries are working together to develop a coordinated programme of action designed to improve the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries. The major implementation partners are the Fisheries and Environment Departments of each country. The BOBLME Project is funded principally by the Global Environment Facility (GEF), Norway, Sweden, the Food and Agriculture Organization of the United Nations (FAO), and the National Oceanic and Atmospheric Administration of the USA. FAO is the executing agency.

The Bay of Bengal is one of 64 identified LMEs of the world, and covering approx. 6.2 million km^2 it is also one of the largest, and its coasts are among the most populous in the world. Projects similar to the BOBLME are currently implemented, with GEF-funding in almost 20 of these LMEs, and all follow a similar modular approach for sustainable development. The five modules identified are productivity, pollution and ecosystem health, fish and fisheries, governance, and socio-economics.

A key requirement of EAF is its application and integration to entire management systems such that it has best chance to contribute positively to governance of aquatic resource use, biodiversity, and human well-being, including social development and poverty alleviation. For example, addressing both human and ecological well-being, the EAF combines two concepts: that of conserving biodiversity, ecosystem structure and functioning, and that of fisheries management dealing with providing food, income and livelihoods for humans. These areas can be further subdivided into policy objectives and issues which need to be addressed (APFIC, 2009; Staples and Funge-Smith, 2009).

In the two years since it became operational, the BOBLME Project has initiated an extensive programme of studies, reviews, workshops and trainings that have established baseline information in the Project's theme areas of fisheries, pollution and critical habitats. The Project will continue to assist countries implement the EAF for the transboundary or shared fish stocks of hilsa shad and Indian mackerel, and strengthen natural resource management and policy development capabilities in general. Under the key aspect of ecological well-being, the Project contributes to improved management of critical habitats, promotes the establishment of regional management bodies and Marine Protected Areas or fish refugia. It also works toward pollution reduction and increased understanding of large-scale processes and the application of ecosystem health indicators. Initiatives to promote social well-being are concerned with alternative livelihoods, community participation in fisheries and habitat management, and improving the resilience to extreme natural events. Key areas of work in governance, as the ability to achieve the balance of ecological and social well-being, are in the field of strengthening institutions in general and policy making capacity in particular, as well as promotion of coastal management best practices and multi-sectoral involvement. Improved or effective communication from science to policy and management is another focus of the project.

Notwithstanding the current efforts of the countries in implementing EAF, the Project faces some inherent difficulties. In practice, because governments are structured along sectoral lines, *e.g.* agriculture, forestry and fisheries; mining and petroleum; environment; shipping and maritime affairs, sector-based management approaches, rather than integrated cross-sectoral (EAF) approaches, are still widespread (Staples and Hermes, in press). Thus, while the BOBLME Project was planned and developed in an integrated fashion - with broad sectoral involvement and advocating multi-sectoral participation - and the evaluation is designed to cover multi-sectoral outcomes, the reality is that the activities are implemented mostly at the single sector - or sometimes two levels: fisheries and environment. The EAF, if applied appropriately, makes use of a combination of sectoral and ecosystem management tools, but integrates these at the planning and at the monitoring and evaluation steps in the policy cycle (Figure 1).

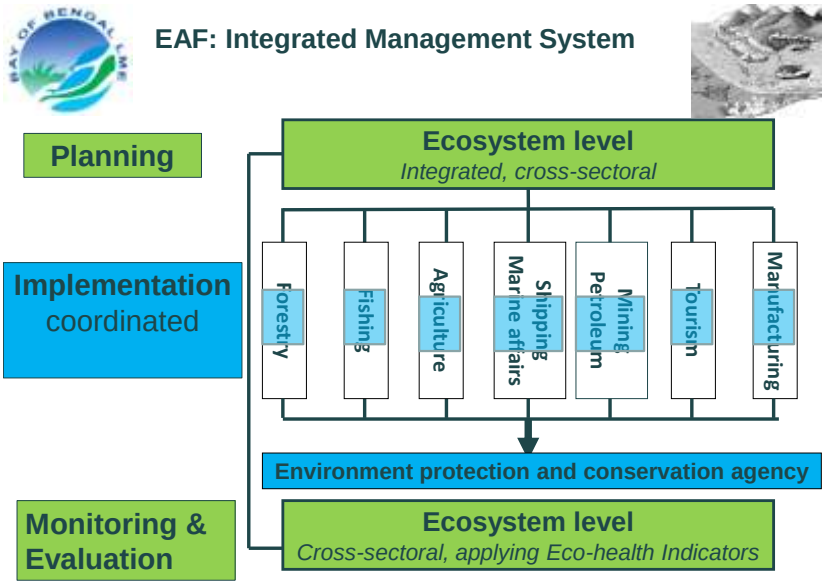

Figure 1. The Ecosystem Approach to Fisheries applied to an Integrated Management System (modified from Staples and Hermes, in press).

Conclusion

Overall, the BOBLME Project is attempting to integrate ecological, economic, social and governance elements into the management platforms it is developing for the transboundary fisheries for hilsa shad, Indian mackerel and shark and, overall, into a Strategic Action Plan for the ongoing coordinated management of the Bay of Bengal marine ecosystem. The Project is building on many National EAF practices already in place, and implementing a coordinated programme to strengthen management capability in each participating country and harmonise management practices and policies to achieve effective regional management.

The EAF is considered a viable and most applicable approach to be applied in a Large Marine Ecosystem project such as BOBLME. Used in an integrated management system, it should be understood and implemented as a combination of ecosystem planning and monitoring, with sectoral implementation and environmental management. The Large Marine Ecosystem concept is an effective integrative resource management approach to achieve better resource management and biodiversity outcomes. The implementation of the concept, however, requires a high degree of intergovernmental cooperation and will incur higher transaction costs to make it effective. At present, understanding of the EAF is still rather limited; there is confusion with similar approaches; there is uncertainty about the tools available and applicable; and moving from theory to practice is a major remaining challenge.

To meet this challenge, the BOBLME, together with regional partners such as SEAFDEC and the USAID-Coral Triangle Support Programme, is commissioning the development of a regional EAF Training Course, to become available early 2012.

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Annex 15

RESOURCE ENHANCEMENT THROUGH FISHERIES *REFUGIA*

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Summary

This paper presents the results of the study in Danajon bank on rabbitfish (*Siganus canaliculatus*) conducted under the USAID Project Fisheries Improved for Sustainable Harvest (FISH). The study was conducted in order to sustain fish stocks and the need to manage fisheries resources of the country. The study recommends the establishment of fisheries refugia in Danajon bank, Bohol, the Philippines for the target species, *Siganus canalicultus*. The study recommends that fishing for *Siganus canaliculatus* be closed during spawning season on the 4th 5th and 6th day after the new moon monthly for the entire year or for a few months only; banning of fine meshed gears catching rabbit fish and banning of selling rabbit fish during closed season.

Introduction

Resource enhancement comes in varieties of activities like direct re-stocking, Marine Protected Areas (MPAs), fisheries *refugia*, habitat restoration and in a general context management of the resource in an ecosystem approach. Fisheries *Refugia* on the other hand is a new paradigm where management is focused on the most critical stage in the life cycle of the target fish species. For this paper, the fish species studied is rabbit fish (*Siganus canaliculatus*) and Danajon Bank as the study area. The Fisheries Component of the UNDP-GEF Project entitled "*Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*" defined Fisheries *Refugia as "Spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical phases of their life-cycle, for their sustainable use."*

Rabbit fish (*Siganus canaliculatus*) are found in inshore, algae reefs, estuaries and in lagoons. They are common in rocky substrates and they can tolerate more turbid waters. They can be seen also within the vicinity of river mouths especially around seagrass beds (Figure 1). The juveniles usually form large schools in shallow bays and coral reef flats. However, the school size reduces with size with the adults occurring in groups of around 20 individuals. They are hervivores and feeds on benthic algae and to some extent on seagrass. Rabbit fish are pelagic spawners.

Rabbit fish locally known as "danggit" is a popular fish in the Philippines. In some regions of the country, the post-larvae size or commonly called "padas" is the most desired, being utilized as fish sauce. The pre-adult size is the next target size for the market of rabbit fish nationwide. This is mainly sold in the market as boneless rabbit fish either fresh/frozen marinated or dried form. The price varies depending on the form it is sold in the market. In general, the boneless form commands higher market price and is the most preferred by the buyers.

Danajon bank project is one of the project sites of the FISH project located in Tagbilaran, Bohol, The other project sites are in Coron, Palawan, Bongao, Tawi=Tawi and Tandag, Surigao del Sur. Danajon bank is the only double barrier reefs in the Philippines. The total area of the bank is 2,142 sq kms and with an aggregate coastline of 381 kms on 40 islands (Figure 3).

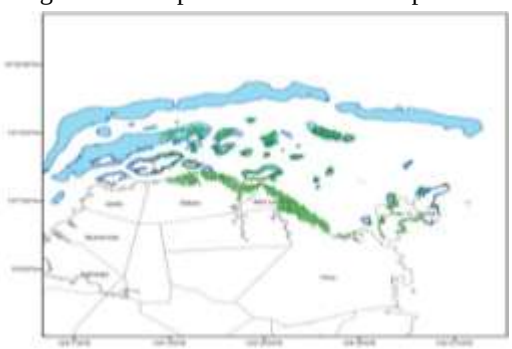

Figure 1. Major seagrass beds in Dajanon Bank
(Source: FISH Project)

Overfishing of juvenile rabbit fish has been reported by Soliman, *et. al*., (2009) in Lagonoy gulf. This is also true in almost all known fishing grounds for rabbit fish. The demand of post larvae and the pre-adult sizes in the local markets have triggered the exploitation to the extent of overfishing the resource. The study of the production of juvenile rabbit fish in Lagonoy Gulf has shown the decline from 2001 to 2004 from 175, 154,

130, and 65 tonnes respectively (Soliman *et. el*., 2010). There is no available national catch data of rabbit fish. The data available are limited to studies conducted in particular fishing grounds. In the absence of statistics for rabbit fish, the increasing trend of the price of fresh and dried juvenile rabbit fish from P40.00/kg to P 120.00/kg and from P200.00/kg to P650/kg from 2005 to the present. This might be one of the indications that the supply of rabbit fish has been declining. To address this issue, the Danajon Bank project was developed in order to prevent the collapsed of this resource.

Figure 2. Rabbitfish (*Siganus canaliculatus*) (Source: FISH Project)

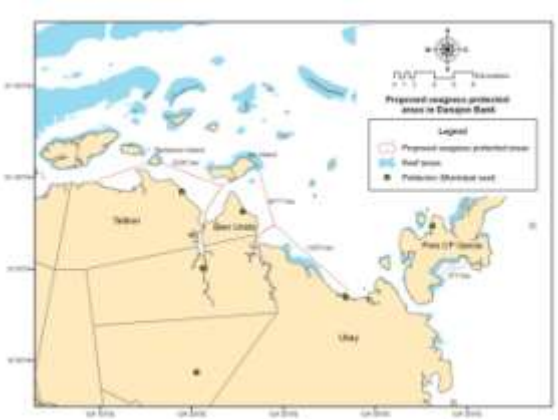

Figure 3. Proposed seagrass protected areas (*Fisheries Refugia*) in Danajon Bank (Source: FISH Project)

Methodology

The study identified the site where fishery for rabbit fish is occurring. The project identified the areas and the time where the rabbit fish spawned. Other parameters used to identify the exact location where the fisheries *refugia* will be established were the source and sink of the fish eggs and larvae, the current system of the area, the moon phase, the volume of the fish eggs and larvae, maturity stages of the gonadal development, etc. Daily collection of rabbit fish samples from the catch of the different gears catching rabbit fish in selected landing sites were conducted from May 2004 to July 2004.

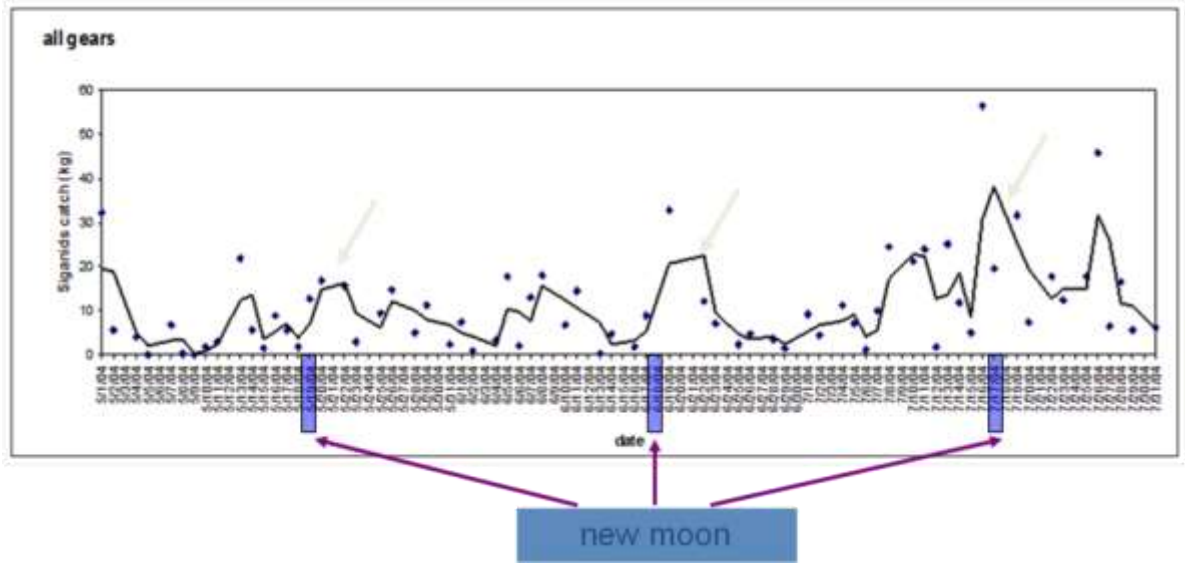

Figure 4. Catch monitoring data from various gears catching rabbit fish in Danajon Bank from May to July 2004 (Source: FISH Project)

The project conducted consultation in the locality after the data collected were processed and analyzed to present the results of the study. The concept of *fish refugia* was introduced to the community and the local government officials. It was emphasized that there is a need to impose management measures to sustain the resource for the present and future generations. The consultation agreed that instead of banning the fishing of rabbit fish for 3 months, there will only be closure of fishing by just few days every month. During this closure the fishermen will be the one to police their rank and at the same time this will also be the time for them to mend their nets and some maintenance work for their fishing boats. The local government units also

support this closure as there is no need to provide alternative livelihood for the fishermen that will be affected by the closure as it will take only three-day fishing closure per month.

Results and Recommendations of the Study

The study has identified the peak spawning days of the rabbit fish in Danajon Bank (Figure 4). These specific spawning days also determined when the closed season will be imposed in the area. The study also increased the level of awareness on the conservation and management of fish stocks in general to the community. While increasing the level of awareness of the community in the conservation and management of the resources is a step forward in fisheries management, technical assistance should still be a continues priority activity of the government in providing the needed appropriate specific technical assistance to the community. Constant dialogue and monitoring of the progress in the implementation of the fisheries *refugia* should be done by the government.

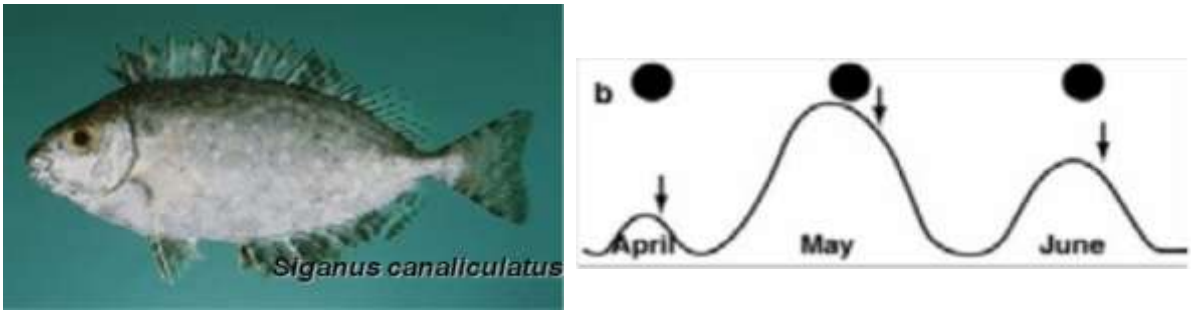

Figure 5. Closed season for rabbit fish (*Siganus canaliculatus*) (Source: FISH Project)

The specific recommendations are the following

- Close season during spawning season, 4th 5th and 6th day after the new moon monthly for the entire year or for a few months only
- Banning of fine meshed gears catching rabbit fishes
- Banning of selling of rabbit fishes during close season

Promotion of the fisheries *refugia* concept should be popularized as a new paradigm in fisheries management to complement the Marine Protected Areas (MPA) especially to the coastal communities.

Acknowledgement

The slides used in the presentation were provided by the FISH Project through Professor Nygiel Armada-Fisheries Expert

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Annex 16

REDUCING THE IMPACTS OF FISHING ACTIVITIES ON COASTAL AND MARINE ENVIRONMENT IN THE SOUTHEAST ASIAN WATERS: A REGIONAL SYNTHESIS

Dr. Worawit Wanchana
SEAFDEC Training Department (TD)

Summary

Within SEAFDEC, reducing the impact of fishing to the environment and resources has been one of the major key issues in its activities that aim to boost sustainable fisheries development in Southeast Asia. In order to provide a forum for experts from Southeast Asia and others to exchange information and discuss activities related to the reducing the impact of fishing, SEAFDEC conducted a series of meetings. That included, for example, the Regional Workshop on the Reduction of the Impact of Fishing in Coastal and Marine Environments in the Southeast Asian Waters that was organized in January 2009. During the Workshop, discussion on the need to improve the various designs and uses of the fishing gear was also conducted while initiatives and efforts made by the countries in the region to mitigate the impacts of fishing on the coastal and marine environments were collated and summarized.

Background

Many traditional fishing activities have been found to induce negative impacts on the coastal and marine environments as well as on the resources. In an effort to assess the extent of such impacts, SEAFDEC convened in January 2009 a workshop to address the concerns on the need to improve the designs and use of fishing gear in order to address the impacts of using such gear on the coastal and marine environments as well as mitigate sea turtle by-catch in fisheries. This article includes the initiatives of the Southeast Asian countries in reducing the impacts of fishing practices on the marine environments and resources.

In this regard, SEAFDEC has been promoting the development and adoption of responsible fishing gear and practices in the Southeast Asian waters that aim to minimize the impact of fishing to the coastal and marine environments. Such initiatives by SEAFDEC have been demonstrated through the implementation of various activities that include a number of R&D activities on Turtle Excluder Devices (TEDs), Juvenile and Trash Excluder Devices (JTEDs) as well as human capacity building on topics related to the use of selective fishing gear and devices and promotion of the concept on fisheries *refugia*.

Issues

In line with the efforts of the ASEAN Countries to reduce the impact of fishing practices to the coastal and marine environments, establishment of the Network for Reduction of Impact of Fishing on Coastal and Marine Environment in Southeast Asian Waters (IFCOME-Network) has been proposed to facilitate the sharing and dissemination of information on programs and initiatives related to the reduction of the impact of fishing, and monitor the developments to be used as basis in improving the design of fishing gears and promotion of responsible fishing practices. The main role of the Network is to provide information and recommendations that could contribute to: (1) improving the current fishing gear technology and its practices to reduce the impacts from fishing activities; (2) enhancing inter-agency and inter-sectoral coordination at the national, regional and international levels for achieving sustainable fisheries management and development in the Southeast Asian region through proper development of fishing gear technologies and practices; (3) strengthening regional cooperation on R&D, technology transfer, and resources capacity building on the issues related to reduction of impact of fishing practices; and (4) widening the network of people, government, organizations for reducing the impact of fishing practices to the coastal and marine environments.

Conclusions and Recommendations

Considering that the following fishing practices could bring about negative impacts on the coastal and marine environments especially in the Southeast Asian waters, namely: (1) light fishing; (2) use of stationary gears (*e.g.*, tidal traps, stow-net, fyke net, Japanese set net, muro-ami, choko-ami, etc.); (3) use of active gears (*e.g.*, trawls, dredge, push net, etc.); (4) use of semi-passive gear and small-scale fishing gear (*e.g.*, pot, gill net, etc.); (5) long-line fisheries; and (6) purse seine operations associated with FADs, various actions have been proposed to mitigate such impacts at the regional and national levels. Moreover, the action plan for alleviating the interaction of fisheries with sea turtles has also been developed for consideration by the countries in the

Southeast Asian region. At the regional level, the establishment of IFCOME Network could provide the necessary link for the exchange of information by the countries in Southeast Asia.

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Annex 17

ECOSYSTEM-BASED TECHNOLOGY AND MANAGEMENT FOR CAPTURE FISHERIES, WITH CASE STUDIES ON LIGHT FISHING: EXPERIENCES IN JAPAN

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Background

The improvement of gear selectivity has been a traditional goal for fishing technology, for reducing of impacts from fishing, especially to minimize the waist of unwanted species and sizes. Selective fishing is achieved by means of mesh size enlargement, the use of a variety of by-catch reduction devices, as well as closed seasons and areas. This concept can be applied in an ecosystem-based approach for fisheries management, by identifying different zones (*e.g.* coastal and off-shore) with different biodiversity aspects, for different users of small-scale and large-scale fisheries, which require different management system. Historically, in the management system in the coastal waters in Japan, the Fishermen's Cooperative Association created the "*own-garden concept*" with fishing access limited to the cooperative members. *Sato-umi* is another concept for sustainable and harmonious establishment of areas allocated to Nature and for human activities in the coastal area. In order to enhance the *autonomous management* concept, it is essential to provide technical support to identify the better, smarter usage of fishing gear in accordance with the specific type of capture and with the required selectivity performance for species and sizes in each gear type.

As a case study for technical approach to reduce the impacts from fishing, the application of Light Emitting Diode (LED) lamp for establishing the eco-harmonic fishing is reviewed through the experiences in the recent implementation process in Japan.

General Concept on Ecosystem-based approach

- *What is Fishing Impact?*

Fishing Impacts can be classified into several aspects as eco-system level and biodiversity impact including the direct impact to target resources, as well as the environmental impact such as habitat disturbance and pollutions. Both of the positive and negative impact should be well analyzed and described, for better understanding what is wrong, and what are the right things to do for minimizing the negative impacts and maximizing the positive impacts.

- *Fishing Gear Selectivity-Function and Limitation*

Gear Selectivity can be the tool for solution to reduce the impacts of fishing, by minimizing the discarding waist for unwanted sizes/species, but never be perfect for selectivity function, together with the awareness on fishing mortality of escapees.

Another new issue is the awareness on the undesirable effect of selective fishing for targeting the larger size group depleting from the stock, for resulting into the genetic disturbance to create the different characteristics for remaining the smaller size group in the stock. The very different idea is the balanced exploitation for maintaining the ecosystem, while we are far behind to understand the full image of ecosystem structure.

Long-term monitoring of catch composition for species and sizes is the key function to evaluate the impacts of fishing, for understanding the sustainability of the concerned fishing gear type in the concerned fishing ground. Then, the management approach is simple; needs to stop "overfishing by over-capacity of fishing activities", but really difficult to do right things in anywhere of the world fisheries.

- *Zoning for Fishing Activities and Role of Fishermen's Cooperative*

Another point for the sustainable approach is the zoning of fishing activities, especially to protect the coastal fisheries resources against the large-scale commercial fisheries such as trawl and purse seine. The problem is the present fishing regulation for zoning arrangement which is set through the distance from shore, depth range and boat size in each region, and not always fit in coordination with the ecosystem. Different scenario for fisheries management is required for different category of fishing activities, by fishing zone arrangement between the large-scale commercial fisheries and the small-scale artisanal/subsistence fisheries.

In case of Japan, the autonomous management system for coastal waters is covered by the local Fishermen's Cooperative, with the limited fishing access only for Cooperative members. Each Cooperative sets regulations for fishing gear and methods with the fishing ground allocation, and coordinates with neighboring Cooperatives. Voluntary settings are also commonly implemented for the closed area/season together with the stock enhancement by seedling and artificial reefs, the fishing abstention days, and minimum landing size for marketing arrangement. The Cooperative actions are under the networking in each prefecture, under the umbrella of all Japan Federation with support and advice from National Fisheries Agency.

"*Tragedy of Commons*" is the reason of difficulty for management of coastal waters, while the concept of *Local Commons* can work as the front sea is the own garden under own responsibility, and the fish here is also own property with responsibility for keeping them to the next generation.

- *Sato-umi movement*

Sato-umi is another concept appealed in 2010 Nagoya CoP10 on Biological Diversity, defined as the dynamic mosaics of managed socio-ecological systems that produce a bundle of ecosystem services for human well-being. This concept of *Sato-umi* can work as the coastal management tool, through the human activities including fisheries going together with the Nature of coastal waters with symbiotic relationship on harmonious base. The participatory actions of city people can be also enhanced to enjoy the local amenities including fresh fish and fisheries products, local cultures and scenery of fishing villages, and to join the nature conservation program through the eco-tourisms.

Case studies on Light Fishing

- *What is Impact of Light Fishing?*

Fishing with light has been one of the most advanced and efficient methods for attracting and controlling fish and squids for capture purpose. All fishers/fishing boats wish to have higher lighting output than others for better catch, which is accelerated through the technical development of lighting devices for the Incandescent lamp, Halogen lamp and Metal halide lamp, so as to accelerate the *lighting power competition* among the fishing boats in the congested fishing ground. This resulted into *cost increase* due to the high fuel consumption, really the negative impact for fishers by decreasing the income in cost-benefit balancing. The negative environmental impact is the CO_2 *emission* through the exhausting fumes, which is directly linked with the global warming issues.

The positive impact is the very species-selective capture function in case of squid jigging, while the negative biodiversity impact is the mixed catch of species and sizes in case of purse seine. Another negative impact can happen in the coastal waters for the small-scale fisheries through the very efficient way of attracting and catching with large-scale fishing.

- *How to Monitor the Impact of Light Fishing?*

The research process for evaluating the impact is firstly to monitor the lighting output and the underwater light intensity, thorough the direct measurement at sea, or simulation process to calculate the light intensity according to the lighting output. The comparative fishing with differed lighting output is very practical approach to evaluate the rational use of lighting devices and to prevent the excessive use of lighting outputs. For this purpose, the evaluation of catch quantity and quality according to the lighting quantity (kW and number of bulbs) and quality (color or wavelength patterns) can be helpful, together with the better understanding of Physiological and behavioral response of target and unwanted species to light.

- *How to Minimize the Impact of Light Fishing?*

Awareness building for cost-benefit balance is a good idea for changing the fishers' attitude, to minimize the cost for fuel consumption on fishing light. For the challenging attitude to reduce the lighting output, the setting of the maximum level is required, otherwise the higher output boats can affect the catch of lower output boats in case of fishing in the close vicinity of the fishing ground. In this point, the distance among boats for positioning to fish can be the key for giving the fair opportunity among boats to attract and catch animals.

Zoning of the fishing ground can be also of practical approach for protecting the small-scale fisheries in the coastal waters, against the very effective commercial fisheries with light such as purse seine. Even among the commercial scale boats, the zoning for fishing ground according to the fishing capacity such as the boat size, lighting output can be a good idea.

- *LED Application for reducing the fuel consumption*

The Application of Light Emitting Diode (LED) for light fishing is now progressing in Japan for the purse seine, stick-held lift-net and squid jigging as onboard or underwater lighting system. In the initial trial stage since 2000, the governmental supports have been deployed for installing the new devices of LED panels by replacing the conventional lamps, and for long-term monitoring the trend of catch and fuel consumption through the practical commercial scale operations, for confirming the decrease of fuel consumption. Even with the high investment cost for introducing new LED devices, it was confirmed for the stick-held lift-net to depreciate the initial cost in 5-10 years, by keeping the catch trend as before.

The LED application can also give the innovative fishing strategy to control the response of fish and squids, by means of the instantaneous on/off flickering patterns or of the color conditions with RGB mixture, for attracting, herding and barrier trapping, in order to develop the smarter usage of fishing light, including the species/size-selective control in the very near future.

Annex 18

FISH UTILIZATION AND TRADE

Dr. Lahsen Ababouch,
Food and Agricultural Organization of the United Nations (FAO)

Introduction

Fisheries and aquaculture are an important source of food and also a provider of livelihoods and economic benefits for many countries engaged in harvesting, culturing, processing and trading of fish. For example, fisheries and aquaculture supply over 1.5 billion people with almost 20 percent of their average animal protein intake and 3 billion people with at least 15 percent of their average animal protein intake. In addition, around 45 million people were directly engaged, full time or part time, in fisheries and aquaculture and an additional 135 million people work in subsequent activities (FAO, 2010). Likewise, fish and seafood are commodities that have been preserved and traded since the Bronze Age. Around 32 to 40 percent of fish globally harvested entered international trade over the last 40 years, increasing in value from a mere US$ 8 billion in 1976 to an estimated export value of US$ 102 billion in 2008. Developing countries contribute almost 50 percent in value of world exports of fish and fishery products. But fish and seafood are highly perishable. Immediately after capture, several chemical and biological changes can take place in the fish flesh and lead to rejection for human consumption because of spoilage. These fish post-harvest losses remain unfortunately important, especially in coastal areas of developing countries. Estimated at 10 to 12 million tons, they account for more than 8 percent of global fish production, but can reach over 30% in some developing countries (Ward, 2007). Understanding the causes of post harvest losses and the options for their prevention can assist in the choice of the most appropriate and cost effective preservation and utilization methods. Following is an analysis of fish and aquaculture production, utilization, economics and trade and of the main issues to be addressed to promote responsible fish utilization and trade, for a sustainable social and economic development of the fishing and aquaculture communities, while preserving food security and the environment.

Fish production, utilization and trade

Production

The world production from capture fisheries and aquaculture remains very significant for global food security and food trade, providing an apparent per capita supply of 17.2 kg (live weight equivalent LWE) in 2009. It averaged 138.2 million tonnes per year during the period 2000-2009, with a record high of 145.1 million tonnes in 2009 (Table 1). While fish production from capture fisheries has stagnated at around 90 to 92 million tonnes over the years, the demand for fish and fishery products has continued to rise (Figure 1). Consumption has more than doubled since 1973. The increasing demand has been steadily met by a robust increase in aquaculture production, estimated at an average 8.3% yearly growth during the period 1970-2008, while the world population grew at an average of 1.6 percent per year. As a result, the average annual per capita supply of food fish from aquaculture for human consumption has increased ten folds, from 0.7 kg in 1970 to 7.8 kg in 2008, at an average rate of 6.6 percent per year. This trend is projected to continue, with the contribution of aquaculture to fish food supply estimated to reach 60% by 2020, if not before. Global capture fisheries production in 2008 was about 90 million tonnes, comprising about 80 million tonnes from marine waters and a record 10 million tonnes from inland waters (Table 1). World capture fisheries production has been relatively stable in the past decade, with the exception of marked fluctuations driven by catches of anchoveta-a species extremely susceptible to oceanographic conditions determined by the El Niño Southern Oscillation-in the Southeast Pacific. Fluctuations in other species and regions tend to compensate for each other to a large extent. In 2008, China, Peru and Indonesia were the top producing countries. China remained by far the global leader with production of about 15 million tonnes (figure 2).

Table 1. World fisheries and aquaculture production and utilization 2004 – 2009 (FAO, 2010)

	2004	2005	2006	2007	2008	2009*
PRODUCTION		(million tonnes)				
Inland:						
Capture	8.6	9.4	9.8	10.0	10.2	10.1
Aquaculture	25.2	26.8	28.7	30.7	32.9	35.0
Total inland	33.8	36.2	38.5	40.6	43.1	45.1
Marine:						
Capture	83.8	82.7	80.0	79.9	79.5	79.9
Aquaculture	16.7	17.5	18.6	19.2	19.7	20.1
Total marine	100.5	100.1	98.6	99.2	99.2	100.0
Total capture	92.4	92.1	89.7	89.9	89.7	90.0
Total aquaculture	41.9	44.3	47.4	49.9	52.5	55.1
Total world fisheries	134.3	136.4	137.1	139.8	142.3	145.1
UTILIZATION						
Human consumption	104.4	107.3	110.7	112.7	115.1	117.8
Non-food uses	29.8	29.1	26.3	27.1	27.2	27.3
Population (Billions)	6.4	6.5	6.6	6.7	6.8	6.8
Per capita food fish supply (kg)	16.2	16.5	16.8	16.9	17.1	17.2

Note: Excluding aquatic plants. Data for 2009 are provisional estimates.

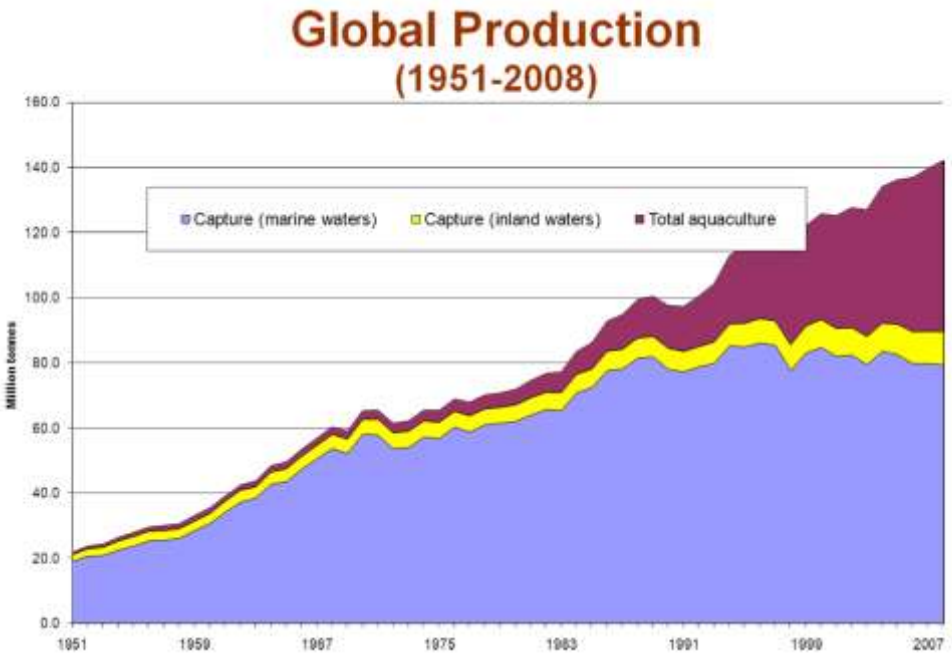

Figure 1. Global Fisheries and aquaculture production (1951-2008)

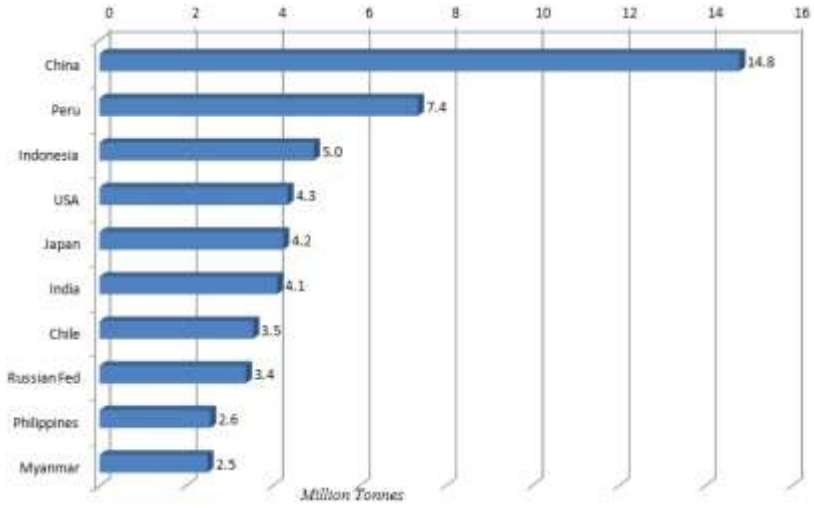

Figure 2a. Global capture fisheries production in 2008: top ten producers and 10 species

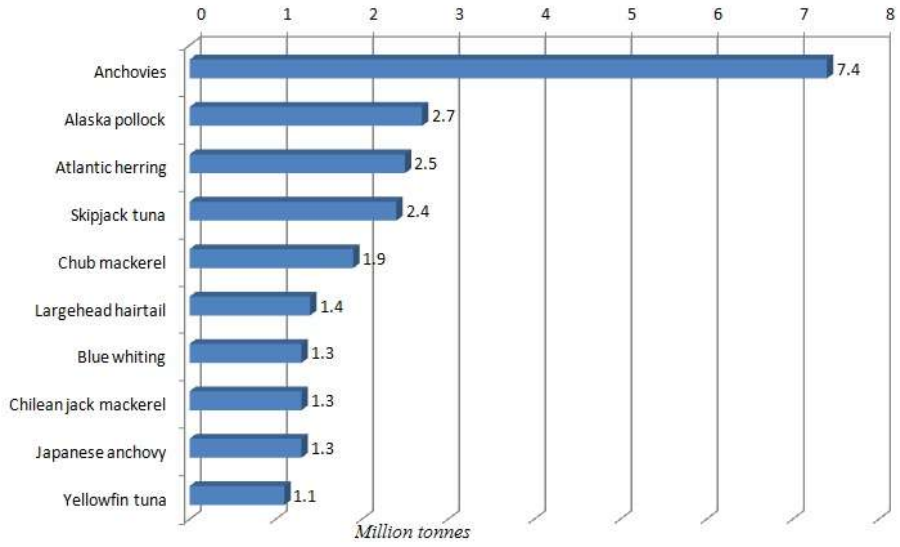

Figure 2b. Marine capture production: top ten species in 2008

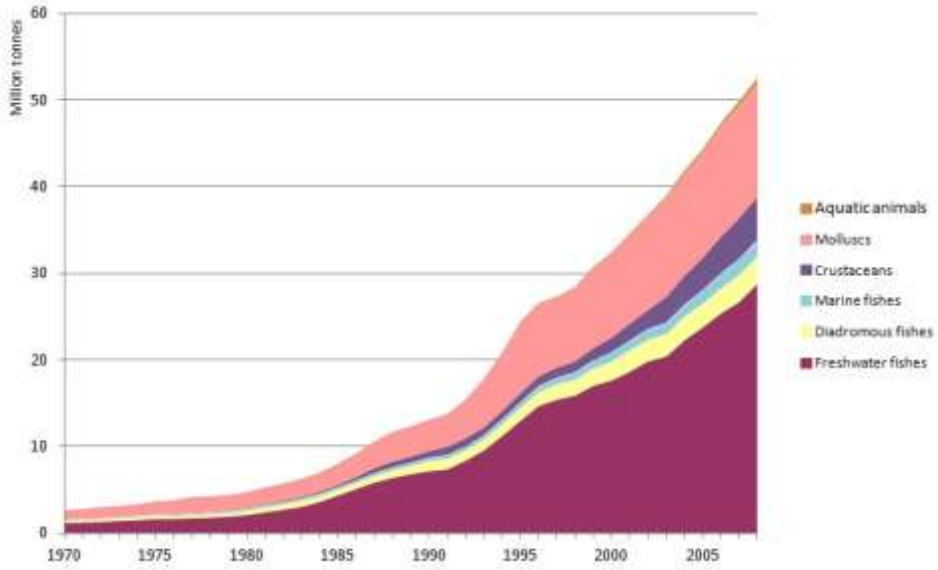

Figure 3. Trends in world aquaculture production: major species groups

Table 2. Top 15 aquaculture producers by quantity in 2008 and annual growth rate

	Production (1000 tonnes)			Average annual rate of growth (Percentage)		
	1990	2000	2008	1990-2000	2000-2008	1990-2008
China	6 482	21 522	32 736	12.7	5.4	9.4
India	1 017	1 943	3 479	6.7	7.6	7.1
Viet Nam	160	499	2 462	12.0	22.1	16.4
Indonesia	500	789	1 690	4.7	10.0	7.0
Thailand	292	738	1 374	9.7	8.1	9.0
Bangladesh	193	657	1 006	13.1	5.5	9.6
Norway	151	491	844	12.6	7.0	10.0
Chile	32	392	843	28.3	10.1	19.8
Philippines	380	394	741	0.4	8.2	3.8
Japan	804	763	732	-0.5	-0.5	-0.5
Egypt	62	340	694	18.6	9.3	14.4
Myanmar	7	99	675	30.2	27.1	28.8
United States of America	315	456	500	3.8	1.2	2.6
Korea, Republic of	377	293	474	-2.5	6.2	1.3
Taiwan Province of China	333	244	324	-3.1	3.6	-0.2

Notes: Data exclude aquatic plants.

However, growth rates for aquaculture production are slowing, reflecting the impacts of a wide range of factors, and vary greatly among regions. Latin America and the Caribbean showed the highest average annual growth (21.1 percent) in the period 1970-2008, followed by the Near East (14.1 percent) and Africa (12.6 percent). During the same period, China's aquaculture production increased at an average annual growth rate of 10.4 percent, although it has declined to 5.4 percent in the new millennium. This is significantly lower than in the 1980s (17.3 percent) and 1990s (12.7 percent). In Europe and North America, the annual growth rate decreased substantially since 2000 to 1.7 percent and 1.2 percent, respectively. The once-leading countries in aquaculture development such as France, Japan and Spain have seen declining production in the past decade. It is expected that, while world aquaculture production will continue to grow in the coming decade, the rate of increase in most regions will slow.

Economics

The sector of fisheries and aquaculture contributes significantly to national economies, income and livelihood for millions of people around the world. In 2008, the first sale value of capture fisheries was estimated at US$ 93.9 billion and that of aquaculture at 105.8 billion, including US$ 7.4 billion of aquatic plants. This harvest undergoes a primary and a secondary processing and distribution, generating additional value at each subsequent step. Based on a methodology developed by (Gudmundsson, Asche and Nielsen, 2006), the additional values were estimated in 2008 at US$ 90 billion, US$ 180 billion and US$ 350 billion respectively for primary processing, secondary processing and distribution, in addition to employment opportunities, especially for women employed in first and secondary processing in developing countries (Figure 4).

Figure 4. Fisheries and aquaculture value chain in 2008

Employment in fisheries and aquaculture has grown substantially in the last three decades, with an average rate of increase of 3.6 percent per year since 1980. It is estimated that, in 2008, 44.9 million people were directly engaged, full time or part time, in capture fisheries and aquaculture, and at least 12 percent of these

were women. This represents a 167 percent increase since 1980 (16.7 million people) and 3.5 percent of the 1.3 billion people economically active in the broad agriculture sector worldwide in 2008, compared with 1.8 percent in 1980. It is also estimated that, for each person employed in capture fisheries and aquaculture production, about three jobs are generated in subsequent activities, for a total of more than 180 million jobs in the fisheries and aquaculture sector. Considering that on average, each jobholder provides for three dependants or family members, the sector is likely to support the livelihoods of a total of about 540 million people, or 8.0 percent of the world population. In 2008, 85.5 percent of fishers and fish farmers were in Asia, followed by Africa (9.3 percent), Latin America and the Caribbean (2.9 percent), Europe (1.4 percent), North America (0.7 percent) and Oceania (0.1 percent). China is the country with the highest number of fishers and fish farmers, representing nearly one-third of the world total. Although the highest concentration of people employed in the primary sector is in Asia, average annual production per person there is only 2.4 tonnes, whereas it is almost 24 tonnes in Europe and more than 18 tonnes in North America. This reflects the degree of industrialization of fishing activities, but also the key social role played by small-scale fisheries in Africa and Asia. The difference is even more evident in the aquaculture sector, where, for example, fish farmers' average annual production in Norway is 172 tonnes per person, as compared to 72 tonnes in Chile, 6 tonnes in China and 2 tonnes only in India (FAO, 2010).

Fish Utilization

As a highly perishable commodity, fish is often processed to conserve its nutritional properties and prolong its shelf life. It is estimated that over 1,200 fish and seafood species are harvested commercially worldwide, with a wide variation in appearance, taste, and price, although their nutritional attributes are broadly similar, particularly with reference to their protein content (OECD, 1995).

Fish can be processed in a great variety of ways and product forms and is generally distributed as live, fresh, chilled, frozen, heat-treated, fermented, dried, smoked, salted, pickled, boiled, fried, freeze-dried, minced, powdered or canned, or as a combination of two or more of these forms. These many options for processing fish allow for a wide range of tastes and presentations, making fish one of the most versatile food commodities. Yet, unlike many other food products, processing does not necessarily lead to greater value than that of premium fresh fish. In fact, for many finfish species, premium fresh gutted fish can fetch the highest price.

During the period 2004-2009, 104.4 to 117.8 million tons, representing on average 80 percent of yearly world fish production, were used for direct human consumption (Table 1). The remaining 27 to 30 million tonnes, were destined for non-food products, in particular for the manufacture of fishmeal and oil. The data on Figure 5 show that, the proportion of fish used for direct human consumption has grown since the mid-1990s, mainly because more fish is used as food and less for producing fishmeal and fish oil. Also, the proportion of fish marketed in live/fresh form worldwide increased more significantly over the years compared with other products.

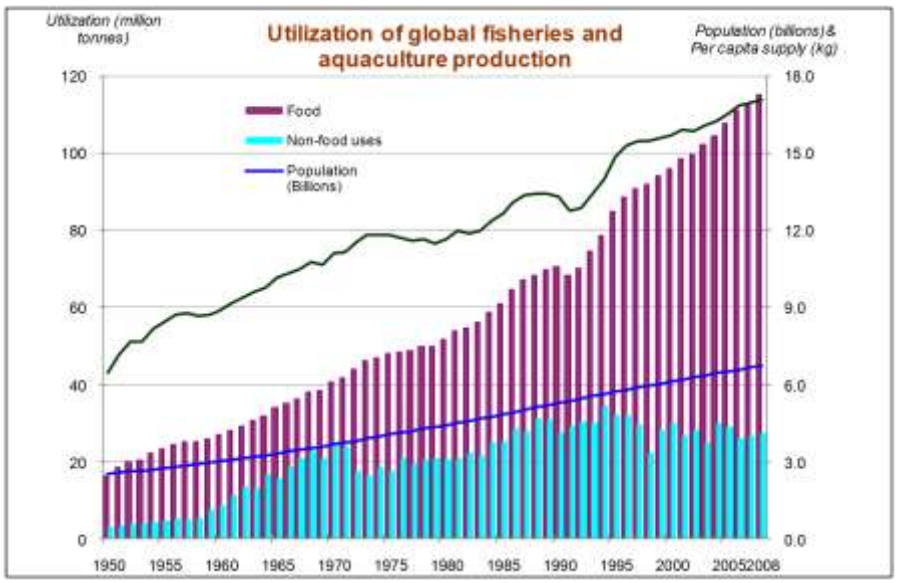

Figure 5. Utilization and supply of world fisheries and aquaculture production (1950-2008)

Small pelagics, in particular anchoveta, are the main groups of species used for the production of fishmeal and fish oil. The El Niño phenomenon affects considerably anchoveta catches, which has experienced a series of peaks and drastic drops in the last few decades. Since the peak of 30.2 million tonnes (LWE) in 1994, anchovies catches have been fluctuating significantly. In the last three years, they have stabilized at around 21 million tonnes per year.

Of the fish destined for direct human consumption, fish in live or fresh-fish form was the most important product, with a share of 49.1 percent, followed by frozen fish (25.4 percent), prepared or preserved fish (15.0 percent) and cured fish (10.6 percent). Live and fresh fish increased in quantity from 45.4 million tonnes in 1998 to 56.5 million tonnes in 2008. Processed fish for human consumption increased from 46.7 million tonnes in 1998 to 58.6 million tonnes in 2008. Freezing represents the main method of processing fish for human consumption, and it accounted for a 49.8 percent share of total processed fish for human consumption and 20.5 percent of total fish production in 2008 (Figure 6).

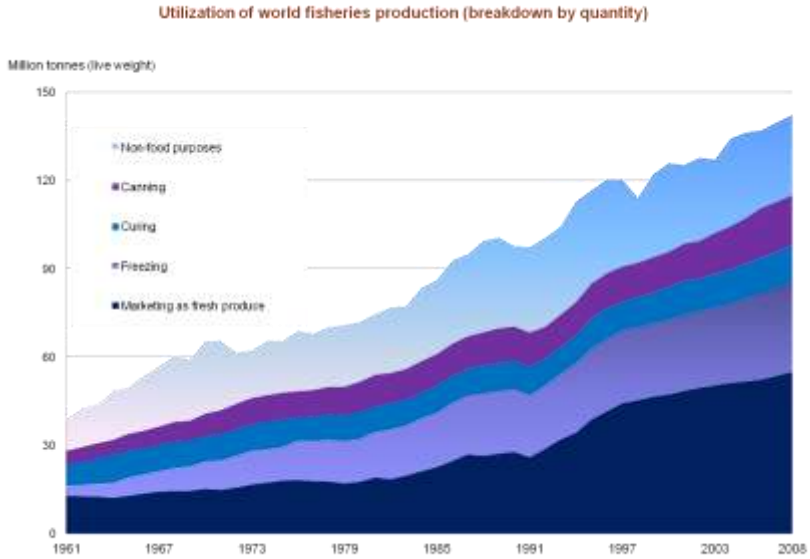

Figure 6. Utilization of world fisheries and aquaculture production (1960-2008)

However, these general data mask significant differences, depending on the continent, region, country and even within countries. The highest percentage of fishmeal is produced by Latin American countries (47 percent of the total). The proportion of cured fish is higher in Africa (14 percent of the total) compared with other continents (the world average is 8.6 percent). In Europe and North America, more than two thirds of fish used for human consumption is in frozen and canned forms.

In developing countries of Africa, Asia and Latin America, a large proportion of fish is marketed in live or fresh forms representing 60 percent of fish destined for human consumption in 2008. Live fish is particularly appreciated in Asia and in niche markets in other countries, mainly among immigrant Asian communities. However, notwithstanding technical changes and innovations, many of these countries still lack adequate infrastructure, especially properly equipped landing centres with access to electricity, potable water, roads, ice plants, cold rooms and refrigerated transport. These factors, combined with tropical temperatures, cause a high percentage of post-harvest losses and quality deterioration. Market infrastructure and facilities are often limited and congested, increasing the difficulty of marketing perishable goods.

It is worth noting in the last few years, developing countries have experienced a growth in the share of frozen products (18.4 percent in 2008, up from 7.7 percent in 1998) and of prepared or preserved forms (11.8 percent in 2008, compared with 7.8 percent in 1998). Notwithstanding these differences and limitations, globally, the fish industry has been dynamic during the last two decades. Fish utilization and processing have diversified significantly, particularly into high-value fresh and processed products, fuelled by changing consumer tastes and advances in technology, packaging, logistics and transport. Processing is becoming more intensive, geographically concentrated, vertically integrated and linked with global supply chains. These changes reflect the increasing globalization of the fisheries value chain, with the growth of international distribution channels controlled by large retailers. More and more producers in developing countries are being linked with, and coordinated by, firms located abroad. The increasing practice of outsourcing processing has gained significance, its extent depending on the species, desired products and cost of labor and transportation. For

example, whole fish from European and North America are sent to Asia (China in particular, but also India and Viet Nam) for filleting, packing and re-export. In Europe, smoked and marinated products are processed in Central and Eastern Europe, in particular in Poland and in the Baltic countries. European shrimp is peeled in North Africa and tuna loins or canned tuna are prepared in many African and Latin American countries. For some commodities, an entire industry has been delocalized over the years from the developed to the developing world. For example, the preparation of salted anchovies has been moved from Southern European countries to North Africa, mainly Morocco (Ababouch and El Marrakchi, 2009). The further outsourcing of production to developing countries is restricted specifically by sanitary and hygiene requirements that can be difficult to meet. At the same time, processors are frequently becoming more integrated with producers, with large processors in Asia, but also in Africa and Latin America rely on their own fishing vessels or aquaculture farms for the supply of groundfish, salmon, catfish and shrimp to improve the product mix, obtain better yields and respond to evolving quality and safety requirements in importing countries.

In developed countries, innovation in value addition is mainly focused on increased convenience foods and a wider variety of high-value-added products, mainly in fresh, frozen, breaded, smoked or canned form. These require sophisticated production equipment and methods and, hence, access to capital. The resulting fish products are commercialized as a variety of branded ready to eat meals.

In developing countries on the other hand, because of cheaper labour, manual processing is still widespread for filleting, salting, canning, drying and fermentation, thus providing livelihood support to large numbers of people in coastal areas in these countries. But, in several developing countries, fish processing is evolving towards more value adding processes such as breading, cooking, vacuum packaging or individual quick-freezing. Some of these developments are also driven by demand in the domestic retail industry, especially in countries with increasing middle class, or by a shift in cultured species.

Finally, important innovations have also been achieved in the utilization of fish waste derived from the fish-processing industry. Chitin and chitosan obtained from shrimp and crab shells are now used in water treatments, cosmetics and toiletries, food and beverages, agrochemicals and pharmaceuticals. Skin of fish such as shark, salmon, ling, cod, hagfish, tilapia, Nile perch, carp and seabass is used as a source of gelatin as well as leather in making clothing, shoes, handbags, wallets and belts. Fish collagen is used in the pharmaceutical industry, as are carotenoids and astaxanthins-pigments that can be extracted from crustacean wastes. Fish silage and fish protein hydrolysates obtained from fish viscera are finding applications in the pet feed and fish feed industries. A number of anticancer molecules have been discovered following research on marine sponges, bryozoans and cnidarians. These molecules are now chemically synthesized, while research on how to cultivate these sponge species is ongoing. Procedures for the industrial preparation of biofuel from fish waste as well as from seaweeds are being developed and their economical feasibility assessed.

Fish Consumption

For many countries, the sector of fisheries and aquaculture is vital for food security, not only for subsistence and small scale fishers who rely directly on fisheries for food and incomes, but also for consumers who can have access to an excellent source of animal protein, which contains all the essential amino acids. It is estimated that a portion of 150 g of fish provides about 50–60 percent of the daily protein requirements for an adult. Fish is also a source of essential micronutrients, including various vitamins and minerals and highly unsaturated fatty acids with well established health benefits (Lewin *et al*., 2005; Mozaffari and Rimm, 2006). Although in many countries, especially in developing countries, the average per caput fish consumption may be low, but even in small quantity, fish can significantly improve the quality of dietary proteins by complementing the essential amino acids that are often absent or present only in low quantities in vegetable-based diets.

Total and per capita fish food supplies have expanded significantly in the last five decades. Total food fish supply has increased at an annual rate of 3.1 percent since 1961, while the world population has increased by 1.7 percent per year in the same period. Annual per capita fish consumption grew from an average of 9.9 kg in the 1960s to 17.2 kg in 2009 (Table 1 and Figure 6). Table 3 shows per capita consumption and the difference between countries and regions reflecting the different levels of availability of fish and other foods, diverse food traditions, tastes, income levels, prices and seasons. Annual per capita apparent fish consumption can vary from less than 1 kg in one country to more than 100 kg in another. Differences are also evident within countries, with consumption usually higher in coastal areas.

Table 3. Fish food supply by continent and economic grouping in 2007

	Total fish food supply (million tonnes LWE)	Per capita fish food supply (kg/year)
World	113.1	17.0
World excl China	78.2	14.6
Africa	8.2	8.5
North America	8.2	24.0
Latin America and the Caribbean	5.2	9.2
Asia	74.5	18.5
Europe	16.2	22.2
Oceania	0.9	25.2
Industrialized countries	27.4	28.7
Other developed countries	5.5	13.7
Least developed countries	7.6	9.5
Other developing countries	72.6	16.1
LIFDCs	61.6	14.4
LIFDCs ex China	26.7	9.0

Countries in the sub-Saharan Africa region have experienced a static or decreasing fish consumption, whereas countries of the former Soviet Union in Eastern Europe and Central Asia experienced major declines in the 1990s. The most substantial increases in annual per capita fish consumption have occurred in East Asia (from 10.8 kg in 1961 to 30.1 kg in 2007), Southeast Asia (from 12.7 kg in 1961 to 29.8 kg in 2007) and North Africa (from 2.8 kg in 1961 to 10.1 kg in 2007). China, in particular, has seen dramatic growth in its per capita fish consumption, with an average growth rate of 5.7 percent per year in the period 1961–2007, owing to the substantial increase in aquaculture production. If China is excluded, in 2007, annual per capita fish supply was about 14.6 kg, slightly higher than the average values of the mid-1990s, and lower than the maximum levels registered in the mid-1980s.

The total amount of fish consumed and the species composition of the fish food supply vary according to regions and countries. Of the 111 million tonnes available for human consumption in 2007, consumption was lower in Africa (8.2 million tonnes, with 8.5 kg per capita), while Asia accounted for two-thirds of total consumption, with 74.5 million tonnes (18.5 kg per capita), of which 39.6 million tonnes was consumed outside China (14.5 kg per capita). Likewise, per capita consumption was 25.2 for Oceania, 24.0 for North America, 22.2 for Europe, 9.4 for Central America and the Caribbean, and 9.1 kg per capita for South America.

Because of their increasing reliance on fish import, apparent fish supply rose from 16.7 million tonnes (LWE) in 1961 to 33.0 million tonnes in 2007 in developed countries and this is forecast to continue because of the increasing demand and the decreasing fisheries production (down 16 percent in the period 1998-2008) of these countries. Apparent fish consumption in developed countries grew from 17.2 kg per capita per year in 1961 to 24.3 kg in 2007. However, the share of fish to animal protein intake, after consistent growth up to 1984, declined from 13.3 percent in 1984 to 12.0 percent in 2007, because of higher consumption of other animal proteins.

Regarding species groups, annual per capita availability of crustaceans grew substantially from 0.4 kg to 1.6 kg and that of molluscs (including cephalopods) from 0.8 kg to 2.5 kg during the period 1961-2007, although consumption of these highly priced species is concentrated mainly in affluent economies. The increasing production of salmon, trouts and selected freshwater species has led to a significant growth in annual per capita consumption of freshwater and diadromous species, up from 1.5 kg in 1961 to 5.5 kg in 2007. In the last few years, no major changes have been experienced by the other broader groups.

Consumption of demersal and pelagic fish species has stabilized at about 3.0 kg per capita per year. Demersal fish continue to be among the main species favoured by consumers in Northern Europe and in North America (8.5 kg and 7.0 kg per capita per year, respectively, in 2007), whereas cephalopods are mainly preferred by Mediterranean and East Asian countries. Of the 17.0 kg of fish per capita available for consumption in 2007, about 75 percent came from finfish. Shellfish supplied 25 percent (or about 4.1 kg per capita), subdivided into 1.6 kg of crustaceans, 0.6 kg of cephalopods and 1.9 kg of other molluscs. Freshwater and diadromous species accounted for about 36.4 million tonnes of the total supply. Marine finfish species provided about 48.1 million tonnes, of which 20.4 million tons were pelagic species, 20.0 million tonnes were demersal fish, and 7.7 million tons were unidentified marine fish.

In addition, many studies have established the health benefits of fish consumption. In addition to the provision of high quality animal proteins, fish and fisheries products are a unique sources of the long chained (LC) omega-3 fatty acids (docosahexaenoic acid (DHA), essential for an optimal development of the brain and neural system, and eicosapentaenoic acid (EPA)) well known to prevent coronary heart disease (CHD) in the adult population (Lewin *et al.*, 2005; Mozaffari and Rimm, 2006). DHA is a major building block of the human brain where it is mainly incorporated during the period starting at the third trimester of a pregnancy and expanding over the two first years after birth (Martinez, 1992; Lewin, 2005).

Likewise, a pooled analysis of 19 different studies has shown a 36% risk reduction on CHD mortality with a daily consumption of 250 mg/day of LC omega-3 fatty acids (Mozaffari and Rimm, 2006). The role of fish consumption in mitigating mental disorders, such as depression and dementia, is increasingly recognized (FAO, 2011).

Furthermore, fish is among the best sources of essential micronutrients. Micronutrient deficiencies are affecting hundreds of million people, particularly women and children in the developing world. More than 250 million children worldwide are at risk of vitamin A deficiency, 200 million people have goitre, and 20 million are mentally retarded as a result of iodine deficiency, 2 billion people (over 30% of the world's population) are iron deficient, and 800,000 child deaths per year are attributable to zinc deficiency (WHO, 2005; 2007; 2009). Many rural diets in many countries may not be particularly diverse, and thus, it is vital to have access to food that can provide the essential nutrients. Improving access and consumption of fish and seafood could help in combating micronutrient deficiencies. Essential minerals, such as calcium, iodine, zinc, iron and selenium are widely found in fish products, particularly in small species that are consumed whole. Seafood is almost the only natural source of iodine, and iron and zinc are found in significant amounts, particularly in fish species eaten whole such as the small indigenous fish Chanwapileng (*Esomuslongimanus*) from Cambodia. Only 20 grams of this species eaten whole can be one of the best sources of dietary minerals such as iron and zinc, meeting the daily need of iron and zinc of a child (Roos *et al*., 2007).

Vitamins A, D and the B vitamin complex are found in significant amounts in many fish species such as the small indigenous fish species from Bangladesh, Mola (*Amblypharyngodonmola*), which is reported to contain over 2,500 µg RAE of vitamin A in 100 g. of fish; making it possible for 140 g. of this fish to cover a child's weekly need of vitamin A (Roos *et al*., 2007).

However, there is a growing public concern regarding the presence of chemical contaminants in fish. This concern has become more apparent in recent years, while during the same period the multiple nutritional benefits of including fish in the diet have become increasingly clear. Some fish species are known to contain contaminants such as methyl mercury and dioxins. While the levels of such contaminants in seafood are well below the maximum levels established for their safe intake, some long-lived predator species can contain levels of these contaminants that exceed the levels regarded as safe for consumption. The evolving science in this field has led to questions about how much fish should be eaten, and by whom, in order to minimize the risks of chemical exposures and maximize the health benefits. National authorities have been faced with the challenge of communicating complicated and nuanced messages to consumers and also with questions on regulating maximum levels of these chemical contaminants in fish and other foods.

A recent FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption reviewed data on nutrient and specific chemical contaminant levels in a range of fish species, as well as recent scientific literature covering the risks and benefits of fish consumption (FAO, 2011). The review was used to consider risk-benefit assessments for specific end-points of benefits and risks, including for sensitive groups of the population. The output is intended to provide guidance to national food safety authorities and the Codex Alimentarius Commission in their work on managing risks taking into account the existing data on the benefits of eating fish.

The consultation concluded that:

- Consumption of fish provides energy, protein, and a range of other important nutrients, including the long-chain n-3 poly unsaturated fatty acids (LCn3PUFA).
- Eating fish is part of the cultural traditions of many peoples and in some populations is a major source of food and essential nutrients.
- Among the general adult population, consumption of fish, particularly oily fish, lowers the risk of coronary heart disease (CHD) mortality. There is absence of probable or convincing evidence of CHD risks of MeHg. Potential cancer risks of dioxine like compounds (DLCs) are well below established CHD benefits.
- When considering benefits of LCn3PUFA vs. risks of MeHg among women of childbearing age: maternal fish consumption lowers the risk of suboptimal neurodevelopment in their offspring compared to women not eating fish in most circumstances evaluated.
- At levels of maternal DLCs intake (from fish and other dietary sources), which do not exceed the provisional tolerable monthly intake (PTMI) of 70 pico grams/kg bodyweight/month established by JECFA, neuro developmental risk for the foetus is negligible. At levels of maternal DLCs in take (from fish and other dietary sources) that exceed the PTMI, neuro developmental risk may no longer be negligible.
- Among infants, young children, and adolescents, the available data are currently insufficient to derive a quantitative framework of health risks and benefits of eating fish. However, healthy dietary patterns that include fish and are established early in life influence dietary habits and health during adult life.

In order to minimize risks in target populations, the Consultation recommended a series of steps that member states should take to better access and manage the risks and benefits of fish consumption and more effectively communicate with their citizens:

- Acknowledge fish consumption as an important food source of energy, protein, and a range of essential nutrients and part of the cultural traditions of many peoples.
- Emphasize the benefits of fish consumption on reducing CHD mortality for the general adult population.
- Emphasize the neurodevelopment benefits to their offspring of fish consumption by women of childbearing age, particularly pregnant women and nursing mothers.
- Develop, maintain, and improve existing databases on specific nutrients and contaminants, particularly MeHg and DLCs, in fish consumed in their region.
- Develop and evaluate risk management and communication strategies that both minimize risks and maximize benefits from eating fish.

Fish Trade

Total world trade of fish and fishery products has seen an important increase during the last three decades, going from a mere US$ 8 billion in 1976 to a record export value of US$ 102 billion in 2008, at an average annual growth rate of 8.3 percent in value (Figure 7).

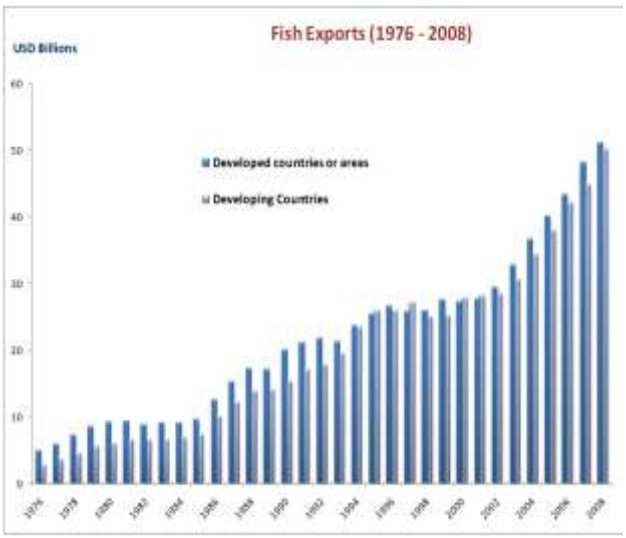

Figure 7. Global export of fish and fishery products (1976-2008)

Trade in fish and fishery products is characterized by a wide range of product types and participants. In 2008, 197 countries reported exports of fish and fishery products. Fish export is important for many economies, in particular for developing nations where it generates foreign currency earnings, in addition to the sector's impact on employment, income and food security. In a few cases, fishery exports are crucial for the economy. For example, in 2004 they accounted for more or about a half of the total value of merchandise trade for St. Pierre and Miquelon, Maldives, Federal States of Micronesia, Iceland, Panama and Kiribati (FAO, 2010).

The 2008 fish exports figure indicates a record of US$ 102.0 billion, 9 percent higher than 2007, and nearly double the US$51.5 billion corresponding value in 1998. This represents about 10% of total agricultural exports and 1% of world merchandise trade. In real terms, fish export grew by 11 percent in the period 2006–2008, by 50 percent between 1998 and 2008 and by 76 percent between 1988 and 2008. In quantity terms (live weight equivalent), exports was 55 million tonnes in 2008, representing an increase of 28 percent since 1995 and of 104 percent since 1985, although some slight decline was observed since 2005. This decline was mainly because of a fall in production and trade in fishmeal (down 10 percent in the period 2005-2008), but also to the first signs of contraction in demand as a consequence of the food price crisis, which affected consumer confidence in major markets.

Similarly to other food commodities, prices of fish and fishery products were also affected by the food price crisis of 2006-2008 when they reached record levels. The FAO Fish Price Index indicates an increase from 93.6 in February 2007 to 128.0 in September 2008. This represents the highest value reached since 1994, with the base year 1998–2005 = 100). Prices for species from capture fisheries increased more than those for farmed species (which reached 137.7 versus 117.7 in September 2008, with 2005 as base year = 100) because of the larger impact from higher energy prices on fishing vessel operations than on farmed species.

Following the economic recession of September 2008, food prices fell dramatically. The FAO Fish Price Index reported a drastic drop from 128.0 in September 2008 to 112.6 in March 2009, before recovering to 119.5 in November 2009. Provisional data for 2010 indicate that there have been increasing signs that fish trade is recovering in many countries, and the long term forecast for fish trade remains positive.

Table 4 shows the top ten exporters and importers of fish and fishery products in 1998 and 2008. China, Norway and Thailand are the top three exporters. Since 2002, China has been by far the leading fish exporter, contributing almost 10 percent of world fish export, estimated at US$10.1 billion in 2008 and at US$10.3 billion in 2009, although this represents a mere 1 percent of its total merchandise exports. China is also the sixth-largest importer, with an import value estimated at US$ 5.1 billion in 2008, as compared to US$ 1 billion in 1998. This increase in imports reflects the lowered import duties following China's accession to the World Trade Organization (WTO) in late 2001, the rising imports of raw material for reprocessing, as well as the growing domestic consumption of high-value species that are not available from local sources.

Viet Nam has also experienced significant growth in fish export, up from US$ 0.8 billion in 1998 toUS$4.6 billion in 2008, when it became the fifth-largest exporter in the world. Its growing exports are linked to its flourishing aquaculture industry, in particular to the production of *Pangasius* spp. and of both marine and freshwater shrimps and prawns.

In addition to China, Thailand and Viet Nam, many other developing countries play a major role in global fish export. In 2008, developing countries accounted for 80 percent of world production. Their fish export accounted for 50 percent (US$ 50.8 billion) of world fish export in value and 61 percent (33.8 million tonnes) in quantity. Fishmeal represented 36 percent by quantity, but only 5 percent by value of developing countries export in 2008.

A major barrier for fish export by developing countries is represented by the stringent quality- and safety standards and buyers requirements for animal health, environmental and social responsibility standards. In addition, the increasing power of large retail and food services in seafood distribution is shifting negotiating power towards the final stages in the value chain, and retailers are also imposing more and more private- or market-based standards and labels on exports from developing countries. All the above are making it more difficult for small-scale fish producers and operators to penetrate international markets and distribution channels.

Table 4. Top ten exporters and importers of fish and fishery products

	1998 (US$ millions)	2008	APR (Percentage)
Exporters			
China	2 656	10 114	14.3
Norway	3 661	6 937	6.6
Thailand	4 031	6 532	4.9
Denmark	2 898	4 601	4.7
Viet Nam	821	4 550	18.7
United States of America	2 400	4 463	6.4
Chile	1 598	3 931	9.4
Canada	2 266	3 706	5.0
Spain	1 529	3 465	8.5
Netherlands	1 365	3 394	9.5
TOP TEN SUBTOTAL	23 225	51 695	8.3
REST OF WORLD TOTAL	28 228	50 289	5.9
WORLD TOTAL	**51 453**	**101 983**	**7.1**
Importers			
Japan	12 827	14 947	1.5
United States of America	8 576	14 135	5.1
Spain	3 546	7 101	7.2
France	3 505	5 836	5.2
Italy	2 809	5 453	6.9
China	991	5 143	17.9
Germany	2 624	4 502	5.5
United Kingdom	2 384	4 220	5.9
Denmark	1 704	3 111	6.2
Republic of Korea	569	2 928	17.8
TOP TEN SUBTOTAL	39 534	67 377	5.5
REST OF WORLD TOTAL	15 665	39 750	9.8
WORLD TOTAL	**55 199**	**107 128**	**6.9**

Note: APR refers to the average annual percentage growth rate for 1998-2008.

On the other hand, developing countries rely heavily on imports from developed countries to supply the processing industry, including for re-export, and the domestic markets (mainly low-priced, small pelagic as well as high-value fishery species for emerging economies). In 2008, out of 75 percent (in value) of fish export from developing countries directed to developed countries, a growing share used imported raw material for further processing and re-export. In 2008, in value terms, 40 percent of the imports of fish and fishery products by developing countries originated from developed countries.

Net export revenues of fish and fish products (*i.e.* value of fish exports - value of fish imports) are particularly important for many developing countries, being higher than those of several other agricultural commodities such as rice, meat, sugar, coffee and tobacco combined (Figure 8). They have increased significantly in recent decades, growing from US$ 2.9 billion in 1978 to reach US$ 9.8 billion in 1988, US$ 17.4 billion in 1998, and US$ 27.2 billion in 2008, including US$ 8.3 billion for low-income food deficit countries LIFDC (out of US$ 11.5 of LIFDC net export revenues). World imports of fish and fish products reached a new record of US$ 107.1 billion in 2008, up 9 percent from 2007 and 95 percent since1998.

Figure 8. Net exports of selected agricultural commodities by developing countries

Japan, the United States of America and the EU are the major markets, with a total share of about 69 percent in 2008. Japan is the world's largest single national importer of fish and fishery products, with imports worth US$ 14.9 billion in 2008, a growth of 13 percent compared with 2007, followed by a decrease of 8 percent in 2009. The EU is by far the largest fish importing market. However, it is extremely heterogeneous, with markedly different conditions from country to country. In 2008, imports by the EU reached US$ 44.7 billion, up 7 percent from 2007, and representing a share of 42 percent of total world imports. However, if intraregional trade among EU countries is excluded, the EU imported US$ 23.9billion from non-EU suppliers. This still makes the EU the largest market in the world, with about 28 percent of the value of world imports (excluding intra-EU trade). Figures for 2009 indicate a downward trend in EU imports, with a 7 percent decrease in value recorded.

Responsible fish utilization, trade and market access

With the globalization of the economy and the ever increasing concern over fisheries and aquaculture sustainability, fish utilization and trade are not considered anymore under the prism of technical and economical feasibility of processing and investment projects only, but they are more and more integrated in the policies of government and the corporate social responsibility strategies of fish and food companies.

Food security

A first major issue that faces policy makers, especially in developing countries, is the necessity to balance food security and export promotion objectives owing to the impact of fish trade on food security. Food security is considered to exist *"when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preference for an active healthy life"* (FAO, 1996).

Fish is an important source of both direct and indirect food security in many developing countries. Much of the concerns on issues relating to fish and food security focused on the direct dimension of fish for consumption. Consequently, when fish exports are examined, the focus has been primarily on how it reduces fish availability for domestic consumption. Fish imports, on the other hand, are mostly seen as means to increase local availability. In actual fact, the relationship between trade (exports and imports) and food security is more complex.

Production for exports to lucrative markets can enhance the income of poor fishers substantially and thus achieve greater food security. This is especially beneficial for non or low fish eating communities in Mauritania, Mali, Burkina faso, etc. or vegetarian fishermen in India. On the other hand, exports may deprive a section of the domestic consumers of a variety of fish, leading to a potential loss of food security for them. This is particularly so when fish is an integral part of the culturally conditioned diet of a population.

Fish import for human consumption can help to stabilize or reduce fish prices for poorer fish consumers. However, this can have an adverse effect on the income of fishers in the importing country thus lowering their food security. As a response they may begin to exploit the local fish stocks heavily endangering resource renewal. But it can be positive for food security of countries such as Nigeria or Egypt, which import large quantities of highly nutritious but low price small pelagic fish such as herring and mackerel for national consumption. Alternatively, women working in fish processing may have more employment opportunities and secure more income to spend on household food security. Imports may also be for re-exporting after processing. Also in this case, new employment is generated in processing facilities for fish workers from urban and rural areas. Their increased incomes will contribute to household food security.

These examples illustrate that a single answer regarding the impact of international fish trade on food security is not possible and that it is essential to analyze very specific case studies in a variety of country contexts. In this respect, an FAO/Norway study (Kurien, 2005) examined the impact of international fish trade on food security both at the global level and through 11 national case studies in Nicaragua, Brazil, Chile, Senegal, Ghana, Namibia, Kenya, Sri Lanka, Thailand, Philippines and Fiji. The evidence drawn from this study indicates that, globally and in 8 of the 11 countries, international trade has had a positive impact on food security. This assessment was based on outcomes related to national impacts, impacts on fishers, workers, consumers and resources. International fish trade was, however, determined to have a negative impact on the fish resources for all the countries, highlighting the urgent need for more effective management regimes. Consequently, the study cautions that sustainable resource management practices are a necessary condition for sustainable international trade and that fish export promotion needs to be coupled with a sustainable resource management policy. Eco-labelling and certification is an attempt to link market access and resource sustainability (Washington and Ababouch, 2011).

The study also highlights the need for free and transparent trade and market policies to ensure that the benefits from international fish trade are equitably enjoyed by all segments of society. The study underscores the FAO's Code of Conduct for Responsible Fisheries recommendation that States consult with all stakeholders, industry as well as consumer and environmental groups, in the development of laws and regulations related to trade fish trade.

Post-harvest Losses

The generally acknowledged limits of production from capture fisheries and the widening gap between fish supply and demand reaffirms that post-harvest losses are an unacceptable waste of scarce natural resources. Post-harvest losses of fish occur in various forms (Ward and Jeffries, 2000). The physical loss of material is caused by discarding fish or bycatch (accidentally or voluntarily), predation by birds, other animals or insects. Quality losses occur when spoilage or physical damage of fish result in a value decrease or when there is a need to reprocess cured fish, raising the cost of the finished product. In addition, inadequate handling, processing and storage can reduce nutrients, leading to nutritional loss. Similarly, the lowering of large quantities of fish catches into animal feeds can be considered under certain conditions as a "loss" for human food security.

Post-harvest losses in small-scale fisheries can be among the highest for all the commodities in the entire food production system. Fish losses caused by spoilage are estimated at 10 to 12 million tons per year, accounting for over 8 percent of the total production from capture fisheries and aquaculture. Appropriate preservation methods can significantly reduce this loss, including from glut catches when the processing, distribution and marketing system cannot cope with the exceptional quantities of fish that are sometimes landed due to seasonal or inter-annual variations of availability or abundance. A large part of fisheries post harvest losses occur because of inadequate or lack of proper landing sites and related equipment. Fishing ports and landing sites are key infrastructures at the interface between the harvesting of fish and its utilization. The type and size of fishing ports greatly influence the rate at which a country's fisheries resources will be exploited whereas the basic port infrastructure and landing site and their administration setup and services will contribute to the way the resources will be utilized, including the capture of opportunities to add value to the harvests. Fishing ports and landing sites vary in size, organization and complexity depending on many factors. They can range from relatively informal artisanal landing sites to relatively organized and formalized locations. Moreover, these harbours may be found along the coastlines of fresh and marine bodies of water (Sciortino, 2010).

To overcome these difficulties, investments are needed to physically upgrade and rehabilitate landing sites and fishing harbours in conformity with sanitary and hygienic requirements and to develop human capacity and administrative and management structures for their effective utilization and maintenance. In addition to improving fish utilization and reducing post harvest losses, improved harbour and landing infrastructure and

administration can contribute to ease the pressure on the fish resources. However, it is critical that improved physical infrastructure be planned within the framework of proper governance, policy and management of fisheries Indeed, since production from capture fisheries is limited, it is vital that fisheries policies and management are in place to ensure that fishers can focus on maximizing the value of the fish they catch instead of having to focus on maximizing the amount of fish they catch. Physical loss also results from the discarding of bycatch. This type of loss is especially significant in shrimp trawl fisheries where the proportion of co-occurring species caught incidentally is very high and can reach 95 percent of the total material taken on board. Bycatch contains a variety of fish sizes and species and is sometimes thrown back at sea, except in densely populated areas of several developing countries where it is largely used for local consumption. Chilled or frozen storage facilities on board the trawlers are limited and are mostly kept for the main target species. Sorting the bycatch would require additional crew time further reducing the financial incentive.

A FAO study to update fishery-by-fishery the quantity of discards in the world's marine fisheries concluded that in the 1992-2001 period, yearly average discards were estimated at 7.3 million tonnes (Kelleher, 2005). Trawl fisheries for shrimp and demersal finfish accounted for over 50 percent of total estimated discards while representing approximately 22 percent of total landings recorded in the study. Tropical shrimp trawl fisheries have the highest discard rate and account for over 27 percent of total estimated discards. Demersal finfish trawls account for 36 percent of the estimated global discards. Most purse-seine, handline, jig, trap and pot fisheries have low discard rates. Small-scale fisheries generally have lower discard rates than industrial fisheries. The small-scale fisheries account for over 11 percent of the discard database landings and have a weighted discard rate of 3.7 percent.

The study revealed a substantial reduction in discards in recent years. The major reasons for this are reduction in unwanted bycatch and increased utilization of catches. Bycatch reduction is largely a result of the use of more selective fishing gears, introduction of bycatch and discard regulations, and improved enforcement of regulatory measures. Increased retention of bycatch for human food or animal feed results from improved processing technologies and expanding market opportunities for lower-value catch. The study discusses a number of policy issues to reduce discards. These include a "no-discards" approach to fisheries management; the need for balance between bycatch reduction and bycatch utilization initiatives; and concerns arising from incidental catches of marine mammals, birds and reptiles. The study advocates the development of more robust methods of estimating discards, allowance for discards in fishery management plans, development of bycatch management plans and promotion of best practices for bycatch reduction and mitigation of incidental catches. Global discard estimates could achieve greater precision through additional studies at national and regional levels.

Finally, about 15 to 20 percent of the total fish production is still processed into fishmeal and fish oil, using mainly small pelagic oily fish such as herrings, sardines, mackerel, anchovies, pilchards, sand eel, menhaden and offal from the processing of more valuable species (*e.g.* tuna). While fishmeal and oil can be acceptable and efficient fishing strategies, they can also be considered a "loss" from a food security perspective. Ideally, reduction into fishmeal and oil should only occur when it is not economical or practical to utilize fish for direct human consumption.

Reducing post-harvest losses requires wiser use of resources, reducing spoilage and discards and converting low-value resources, which are available on a sustainable basis, into products for direct human consumption. Reducing spoilage requires improved fish handling on board, during landing, processing, preservation, and transportation, all of which can be particularly deficient in small-scale fisheries. Within creasing fish scarcity, the problem of discards tends to resolve itself at least partially as new species previously deemed commercially inferior are progressively integrated into consumer feeding habits and markets. This is insufficient, however, and efforts are needed to use more appropriate technologies systematically, such as square mesh and by-catch excluder devices.

Duties, quotas and tariff escalation

The World Trade Organization WTO classifies fish as an industrial product which carries lower import duties, as compared to agricultural products. Furthermore, the Doha round of negotiations decided that "tariff escalation" for fish and fishery products would be reduced. This means that import duties for value-added products will be lowered thus creating new opportunities, not the least for developing countries.

In addition, stagnant domestic fishery production and growing demand in developed markets, which rely on imports to cover a growing share of internal consumption, have reduced import duties on fish to a current average around 4.5%. As a result, fishery products from developing countries are able to gain increased access

to developed-country markets without facing prohibitive custom duties similar to those applied to agricultural products.

Over the last decade, however, both as a result of the WTO negotiations and of bilateral trade agreements, many tariffs on processed products have been reduced. Consequently, the transfer of value addition technologies, know-how and investment capital to developing countries has increased, generating further employment and hard currency earnings from processing and value-addition. Part of this production has been distributed in emerging economies, mainly in Asia, but also in Africa and Latin America.

However, despite the availability of technology, not all projects in value-addition for export from developing countries have been successful. In particular, due consideration was not always given to quality assurance, marketing and distribution issues, before embarking on the value-addition process. For example, new value-added products have encountered difficulty accessing supermarket shelves without substantial investment in marketing and publicity. Some operators have circumvented the problem by using the label and distribution system of the importer or retailer, giving up some benefits that accrue downstream from marketing and distribution in the value chain (O'Sullivan and Bengoumi, 2008).

An important issue is the study of the distribution of costs and benefits to understand how and where in the fish value chain revenues accumulate, values are added, profits are generated and what are the principal barriers against adding more value to exported seafood products in the country of origin or destination. Preliminary studies indicate that the distribution of benefits is not always equitable, especially in developing countries, where upstream operators, especially small scale fishermen do not always receive adequate benefits, which increases their vulnerability (Gudmundsson, Asche and Nielsen, 2006).

Safety and Quality Requirements

The food and feed scares of last decades (bovine spongiform encephalopathy BSE, dioxins, avian flu, SARS, foot and mouth disease) have exposed the weakness in traditional food control systems. Likewise, the increased globalization of fish trade has highlighted the risk of cross-border transmission of hazardous agents and the rapid development of aquaculture has been accompanied by the emergence of food safety concerns, in particular residues of veterinary drugs.

These developments have led to the need for the development of a food safety strategy applicable throughout the entire fish food chain- from "farm or sea to table". This strategy must be scientifically based, adaptive and responsive to changes in the food production chain. It is articulated around the use of risk analysis to develop food safety objectives and standards and on the implementation of Hazard Analysis Critical Control Points (HACCP) systems. FAO/WHO has identified the following five needs for a strategy in support of a food chain approach to food safety, including for fish and fishery products:

- Fish safety and quality from a food chain perspective should incorporate the three elements of **risk analysis**- *assessment, management and communication* – ensuring an institutional separation of science-based risk assessment from risk management.
- **Tracing techniques** *(traceability)* from the primary producer (including animal feed and medicines used in aquaculture), through post-harvest treatment, processing and distribution to the consumer must be improved.
- **Harmonization** of standards, implying increased development and wider use of internationally agreed, scientifically-based standards is necessary.
- **Equivalence** in food safety systems – achieving similar levels of protection against fish-borne hazards and quality defects whatever means of control are used – must be further developed.
- Increased emphasis on **risk avoidance or prevention at source** within the whole food chain – *from farm or sea to plate.*

The implementation of the food chain approach requires an enabling policy and a regulatory environment at national and international levels with clearly defined rules and standards, establishment of appropriate food control systems and programmes at national levels, and provision of appropriate training and capacity building. Development and implementation of Good Aquaculture Practices (GAP), Good Hygienic Practices (GHP) and HACCP are required in the food chain step(s). Government institutions should develop an enabling policy and a regulatory environment, organize the control services, train personnel, upgrade the control facilities and laboratories and develop national surveillance programs for relevant hazards. The industry should adopt good practices and train personnel to implement GAP, GHP and HACCP. The support institutions (academia, trade associations, private sector, etc.) should upgrade skills of personnel involved in

the food chain, conduct research on quality, safety and risk assessments, and provide technical support to stakeholders. Finally, consumers groups and other NGOs should promote consumer education and information and play a counterbalancing role to ensure that safety and quality policy is science based and not driven only by political or economical considerations.

The globalization and further liberalization of world fish trade, while offering many benefits and opportunities, also presents emerging safety and quality challenges. Improved scientific tools must be adopted and novel flexible approaches to safety must be sought to ensure that responsibility for consumer protection is effectively shared along the food chain and that regulations and standards reflect the most current scientific evidence. This requires significant resources which are not always available, especially for small scale operations in developing countries.

Fish safety and quality assurance at the beginning of this third millennium requires enhanced levels of international co-operation in promoting transparency, harmonization, equivalency schemes and standards setting mechanisms based on science. The SPS/TBT agreements of the WTO and the benchmarking role of the Codex alimentary provide an international reference in this respect.

Labelling and certification

Certification and labelling have become important competitive parameters to access international fish markets. Not only must suppliers adhere to the regulatory requirements of importing countries, but additional labels or certificates may also be required by the importer for commercial and marketing reasons. In the same way, the supplier may also choose to apply particular labels or undergo voluntary certification programmes in order to target specific segments of consumers, thereby gaining a competitive advantage in market niches.

Similarly, companies may choose to produce according to specific requirements that permit them to label their products as environmentally friendly or produced in respect of certain social values. Examples of such labelling include: "*organic production*" labels, "*fair trade*" labels", "*dolphin-safe tuna*" labels or ecolabels such as those of the Marine Stewardship Council MSC or Friend of the Sea FoS. An eco-label is a tag or label placed on a product that certifies that the fish was produced in an environmentally friendly way. The label provides information at the point of sale that links the product to the production process.

In fisheries, the increased interest in eco-labels results from the concerns about the dramatic state of the world's marine resources. The perceived failure of governments to effectively manage marine resources has led to the development of alternative mechanisms for protecting marine life and promoting sustainability. These are aimed at influencing the purchasing decisions of consumers and the procurement policies of retailers. Eco-labels are one such mechanism. Organizations developing and managing an ecolabel develop standards against which applicants wishing to use the label will be judged. They also manage the accreditation and certification process, and market the label to consumers to ensure recognition and demand for labelled products.

Other mechanisms used by NGOs include:

- Publicity campaigns or organized boycotts or of certain species deemed to be threatened such as the "*Give Swordfish a Break*" campaign in the United States in the late 1990s;
- Consumer guides to influence consumers purchasing decisions, such as the "*Best Fish Guide*" of the New Zealand Royal Forest and Bird Protection Society or "*The Sustainable Seafood Guide*", produced by Eartheasy, Canada;
- Putting pressure on retailers to introduce sustainable procurement policies for fish and seafood. This is perhaps most developed in the United Kingdom where Greenpeace is working with large retailers and produces an annual league table, "*Ranking of the sustainability of supermarkets' seafood*". Greenpeace also uses "*naming and shaming*" strategies such as media-savvy protests outside retail outlets.

These strategies can be seen in terms of a continuum from more reactive mechanisms that highlight and "shame" bad practice, to more proactive activities: encouraging consumers to purchase fish from sustainable stocks, and working with retailers to improve their procurement policies, as well as rewarding those that do with positive publicity. Buyers and retailers have in turn responded by imposing private standards and certification back through the supply chain, especially on producers and processors. These developments have resulted in the proliferation of certification bodies and schemes designed to trace the origin of fish, its quality and safety, the environmental and/or social conditions prevailing during fishing, aquaculture production, processing and distribution (Washington and Ababouch, 2011).

But as standards, certification schemes and labels proliferate; both producers and consumers are questioning their value. Producers in particular question whether these private standards and certification schemes duplicate or complement government work. In addition consumers ask if private schemes really provide better protection for them and the environment and/or contribute to social equity.

Many producers and exporting countries hold the view that sanitary standards represent unjustified restrictions to trade, especially where they introduce measures which duplicate those already applied by government authorities of the exporting country. This raises the issue of how to define boundaries between public regulations dealing with food safety, animal health, environmental and social protection on the one hand and private market standards on the other? And who is responsible for what and accountable to whom? While governments that are seen to use standards as trade barriers can be challenged through the rules of WTO, what international mechanism, or agreement, should be invoked to challenge private companies whose standards are judged to create technical barriers to trade between countries? Several countries and industry associations have raised serious concerns about the potential for private standards to have trade limiting or trade distorting effects (WTO, 2008).

Proponents of private standards and certification schemes claim that they encourage suppliers to force the use of responsible practices in fisheries and aquaculture. Opponents of such standards see them as a private sector attempt to replace/duplicate governmental policy in fisheries and aquaculture. The key issue is how private standards and certification schemes, if needed, can be reconciled with the public sector's responsibility to regulate the use of responsible practices in fisheries and aquaculture, throughout the food chain.

These issues require a concerted international effort. A precondition for an international understanding and an approach to dealing with this issue is better knowledge. More must be known about the effects of private standards and certification schemes. Such knowledge may make it possible to propose solutions that will ensure coherence of private standards with WTO trade measures.

It is also necessary to analyze if and how private standards are duplicating or complementing the work of government authorities. Such an analysis will have a particular focus on the effects that private standards and certification schemes are having on developing countries' capacities to access markets.

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Annex 19

POST-HARVEST AND SAFETY OF FISH AND FISHERIES PRODUCTS

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Technical Panel and Theme 4 of this conference is titled Post-Harvest and Safety of Fish and Fisheries Products. This panel session will discuss issues related to the field of fisheries post-harvest technology: Improved Fish Handling, Processing and Preservation; Improved Traditional Products-quality, marketing and trade; and Quality, Safety and Control Systems for Fish Products. Given the importance and breadth of issues related to this topic, Theme 5 Emerging Requirements for Trade in Fisheries Products will also discuss topics related to this subject.

The theme relates to all aspects of fisheries post-harvest activities particularly quality and safety throughout the supply chain, from handling (at capture and on-shore), processing, marketing and distribution. This also includes those control or management systems, private and governmental that are designed to assure quality, safety and traceability of fish destined for domestic or export markets. This theme has components that involve poverty alleviation, food security, foreign exchange, and food safety.

The relationship between the fisheries post-harvest sector and food security is enormous and is two-fold; it indirectly contributes to incomes and wealth and it directly supplies food. The post-harvest sector is a substantial employer and it has been estimated that each job in the primary sector (fish capture), generates not less than four more employment opportunities in secondary and related economic activities; so for an estimated 4.5 million full-time and part-time fishermen in the ASEAN region, it can be said that fisheries supports the livelihood of more than 20 million people, many of which are in processing, distribution and trade. The sector is also important to export earnings in many countries. Fish as food for a country is important in particular for its nutritious value and contribution to animal protein supplies.

Safety of fish and fishery products is becoming of paramount importance to national governments. Today, exported products must meet international standards, like HACCP, or it could adversely affect the economy of the country and the industry. The control of domestic safety is also gaining importance as ASEAN countries are building their economic status. There is much difficulty involved with domestic safety issues, particularly with the allocation of scarce resources for industry assistance

The sub-themes of this Conference are similar to those of the Millennium Conference in 2001. Over the last 10 years national governments and regional organizations have been working under the Resolution and Plan of Action endorsed at the Millennium Conference relating to post-harvest activities. Considerable work has been carried out, for example: research on reducing fish sauce fermentation times; development of HACCP plans for fermented fish; adaptation of GMP/SSOP plans for SME's producing traditional products; developing regional methodologies for the analysis of fish, activities on harmonization and validation of methods, developing GLP's, and implementation of proficiency testing. Much of this work needs be continued and re-focused over the next decade. The sub-themes for this Conference will build on the previous decade's work.

The sub-theme Improving Fish Handling, Processing and Preservation will look at ways to further optimize the utilization of fish catch, raise quality and reduce waste, so that those involved may receive a greater economic return for their product and/or that more of the product could go for human consumption.

The sub-theme Improved Traditional Products-quality, marketing and trade will look at ways to further improve and develop this sector. This is particularly important as in most ASEAN countries 30-45% of fish landed are converted into traditional fish products which is important for food security as most of it goes to the lower income socio-economic classes and plays a vital role in their diet. Also, communities making these products are amongst the poorest socio-economic groups in some countries.

The sub-theme Quality, Safety and Control Systems for Fish and Fisheries Products will look at further improving government and industry quality and safety management systems for both domestic and exported products.

Annex 20

IMPROVING FISH HANDLING, PROCESSING AND PRESERVATION

By SEAFDEC/MFRD

Summary

Most fish caught in ASEAN is utilized; higher value fish is well looked after but low value fish are not treated as well. In the past, a portion of this low value fish went to the production of fishmeal, but a larger portion went to direct human consumption. Today, because of supply/market pressures, more and more of these fish are being diverted to non-human usage, while fish demand for human consumption is increasing. It is necessary, as an 'adaptation to a changing environment' and to improve food security, to look at ways to optimize the utilization of fish catch so that those involved may receive the best economic return for their product and/or that more of the product could go for human consumption. The issue of low value fish is discussed particularly in relation to value adding. Other issues relating to incentives, capacity building, infrastructure, regulatory control, technology transfer, quality, waste, and by-product utilization are also discussed. These issues must be addressed with appropriate actions over the next decade.

Background

This sub-theme covers virtually all aspects of fish technology from capture to market. For marine capture in the ASEAN region, with the exception of two fishing areas and at peak capture times, most fish caught is landed, and for the most part, discards are negligible. This pattern of catch retention is different from other areas in the world and has been brought about by technological changes and economic/marketing pressures particular to the region. High value fish is well looked after, low value fish not. Nevertheless, all the fish landed is utilized. One problem is some of the catch of low value fish may contain juvenile fish of high value species. Also, some high value fish can be reduced to low value fish due to poor handling on-board.

Significant improvements in the utilization of fish as food have taken place over past decades, notably in the major fish-producing countries. Facilities, including cold storages and ice plants, as well as infrastructure for fish handling, distribution and marketing, and techniques for improved fish handling on-board maintain the quality of the catch. Modern fish processing factories have been established in these countries for processing high value and high quality fish and crustaceans, including tuna and shrimp as frozen, filleted or canned products, with an increasing amount of them destined for export. Concurrently, many new fish products have been developed which may be exported and are available in local supermarkets in urban centers, including fish balls, fish cakes, imitation crab sticks, breaded squid rings, breaded fish or shrimp, fish crackers, and other products.

Most of these improvements revolve around high value or "luxury" fish and an industrialized fishery or larger aquaculture enterprises. It also accounts for a small proportion of fish used for food in the region. Food fish, especially in rural areas, may come from small-scale fisheries and aquaculture and inland fisheries. Within ASEAN, over 50% of fish is consumed fresh and/or is processed into a high value product, 8-65% (most between 30-45%) converted into traditional products, and another varying percentage is used for direct feed for livestock or high value species aquaculture, or indirect feed by conversion to fishmeal/oil.

One concern that needs be addressed over the next decade is the utilization of low value fish. Due to supply pressure and the expansion of aquaculture, low value fish is increasingly being diverted from direct human consumption. Optimum utilization, including developing and marketing value-added products from these fish need be examined. Further, the economics of fish marketing need be investigated, currently even if it were possible for fishers to adopt better practices to land a better catch; the benefits of doing so are probably outweighed by the costs of capital investments. Indeed, if prices of low value fish remain high (for non-human use), then the incentives to land better quality fish for human consumption will not be strong.

In view of the current state of fisheries and increasing population in the region, demand will certainly increase but per capita consumption may actually decrease over the next decade. Currently although most fish within the region is utilized, much of the catch landed is of poor quality and is utilized for non-human consumption or very low value products. It is necessary to look at methods of optimizing the utilization of fish catch, so that those involved may receive the best economic return for their product, and/or that more of the product could go for human consumption. Technological innovation has changed the fishery in the past as exampled by the development of surimi, which has transformed a group of low value fish into a value-added industry.

Technological innovation throughout the entire supply chain needs be investigated and examined, including ways technology may further stimulate demand for higher quality, improve economic returns, reduce wastage, and by-product utilization.

Value-adding, improved traditional processing and product demand should stimulate fishermen to land a better quality fish. Thus improved on-shore utilization is the key to improving on-board handling. However, improvements depend for a major part on the economics and situation, which needs to be studied further, particularly for low value fish as it relates to food security. Generally improvements have been made to fish handling, processing, distribution and marketing of exported products, to meet market requirements. This has to be built upon, to meet new demands for domestic product quality and safety.

Issues

The issues at the time of the Millennium Conference were low economic returns for low value fish, poor quality raw materials, poor handling on-board, lack of infrastructure (landing facilities, storage, distribution channels), lack of support to extension services, poor access to credit and support to marketing cooperatives or SME's. It was noted at that time there was a need for improving utilization on-shore by applying value-added technologies, improving traditional products, and developing methods of utilization of underutilized species or species that are seasonal or have a characteristic that makes utilization difficult. There was also need for programs reducing waste and increasing by-product utilization. The RTC and National Seminars on Post-Harvest Technology agreed that the issues mentioned above are still valid today, and highlighted the following issues that need more immediate action and should be addressed over the next decade:

Inadequate human resources and expertise.

Fishermen need greater training on IUU/traceability and on-board handling. On-shore fish processors and workers have similar problems; there is a lack of knowledgeable workers and even a lack of manpower in some countries where it is necessary to hire workers from foreign countries. More technical support needs to be given to extension services, training material developed, continued accelerated training on post-harvest technology and training of trainers programs for both government and industry, and knowledge on handling and implementation of the cold chain at all levels. Guidelines for specialized handling on-board need be developed, for example salting on board is currently uncontrolled and inconsistent. Training on fish handling should be required as part of the requirement for issuance of permits at all levels for fish vessel crews.

Inadequate infrastructure and regulatory control

Many fisheries, particularly small-scale fisheries and inland fisheries still have inadequate infrastructure. Governments should be encouraged through their national development activities to improve fisheries infrastructure such as provision of clean water, water treatment facilities and ice making facilities where appropriate. Where feasible, governments should create a fish processing zone/area. Additionally, in many areas there is a need for stricter port hygiene regulations, better enforcement and control, and better management along the supply chain. There is still a need to co-ordinate the control activities and legislation of various regulatory authorities that oversees the product throughout the supply chain. Recommendations for this action are found in sub-theme 4.3. Standards and guidelines for fishing vessel design and construction respecting on-board fish hygiene need be developed.

Poor handling, processing, distribution and marketing

As noted above, in many cases there is still a lack of clean water, ice, and equipment and facilities. Many establishments have no control system such as GMP/SSOP, HACCP or ISO 22000 as needed. Handling should not be limited to just dead fish, but live as well. Work on the development of value-added products should be continued. Low-cost methods should be investigated. Improvements in fish distribution and marketing should be investigated. Studies should be conducted on economic returns of low value fish, and a baseline study on post-harvest losses should be carried out.

Poor utilization of underutilized species, by-products, and recovery of processing wastes

As noted in the Millennium Conference, more work has to be done on underutilized species. Work also needs to be conducted on waste reduction and recovery, and environmental impact of fish waste. Where appropriate, the application of zero-waste processing should be applied. More research should be conducted on activities to increase by-product utilization for human consumption; alternative use of waste such as bio-fuels; and

activities on utilization of wastewater from production sources including from on-board facilities. Pharmacological use of by-products should also be investigated.

Lack of incentives/credit

There should be greater access to credit for post-harvest activities, and greater support to develop marketing cooperatives and/or SME's. Incentives should be made available to foster a demand for higher economic returns and more fish for human consumption.

Conclusion and Recommendations

Conclusion

Mindful of the issues of food security, and recognizing the demand for fish will increase, while the supply may not keep pace, it is necessary that efforts be made to optimize the utilization of the existing and future fish catch to ensure that as much of the catch as possible is directed to human consumption to help alleviate shortages in food supply.

Recommendations

I. Improve human resources and expertise in fishery post-harvest technology, by:
   a) Developing training programs on post-harvest technology which could be used by extension workers; conduct training of trainers programs for both government and industry on critical aspects of handling, processing, distribution and marketing in the fish supply chain, and implementation of the cold chain at all levels; and trains the industry.
   b) Developing standard training requirements on fish handling as part of the requirement for issuance of permits at all levels for fish vessel crews.
   c) Developing guidelines for specialized on-board handling or on-shore activities

II. Improve national infrastructure, by:
   a) Encouraging governments through their national development activities to improve fisheries infrastructure where appropriate.
   b) Developing standards and guidelines for fishing vessel design and construction respecting on-board fish hygiene.

III. Improve handling, processing, distribution and marketing, by:
   a) Developing guidelines for handling live fish
   b) Continue work on the development of value-added products, particularly for low value fish using low-cost methods as appropriate.
   c) Conducting studies on distribution and marketing of fish
   d) Conducting studies on economic returns of low value fish
   e) Conducting baseline studies on post-harvest losses

IV. Increase utilization of underutilized species, by-products, and recovery of processing waste, by:
   a) Continuing research on optimum utilization of underutilized species.
   b) Conducting studies on waste reduction and recovery, and environmental impact of fish waste.
   c) Conducting research into by-product utilization.

V. Improve the use of incentives/credit to promote the industry and alleviate poverty, by:
   a) Promoting greater access to credit for post-harvest activities, and greater support to develop marketing cooperatives and/or SME's.
   b) Investigating incentives to foster a demand for higher economic returns and more fish for human consumption.

Annex 21

IMPROVED TRADITIONAL FISH PRODUCTS: QUALITY, MARKETING AND TRADE

By SEAFDEC/MFRD

Summary

In the ASEAN region, traditional fish products are a major source of micronutrients and animal protein. In most ASEAN countries 30-45% of fish landed are converted into traditional fish products, which goes for the most part, to lower income socio-economic classes. Communities making these products are amongst the poorest socio-economic groups in some countries. There are many issues in this sector as countries modernize, populations' move, and tastes change; traditional products have to be marketed to a new generation. Problems such as poor quality and lack of raw materials need to be dealt with, including post-harvest losses, poor processing technologies and facilities, poor packaging, better marketing, and development of incentives; so that those involved in catching and manufacturing traditional fish products may lift themselves from the cycle of poverty they are living. Issues of food security are discussed, and means by which some of the problems of the industry could be reduced or resolved.

Background

Fish is a major source of nutrition in ASEAN, supplying essential micronutrients and animal protein. Within ASEAN, over 50% of fish landed is consumed fresh and/or processed into high value products. From 8 – 65% (mostly between 30-45%) is converted into traditional products, *i.e.*: fish sauce and cured fish such as sun-dried, salted and dried, steamed/boiled and fermented fish. Traditional products are very important for food security either directly through human consumption or indirectly through wealth creation by the fishermen and fish workers making and trading these products. The processors may be members of a family, community or local industry. Unfortunately, many fishing communities have a very high level of poverty and are amongst the lowest of the socio-economic classes. Methods are needed to improve the lives of these people, and improved traditional products may help.

Traditional fish processing is part of a "dual economy" in which traditional small-scale activities co-exist with a modern industrialized sector. This traditional industry is characterized by the application of low-level technology, thus producing relatively poor quality, low value products. Modern processing (including icing) and post-harvest handling have developed in response to a growing export market and rising living standards, especially in urban communities and markets; and the technology is generally in line with the demand of importing countries. Traditional processes result in products that meet domestic food needs and require minimal investments; hence, the poor undertake these activities, many of which are women. Such value-adding tends to be very small and such products are for the most part inexpensive and unable to enter world markets. Traditional fish products are vitally important to inland fisheries.

When we are talking about food security for the population, we are generally talking about low value fish. Several issues concerning the production and use of low value fish need to be resolved in order to ensure that fisheries contribute to the region's sustainable development. These include an increasing use of low value fish for aquaculture and other animal feeds diverting these fish from traditional product manufacture; and competition between use of low value fish for value-added products vs. use of low value fish for traditional products. In some fisheries and regions, the price of fish for industrial use may be higher than use for traditional processing.

Studies have been conducted for fish consumption in a number of ASEAN countries, and while fish is generally considered as a necessary food item in most countries, especially low value species and traditional products like dried fish; the poor often consider fish as a luxury food item. Poorer households appear to be sensitive to changes in fish prices, and if the price rises too high, the product may be priced out of range; reducing direct food security. It has also been noted that fish consumption among poorer households responds to income, and that increases in incomes of poorer households, such as when they move to urban centers, will boost demand for fish. Demand in almost all ASEAN countries is rising.

As a means of activating rural fisheries communities and improving their economic status, SEAFDEC has developed a program called "One Village, One Fisheries Product" or FOVOP. This involves fisheries communities to identify a unique and differentiated traditional product, and develop a marketing strategy for that product. Notwithstanding FOVOP, in order for the traditional products industry to survive, develop and

earn more money; efforts need to be made to change consumers "mindset" about traditional products; to sell traditional products in more affluent markets; and to rural immigrants, and a new generation of people that live a more urban life. There is an international trade for traditional products, and quality, safety and marketing requirements for this trade needs further study.

It will not be easy to improve the quality of traditional fish products, but some improvements may be possible. Product diversification, improved organization, better market access and product promotion may increase the income generation abilities of those fish workers manufacturing traditional products; and increase their food security. Radical value-adding may completely change the industry from making traditional products into something else. This also will improve indirect food security and provide more food for human consumption in more affluent markets. Unfortunately these gains can be skewed; technology and innovation can enhance and reduce food security at the same instance for different segments of the population.

Issues

At the time of the Millennium Conference the issues were poor quality raw materials and a lack of supply of raw materials. There was also a lack of infrastructure and insufficient capital and financial and technical incentives to improve quality of the processing enterprise. There was also a lack of know-how in processing and inconsistent quality of products; and finally a lack of safety standards and information (laws/regulations, nutritive value, scientific data) on the products, including a potential threat to the authenticity of traditional products in relation to economic progress. The RTC and National Seminars on Post-Harvest Technology agreed that the issues mentioned above are still valid today, and highlighted the following issues that need more immediate action and should be addressed over the next decade:

Lack of raw materials and poor quality of raw materials

As noted above, raw materials are still of poor quality, and there is increasing competition for alternative use of raw materials. Much of these problems are economic. Currently, even if it were possible for fishers to adopt better practices to land a better catch, the benefits of doing so are probably outweighed by the costs of capital investments. Indeed, if prices of low value fish remain high (for non-human use), then the incentives to land better quality fish for human consumption will not be strong. Additionally, there is a price cap on some traditional products so that capital investment to improve the quality of the catch (which would necessitate increasing price) would decrease consumption of the product. Some of these issues may be resolved by government investment in infrastructure, poverty alleviation programs, and development of feeds that do not involve low value fish. Until that time, work needs to be done on diversification of raw materials to see if different types of raw materials can be used for the same traditional products, or where necessary use different materials to create improved traditional products. Additionally, there has to be a change in the "mindset" of producers and consumers that traditional products are not all sub-grade products that do not have to be of high quality, and that higher quality raw materials could be used for different traditional products.

Poor processing and preservation technologies and facilities

There are poor processing, handling and storage facilities in many counties and a lack of knowledge on processing and preservation technologies. More technical support needs to be given to extension services, training material developed, continued accelerated training on post-harvest technology and training of trainers programs concerning handling, processing, distribution and marketing of traditional products at all levels. Further work has to be carried out on post-harvest losses and quality improvement; such as reduction of insect infestation and use of insecticides, and the use of non-food grade additives/preservatives. Finally, can value-adding maintain a traditional product/industry as traditional? It may be necessary, in order to reduce poverty and create wealth, to use new technologies and develop new value-added products. Work on the development of traditional and value-added products should be continued, particularly using low-cost methods. Radical value-adding could change the traditional processing industry to a new value-added industry; so that those fish workers involved will have a better chance of adapting to a changing environment; and more food will be directed towards human consumption, increasing food security to the fish workers and meeting growing demand for fish products in urban centers. However, at the same time some traditional fish processors and consumers of traditional products may lose food security. Product control and safety is also important, but it will be discussed under sub-theme 4.3.

Poor packaging

There are problems with packaging and high cost in materials/techniques. Processors are also unable to meet labeling requirements. Research should be conducted on the development and acceptance of traditional and/or indigenous materials for packaging, and on use of modern methods to reduce the cost of packaging. Consideration should be given to providing financial assistance through programs such as fish processing centers, which in some countries have assisted in subsidizing the purchase of equipment and consolidation of group packaging orders, thus facilitating cheaper purchases of packaging materials.

Poor marketing practices

There is generally a lack of promotion for traditional products; poor market access and the products are uncompetitive. New market strategies for traditional fish products have to be developed where necessary; by changing the "mindset" of consumers, as noted earlier, and by promoting traditional products to rural immigrants and a new generation of urban dwellers, modern retail outlets, tourism, and the establishment of traditional food zones. Attributes such as products being naturally preserved, low carbon footprint, heritage, customs and traditions need to be emphasized. Much traditional products are only sold locally; the distribution and marketing system need to be critically examined to determine how products could get better access to markets. In-fact, the entire traditional marketing system for small-scale fisheries communities may need a radical change. This may be initiated through the promotion of programs such as SEAFDEC's FOVOP system, which has been developed as a means of activating the rural communities and improving their economic status. This will be discussed more fully in Theme 7, but it involves local producers to identify and promote a unique and differentiated traditional (or value-added) fishery product from each particular fisheries community, and develop a marketing strategy for that product. However, such programs may not work without technical assistance, infrastructure support, and perhaps financial incentives.

Lack of incentives

Fish enters into the traditional processing sector because it cannot find a higher value elsewhere. Thus traditional products are generally of low value. Because of the current problems in the pricing structure, producers do not have incentives to improve the quality and safety of these products or to improve their processing operations. Therefore, governments should consider the creation of incentives to support and upgrade this industry so that it continues to play a vital role in the region's food security. Such incentives could be the development of fish processing centers as noted above, or assisting in the development of co-operatives or SME's based in a fishing community, FOVOP programs, and developing means whereby traditional processors could gain better access to credit, micro-credit or other means to alleviate poverty.

Conclusion and Recommendations

Conclusion

Traditional fish products are an important component of the diet of people in the region. However, the production of these products is facing many challenges. Improving quality, marketing and trade of these products, may assist in increasing food security, particularly for rural fisheries communities that manufacture traditional products; and alleviate demand for fish.

Recommendations

I. Improve raw materials supply and quality, by:

   a) Conducting work on diversification of raw materials to see if different types of raw materials can be used for the same traditional product.
   b) Conducting work on different materials to create improved traditional products

II Improving processing and preservation technologies and facilities, by:

   a) Developing training programs concerning handling, processing, distribution and marketing of traditional products at all levels.
   b) Conducting work on reduction of insect infestation and use of insecticides, and the use of non-food grade additives/preservatives.

c) Continuing work on the development of traditional and value-added products, particularly using low-cost methods

III Improve packaging, by:

a) Conducting research on the use of traditional and/or indigenous materials for packaging, and use of modern technology to reduce the cost of packaging and better preserve the product
b) Investigating the use of fish processing centers to reduce the costs of processing and packaging.

IV. Improve marketing practices, by:

a) Investigating marketing strategies that promote traditional fish products in urban communities
b) Investigating means whereby rural communities may gain better market access for their product
c) Promoting FOVOP and develop products and marketing strategies for this program

V. Improve the use of incentives/credit to promote the industry and alleviate poverty, by:

a) Assisting in the development of co-operatives or SME's based in fishing communities, FOVOP programs, processing centers or other means to assist traditional fish processors
b) Investigating means whereby traditional processors could gain better access to credit or micro-credit.

Annex 22

QUALITY, SAFETY, AND CONTROL SYSTEM FOR FISH PRODUCTS

By SEAFDEC/MFRD

Summary

Quality and safety of fish products are of concern throughout the catching, handling, processing, distribution and marketing supply chain; for both the domestic and export markets. Control systems for quality and safety range from knowledge in the mind of a fish handler/processor, to an external regulatory body auditing the actions of enterprises' control plans for processing fisheries products. The latter case is mandated by import requirements for fish and fisheries products. Export companies have to have a specific international safety control system called HACCP that can be audited by a government fish inspection management control system. Much work has been done by all the ASEAN countries to meet import requirements, but in this changing environment, importing countries are becoming more and more demanding in their requirements; new emerging issues are being brought up, and mechanisms are needed to meet these requirements for the next decade. Additionally, ASEAN has agreed to harmonize national food export and import inspection and certification systems, and the area of fisheries harmonization needs to be discussed. Other issues exist, such as national interagency coordination of fish inspection, and improved safety control of domestic production. Much work has been done in the last decade in developing control systems for SME's; it is up to the next decade to apply these systems.

Background

Quality, safety and control systems relate to every aspect of fisheries, from capture to consumption. They apply to government and industry, both domestic and export. All industry needs a quality/safety management system to operate, whether it is intuitive knowledge, a formal control system or something in-between. Governments generally operate fish inspection and control systems to ensure export market requirements. These agencies may or may not have control over domestic production as well.

Other agencies may control domestic production or areas of supply to export processing plants. Several government agencies, including fisheries, health, commerce and trade, state, municipal, and local authorities are currently providing services related to the safety and quality of fish products. There is still a lack of coordination in some countries among these agencies, which has created confusion, conflicting standards and duplication of roles. Different procedures have been applied in different areas of the country by different agencies.

Importing countries are becoming more and more demanding in their requirements. Initially imports and importing countries required exporters to meet safety requirements under the SPS agreement, through verification of industry HACCP control systems, which can be audited by government. Adapting to a new global trade environment, new emerging issues respecting import requirements have developed, and have to be dealt with; such as traceability and certification of product for safety, sustainability, combating IUU fisheries, social issues, and for environmental purposes; from sea, inland waters or from aquaculture. These and other issues are dealt with in Theme 5; but here, we need to look at the operational mechanism of traceability and certification, and how this information will be passed from processor to the importer. Additionally, there are some other issues such as testing water, testing product for contaminants, toxins, residuals, or GMO's.

Meeting export market requirements is a food security issue, as foreign exchange contributes to the welfare of the country and to all those workers involved in the industry through wealth generation. The ASEAN Economic Plan requires that all ASEAN food inspection agencies, including fisheries, be harmonized by 2015. More work has to be done on the technical aspects of harmonization.

Safety of domestic fish products is becoming a greater issue. The Millennium Conference indicated that regional thrusts should be focused on SME's. This is vitally important to food security in ensuring the consumer eats a safe product. Much work has been done in the last decade in adapting HACCP to SME's that may export traditional products, and to develop improved operating practices for domestic SME's like TPE's and PPE's by incorporating GMP and SSOP. At this point of time, it is not yet practical to try to apply HACCP to these industries, which may come at a later date, but HACCP's prerequisite is GMP/SSOP.

Much work has been done in the last decade on laboratory harmonization for fish import and export control systems, by verifying testing methodologies, harmonizing laboratory procedures and practices between laboratories in the region, and developing GLP's. Additional work still has to be done in order to harmonize procedures between inspection agencies in ASEAN and to develop equivalency with inspection systems in importing countries. Harmonization is being carried out by the ASEAN mechanism, abet slowly. Some of the activities derived from the recommendations of this paper may help assist in obtaining the goal in a shorter time.

Issues

The issues at the Millennium Conference were poor quality raw materials and end products, and a lack of infrastructure; industry, and in particular SME's had a lack of financial assistance and incentives to upgrade and implement appropriate quality/safety control systems; there was a need to review and revise food safety aspects of laws/regulations/guidelines related to fishery products standards and its application; there are sometimes inadequate enforcement of regulations on quality control and food safety, and a lack of coordination amongst various government bodies; there is a need of harmonization of safety standards, inspection, auditing, regulations, laboratory testing, HACCP training and implementation in line with international requirements; and harmonization within ASEAN, Codex and the SPS. The RTC and National Seminars on Post-Harvest Technology noted that some of the issues are covered in other sub-themes, but agreed that the issues mentioned above are still valid today, and highlighted the following issues that need more immediate action and should be addressed over the next decade:

Lack of GMP/SSOP implementation

There is a lack of GMP/SSOP implementation in source suppliers, processors, and transporters due to cost and lack of encouragement. Implementation of control systems such as GMP/SSOP for SME's, that are TPE's and PPE's, supplying to domestic markets should be fast-tracked, and more resources should be put into enforcement. Development of SME's and products from villages and communities should be encouraged. There is an over-emphasis on international markets and regional thrusts should continue to be on SME's; except for the issues mentioned below.

Lack of traceability methodology and capacity to deal with new emerging export requirements

There is a lack of traceability and food safety assurance in raw materials due to suppliers who lack proper documentation, and fish collection from many sources. For some products, in order to meet market requirements, traceability systems do exist in some countries. However, many of these systems are private and are not all-inclusive. These systems need to be harmonized within the country and ASEAN. Traceability systems applying to the whole supply chain need be developed, including regulations, enforcement systems, and certification management mechanisms. Further, there are other more and more stringent importing country requirements that must be dealt with; for example: water, chemical contaminants, residuals, toxin and GMO testing. All of these tests have a high cost, and there is a lack of testing capabilities in the region. There are financial constraints in developing quality/safety control systems, and governments should be urged to support control agencies efforts to cope with these new emerging needs, in order to avoid the development of technical barriers to trade.

Lack of harmonized inspection systems and standards in ASEAN

There is still a lack of harmonization in inspection systems in ASEAN, and there are certification and accreditation issues related to Halal and organic food that needs attention. Governments should invest in testing capabilities, align ASEAN Members inspection systems, and harmonize standards for common products. ASEAN should develop its own equivalency standards, including proficiency testing of laboratories. International certification organizations sometimes have poor knowledge of ASEAN products and they are also expensive and may involve stringent requirements; it would be better if ASEAN could do its own certification.

Poor internal regulatory control and lack of technical manpower

There continues to be internal regulatory control problems in some countries, such as multi-agencies and overlapping functions. Coordination between government agencies should be strengthened, and access and/or exchange of information through existing mechanisms better facilitated. Finally, there is a lack of technical

manpower in many countries. There should be further capacity building, recruitment of personnel and intensified awareness by industry and private sector collaboration.

Lack of knowledge on quality and safety of freshwater fish

Freshwater fisheries are very important to most ASEAN countries, and are vitally important to those countries having a large inland fishery, where it is a major contributor to the food security of those countries. There is a general lack of knowledge on ways and means to improve the quality of these fish and their products. There is also a concern about the safety of freshwater fish; as these fish and their products may be a vector for parasites.

Conclusions and Recommendations

Conclusions

Implementation of an effective quality, safety and control management system is essential if ASEAN Member Countries want to expand their fish trade and competitiveness of fish and fishery products for regional and international trade. Likewise, the production of a good quality safe product for domestic markets is necessary in order to ensure food security.

Recommendations

I. Implement GMP/SSOP in SME's, by:

   a) Developing training materials, conducting training of trainers programs, and training of industry on GMP/SSOP implementation.
   b) Investigating means whereby the industry could obtain funds to incorporate GMP/SSOP.

II. Improve traceability methodology and capacity to deal with new emerging export requirements, by:

   a) Investigating traceability systems that currently exist, and developing a mechanism whereby such systems can be harmonized in ASEAN
   b) Investigating new emerging issues, and how they may be incorporated into a harmonized certification management mechanism

III. Improve harmonization between inspection systems and standards in ASEAN, by:

   a) Investigating certification and accreditation issues related to Halal and organic foods
   b) Continuing ASEAN laboratory accreditation, developing methodologies and mechanisms for proficiency testing, and promoting GLP
   c) Continuing the process of harmonizing food inspection systems and standards for common products
   d) Investigating how private certification schemes could be incorporated into national or ASEAN certification management mechanisms

IV. Improve internal regulatory control and technical manpower, by:

   a) Developing a National Plan of Action in conjunction with other regulatory agencies to coordinate and control all aspects of fish handling, processing, distribution, and marketing.
   b) Encouraging the recruitment and training of quality management personnel.

V. Investigate the quality and safety of freshwater fish

Annex 23

ADDRESSING EMERGING INTERNATIONAL FISH TRADE CONCERNS TO SUPPORT THE SUSTAINABLE DEVELOPMENT OF FISHERIES

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General Description

International fish trade is a complex web of actions of importers and exporters considering that global trade in fishery commodities involve billions of US dollars. In 2008, global fish trade reached US$ 102 billion (export value) representing an 11% growth relative to that of 2004. The top five global fish markets were Japan, USA, Spain, France, and Italy meanwhile Thailand and Vietnam were among the top five exporters of fishery commodities (FAO, 2010). About one-half of all fish exports are produced in developing countries, while the big consumers are developed countries accounting for 80% of all imports. This indicates that developing countries have found a stable market that can be relied on, the market niche carved for the fish and fisheries products from developing countries, providing them bright future in terms of job opportunities and increased incomes, contributing to the socio-economic well-being of their people. Nevertheless, developing countries do not have the same resources, guidelines or know-how that developed countries have such as the United States and Japan. Thus, if developing countries do not take advantage of such guidelines and know-how, the growth of the countries' export fish trade could be jeopardized. Moreover, if unsustainable fishery practices continue to prevail in developing countries, food security could even be threatened. Therefore, promoting responsible international trade in fish and fisheries products should be seriously considered by developing countries, where advocating such important issue is also being addressed during discussions and negotiations in the global arena.

Introduction

With the objective of promoting fish trade in a sustainable manner, the global Code of Conduct for Responsible Fisheries specified that "*Promotion of international fish trade and export production should not result in environmental degradation or adversely impact the nutritional rights and needs of people for whom fish is critical to their health and well-being*". Specifically for the ASEAN region, the 2001 Resolution and Plan of Action on Sustainable Fisheries for Food Security stipulated that ASEAN Member Countries should "*Strengthen the joint ASEAN approaches and positions on international trade in fish and fishery products indigenous to the region by harmonizing standards, criteria and guidelines*".

The establishment of the COFI Sub-committee on Fish Trade in 1986 illustrated the importance of global fish trade. The Sub-committee is tasked to provide a forum for consultations on the technical and economic aspects of international trade in fish and fishery products including the applicable standards for production and consumption. However, the issues on trade in fish and fisheries products have also been greatly discussed and driven by international markets and by various trade-related agencies which rarely involves the fisheries authorities and sometimes even devoid of contributions from the aspects of sustainable fisheries development and management. The developing countries are therefore confronted with difficulties in integrating such global instruments and requirements into their national trade legislations and policies. Nevertheless, global instruments which are agreed or enforced by international organizations should ascertain that the impacts of such instruments on the sustainable development of fisheries in developing countries and particularly on the small-scale fisheries in Southeast Asia are taken into consideration during the formulation of such instruments. Since it is important to reconcile the international driven issues with the promotion of sustainable fisheries development, therefore the implications of fish trade to the fishery resources and the environment, and on the quality and safety of fish and fisheries products as well as the adoption of trade barrier agreements both tariff and non-tariff on imported fisheries products, should be raised for negotiations in the international arena.

Fish Trade-related Measures

In 2008, the total fishery production of the Southeast Asian countries was 27.3 million metric tons valued at US$ 28.6 billion of which production from marine capture fisheries, inland capture fisheries and aquaculture accounted for 51%, 9% and 40% of the total production, respectively (SEAFDEC, 2010). In 2009, the annual growth rate of fish exported as food from Southeast Asia was recorded at 7% with reference to that of the data in 2000 (WTO, 2010). Fisheries also create employment opportunities for peoples in the region, where in 2007

for example, the fisheries sector engaged about 3 million people accounting for 1.5% of the total employed persons in the region (SEAFDEC, 2008).

While the demand for fish and fisheries products continues to increase, the concern on food quality and safety is also escalating. The sustainable use and proper management of the resources have been brought into the picture by various agencies and importing countries. The exporting countries are therefore forced to comply with the requirements as reflected in the growing concern of consumers on contamination and transfer of diseases from animals and on the chemical residues in fisheries products, as well as on the trade measures that aim to address the sustainable harvesting of resources by the fisheries sector.

Box 1. Concerns raised by ASEAN countries with regards to the application of SPS and TBT

Several concerns have been raised by the ASEAN countries with regards to the application of such Agreements:

- Limited knowledge and expertise in risk assessment and SPS/TBT measures constrained the further strengthening and harmonization of the technical regulatory mechanism within ASEAN;
- Insufficient involvement of scientific expertise from the academe and industry, as well as consumers in strengthening the scientific basis for food control decision making processes;
- Difficulties in accessing information on import requirements and limited financial support for capacity building and harmonization activities like ASEAN training activities, meetings and other means of sharing information and experiences; and
- Limited capacity in terms of laboratory facilities where only few countries have their laboratories accredited for ISO/IEC 17025. Currently, key laboratories in Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam have been accredited for ISO/IEC 17025 (FASOR, 2011).

Box 2. ASEAN regional position on fisheries subsidies

- Fisheries subsidies is recognized as a tool either used as temporary or long-term measures under a broad national development and management framework to ensure the sustainable fisheries
- The use of fisheries subsidies needs to be coupled with close monitoring and evaluation of status of fishery resources as well as the impacts of subsidies on socio-economic and the resources, which are different from countries to countries
- Fisheries subsidies contributing to sustainable fisheries as well as people livelihoods and poverty alleviation should be permitted
- Some fisheries subsidies whether they should be permitted or removed will depend on a number of factors including management regime, status of resources and the length of time that subsidies will be applied
- Fisheries subsidies contributing to over-exploitation of resources or unsustainable fisheries and trade distortion must be removed
- Close coordination between fisheries related agencies and trade related agencies in each country should be promoted to reflect the requirements and complexity of the fisheries

As a step towards the realization of the ASEAN Economic Community in 2015, the ASEAN Ministers adopted in November 2004 the ASEAN Framework Agreement for the Integration of Priority Sectors. The roadmap which is an integral part of the Agreement, includes issues specific to the fisheries sector, as well as horizontal issues cutting across all sectors such as: tariff elimination; non-tariff measures; customs cooperation; effective implementation of the Common Effective Preferential Tariff (CEPT) scheme; Improvement of Rules of Origin, Standards and Conformance; future investments; and improvement of logistics services. Among others, assurance that actions relevant to SPS/TBT on the development and application of fisheries quality management systems that ensure food safety through the implementation, validation and verification of the Hazard Analysis and Critical Control Point (HACCP) had also been required. Such efforts had been envisaged to enable the ASEAN community to be more competitive in trading its fish and fisheries products. As a condition for exporting fish, several measures related to trade of fish and fisheries products both non-voluntary and voluntary, have been initiated by international organizations and agencies. Among such regulatory measures are the General Agreement on Tariffs and Trade (GATT), the Agreements on the Application of Measures on Sanitary and Phytosanitary Measures (SPS) and on Technical Barriers to Trade (TBT) shown in **Box 1,** the Agreement on Subsidies and Countervailing Measures (SCM) shown in **Box 2** and **Box 3**, and CITES issues. Moreover, some of the voluntary schemes include: Catch Certification, Catch Documentation and related documentation schemes (**Box 4**); Aquaculture Certification (**Box 5**); Traceability (**Box 6**); Eco-labeling (**Box 7**). It should be noted that the international NGOs have a strong influence in shaping the regulatory framework of trade in fish and fisheries products. Some NGOs lobby with the WTO and UN agencies to raise the profile of the environment, sustainable development and food safety in their trade agenda. Other organizations such as the Marine Stewardship Council (MSC) also set up practical tools such as eco-labeling schemes to foster sustainable trade in fish and fisheries products (**Box 8**).

Non-voluntary International Agreements

Tariff

Tariffs are duties levied on imported products. Tariff barriers are however, considered obstacles to trade and remained the principal legitimate type of government intervention. Nevertheless, tariffs could also be subjected for negotiations and could be progressively decreased based on the provisions spelled out by the World Trade Organization (WTO) which is the main international structure responsible for dealing with rules/negotiations on trade among nations. At the Uruguay Round of WTO negotiations in 1995, it was agreed that 36% reduction of tariffs would be applied for the developed countries and 24% for the developing countries. Within the Southeast Asian region, the ASEAN Free Trade Agreement (AFTA) in 1992 concurred to reduce tariffs on most processed agricultural and industrial products intended for intra-regional trading by 0.0 to 5.0% by 2003 (ASEAN, 2011).

The ongoing establishment of an ASEAN Economic Community or a single ASEAN market by 2015 has accelerated the pace of the regional integration to unify and extend the ASEAN Free Trade Area to the ASEAN Investment Area and the ASEAN Framework Agreement on Services, which are clearly aimed at facilitating trade. Although trade facilitation measures within the ASEAN had been agreed at the regional level or among a subset of members, most trade facilitation is non-discriminatory. Meanwhile, it should be noted that improved documentation, port logistics and so forth could reduce costs of trade with all partners (Pomfret and Sourdin, 2009).

Agreement on Technical Barriers to Trade (TBT)

The Agreements on the Application of Measures on Sanitary and Phytosanitary Measures (SPS) and on Technical Barriers to Trade (TBT) were established and entered into force in 1995 during the Uruguay Round of Multilateral Trade Negotiations of the WTO to address the emerging debate over the use of standards in international trade. SPS measures aim to address and ensure that human and animal food is safe from contaminants, toxins, and diseases. It covers all relevant laws, decrees, regulations; testing, inspection certification and approval procedures; packaging and labeling requirements directly related to food safety. Nations are asked to apply only those measures that are based on scientific principles, and only to the extent necessary and not constituting a disguised restriction on international trade. The Agreement encourages the use of international standards where they exist and identifies the Codex Alimentarius Commission (CAC) food standards, guidelines and other recommendations as consistent with the provisions of SPS. Where a WTO member considers that a higher level of sanitary protection than afforded by Codex is necessary, it will have to produce scientific evidence based on valid risk assessment techniques.

The Agreement on TBT is concerned with the technical regulations on traditional quality factors, counterfeit practices, packaging, labeling, other than the standards covered by the SPS Agreement imposed on countries but will not be more restrictive on imported products than on products produced domestically. Technical measures applied should not create unnecessary obstacles in international trade, have a legitimate purpose and the cost of their implementation should be proportional to the purpose of the measure. If the proposed measure is considered to violate the provisions of any of the two Agreements, it can be challenged and brought before the WTO dispute settlement mechanism. These agreements balance the competing demands for domestic regulatory autonomy and the global harmonization of product standards. At the same time, the agreements attempt to prevent standards from becoming a protectionist device.

The issues underlying the causes of unsatisfactory conditions in food quality and safety control in food trade such as complexity of market systems, as well as the interaction and cooperation between the industry and government on food safety control matters. Several concerns have been raised by the ASEAN countries with regards to the application of those Agreements (**Box 1**).

In line with the imperative for accelerated economic integration towards the realization of the ASEAN Economic Community in 2015, the adoption and implementation of the new ASEAN Trade in Goods Agreement (ATIGA) effective in May 2010 which contains new obligations in both the SPS and TBT areas would facilitate and strengthen intra-ASEAN trade. Under this Agreement, ASEAN is obligated its SPS related-activities in line with international standards and would explore additional opportunities for intra-ASEAN cooperation. For the TBT area, where applicable, ASEAN also obligate its technical regulations and conformity assessment procedures to be aligned with international standards and practices without frustrating trade in ASEAN. It is however, still needed for technical and financial assistance to match the requirements

imposed by SPS and TBT Agreements especially the insufficient capacity to assess the scientific justification of importing countries' SPS requirements, to undertake risk assessment and demonstrate equivalence.

Fisheries subsidies under the Agreement on Subsidies and Countervailing Measures (SCM)

With the deteriorating trend of the fishery resources globally, various international organizations are attempting to advocate the world scenarios in protecting these resources and discontinuing any actions that would threaten their sustainability. Fisheries subsidies become one of the global agenda discussed at WTO negotiations. A number of questions have been raised with regards to the financial support from governments to the fisheries sector, the incentives of which had not helped in achieving sustainable fisheries but seemed to encourage over-fishing activities. Thus, fisheries subsidies had been considered as linkage that contributes to over-exploitation of fishery resources.

The Doha Ministerial Conference in 2001 launched the negotiations to clarify and improve the WTO disciplines on fisheries subsidies, and during the Hong Kong Ministerial Conference in 2005, there was broad agreement on strengthening those disciplines especially the appropriate and effective Special and Differential Treatment (S&DT) for developing and least-developed Members which should be made integral part of the fisheries subsidies negotiations. The Chair of Negotiating Group on Rules (NGRs) circulated in November 2007 the Draft Consolidated Chair Texts of the Anti-dumping and on Subsidies and Countervailing Measures (AD and SCM) which includes disciplines on fisheries subsidies. Since then, a number of proposals pertaining to the Draft Consolidated Chair Texts have been submitted to the Chair especially the proposal on the "Need for Effective Special & Differential Treatment for Developing Country Members in the Proposed Fisheries Subsidies Text" submitted by India, Indonesia and China. The progress of the discussion has extended the disciplines on the prohibition of certain forms of fisheries subsidies to undertake further detailed work for appropriate and effective S&DT.

As such, trade negotiations in fisheries could be even more complex than in agriculture as the specificities of the sector are often overlooked. Among the specificities, the renewable nature of the resources and the question of property rights had been most manifested. These issues will again surface when the question of access to the resources and of the protection of the small-scale fisheries is dealt with. Many developing countries do not have the capacity to be active in so many fronts, especially that some countries do not have permanent representations in the WTO in Geneva and thus, would require profound assistance to be successful in those negotiations. In the past, only representatives from trade or from foreign affairs with inadequate information on the difficulties of implementing fisheries subsidies attended the negotiation rounds. With issues on fisheries raised during the negotiations, the consequent relationship between sustainable fisheries management and trade liberalization could receive less attention to some extent.

Besides, the requirements that would enable developing countries to grant fisheries subsidies in the Chair's Text seemed too stringent and that many of such requirements would be impossible to fully comply with at this time. Such concerns had been discussed among the ASEAN-SEAFDEC Member Countries through various consultations and meetings in the last few years. The ASEAN regional position on fisheries subsidies is summarized in **Box 2** while the progress on the negotiations on fisheries subsidies is summarized in **Box 3**.

Box 3. Progress on the WTO negotiations on fisheries subsidies

The debate among the WTO member countries could not yet be settled, since there is no right answer to the different fisheries situation that vary throughout the world. Therefore, the Chair of NGRs set up a "Roadmap for Discussion on Fisheries Subsidies" and that requires a stronger and detail justification from the Member Countries. Currently, the negotiation on fisheries subsidies at the WTO is under the third round of negotiation under the new Chairman of the NGRs and it had been changed from open-ended discussion to plurilateral format with limited number of participants by invitation only and thus far, has not included the ASEAN countries. Such plurilateral meetings are usually followed by open-ended transparency sessions where the Chair reports the matters discussed during the plurilateral meetings. In the recent open-ended informal meeting of the NGRs in February 2011, the ASEAN member country solely Malaysia had the opportunity to meet the "Friends of the Chair (FOC)" who were appointed to take care of issues on fisheries management and that the FOC would consult with the WTO members on the technical inputs on fisheries management. After consulted with the delegations of several member countries, the FOC reported to the Chair that the core elements which should be mandatory for all members in respect of all sorts of fisheries and "tools" or "illustrative" which would be applied as appropriate.

The six core elements were identified by the Chair of Negotiating Group on Rules (NGRs) during its open-ended informal meeting in February 2011 as follows;

1) Institutions and legislation, to ensure that there is a management authority with sufficient legal power to do its work;
2) Stock assessments, to assess the state of the resource, with a variety of methods identified, including counting landings, catch, by-catch etc., to develop trends on how well the stock and possibly associated species are doing;
3) Capacity assessments and management, which could be effected through vessel registries, maintaining data on boats and licenses, and similar measures, with the idea being that the size of the fleet and its capacity to fish should match the amount of fisheries resources;
4) Effort controls, which could take the form of input controls, such as limits on areas, fishing seasons, gear, vessel sizes, and so forth, and output controls, that is, limits on how much a vessel can catch, through the setting of total allowable catches, quotas, etc.;
5) Monitoring, surveillance and control, which can be effected through direct control where all fish are landed in one place and counted by an inspector, or through periodic sampling, or through various forms of community organizations, including marketing cooperatives through which all fishers must sell their catch. More sophisticated methods and tools also were identified including satellite-based vessel monitoring systems, GPS, and video cameras, although such methods were not viewed as appropriate or possible for all fisheries; and
6) Enforcement, in particular penalties for violating the applicable fisheries management requirements. In some cases, there are criminal penalties, in others community based peer pressure is a main enforcement tool. In regard to all of these elements, the Friends reported that a large number of delegations had stressed the importance of technical assistance, capacity building and appropriate transition periods, which might vary by type of fishery.

As this still an on-going process of discussion, the ASEAN Member Countries are encouraged to consult and provide views and experiences to FOC for the appropriate provision on fisheries management as open the room by the Chair.

CITES issues

With the aim to ensure the international trade in specimens of wild animals and plants without any threaten to their survival, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement entered into force in July 1975. There are currently 175 Parties including all countries in the Southeast Asia. CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the Convention has to be authorized through a licensing system. The species covered by CITES are listed in three Appendices, according to the degree of protection they need. Appendix I include species which are threatened with extinction; Appendix II includes species which are not considered threatened with extinction but may become so if their trade is not regulated, while Appendix III includes species which are not considered threatened with extinction, but are under special management in certain countries.

CITES is one of the important issues for trading of international and regional aquatic species since any goods which may be wildlife products or even live animals under controlled by international treaties must be required special permits to export, import, and re-export the items legally. Without necessary permits, those goods are subject to seizure and forfeiture, and the importers/exporters are liable to prosecution. In order to secure trade-flow of such species, there are more concerns on the listing of commercially-exploited aquatic

species into the Appendices of CITES. Many aquatic animals of economically importance have been increasing, *e.g.* tuna, humphead wrasse, sea horses, and sharks.

A number of proposals related to commercially-exploited aquatic species submitted to CITES are still rising, and those are pushed forward by environmentalist and developed countries. Most pressure point to the species that are highly harvested without proper management. It is indeed different opinions between resource management organizations and wildlife conservation organizations debating during the past decade in this forum. Since Southeast Asian region is considered as an area that diverse of commercially-exploited aquatic species. Close monitoring on the issues should be made. However, since lack of scientific data had been noted especially on shark production and identification of shark species, countries in the Southeast Asian region may face the difficulties in debates and negotiations on the inclusion of such species into the Appendices.

In the region, deliberations on the issues have been carried out through several fora and it was agreed that the listing of commercially-exploited aquatic species to CITES Appendices should be done under the purview of competent organization like FAO. An FAO *Ad-hoc* Advisory Panel for CITES was therefore established in order to review the listing of commercially-exploited aquatic species and provided the technical/scientific advice from FAO, which could also incorporate the relevant technical/scientific information from other relevant Regional Fisheries Bodies including SEAFDEC.

Among the recommendations for Southeast Asian countries, there are priority areas *i.e.* improvement of data collection on sharks at the national level in order to improve compilation of fishery statistics and information on sharks and rays in the region (*e.g.* CPUE, stock assessment, population dynamics), and implementation of HRD activities on species identification of major shark species in the region as well as to continue monitoring the issue and try to come up with relevant information as basis for discussion and formulation of common/coordinated position among the Member Countries.

Voluntary Instruments

With different features from the abovementioned measures, voluntary instruments are known to be sound policy options and could be associated with the market-driven measures. These voluntary instruments are concerned about the awareness of consumers on safety and quality of fish and fisheries products while embracing the context of ecological integrity underlining the need to address the sustainable use of the resources and ecosystems. Such measures have motivated the fisheries industry and markets to reconcile credible certification schemes to support responsible and sustainable fisheries as well as to maintain international and regional trade.

The initiatives of the recent measures are now shifting towards market-driven standards and the need for consumers' acceptance for fisheries products. Several standards and certification schemes have been developed and introduced which are mostly regulatory and voluntary based on the requirements of importing countries. The voluntary instruments elaborated in this paper include measures such as catch certification, the FAO Technical Guidelines on Aquaculture Certification, Traceability, Eco-labeling, and the Marine Stewardship Council initiatives.

Box 4. Catch certification, Catch documentation and related documentation schemes

Catch certification refers mainly a certification scheme of the European Commission (EC)'s regulation 1005/2008 which came into force on 1 January 2010 and requires imported fisheries products enter to the EC to be accompanied by a catch certification (Article 12) validated by the competent authority of the flag state of the vessel where the fish was caught. Indirect imports to the EC must be accompanied by additional traceability documentation provided by the third country. The scheme is to place strong emphasis on checking, inspection and verification activities. However, these requirements are not linked to the food-safety traceability and certification requirements applying to the same products.

"Catch documentation" in general refers to schemes established by Regional Fisheries Management Organizations (RFMOs) to require documentation to accompany particular fish and fish products through international trade identifying the origin of the fish for the purpose of determining levels of unreported fishing. There are two main types concerned under these schemes which are catch documentation schemes and trade documentation schemes.

One key difference between these types is that "catch certifications" are issued at the point of harvesting and cover all fish to be landed or transshipped while "trade documents" are issued only with respect to products that enter international trade. Both types of documents contain information relating to the fish in question, although catch certifications contain more comprehensive data. The terms "catch certification", "catch documentation" and other related terms have not been consistently applied in international practice. However, those schemes have the principle to combat IUU fishing and those documents accompany the fish through trade.

Considering that multiple formats required by each certified body may create confusion and burdensome administration and paperwork placed on operators/exporters. Harmonization of these schemes would create incentives towards compliance, would promote international trade in fish products and would reduce deceit possibility of fraud. However, such catch documentation scheme should align with those of relevant RFMOs and the EC Catch Certification.

In Southeast Asia, there is concern on the need to develop a common catch documentation scheme for the region that complies with those of the RFMOs' and EC's requirements, in order to facilitate intra-regional trade of fish and fishery products. Indonesia, for example, currently is a member of the Indian Ocean Tuna Commission (IOTC) in July 2007, the Commission for the Conservation of Southern Blue Fin Tuna (CCSBT) in April 2008 has already adopted a catch certification scheme for tuna fisheries, which could be taken into consideration in the development of the Catch Documentation Scheme for the region. However, in the development and implementation of such common scheme, caution should be made as such scheme could adversely affect regional trade, particularly for countries that could not comply with the requirements of such scheme.

Box 5. FAO Technical Guidelines on Aquaculture Certification

The increasing importance of aquaculture in providing fish supply for human consumption, has led to a number of aquaculture certification schemes which were established to ensure responsible aquaculture operations and product safety for human consumption. The guidelines, after four years of discussion and debate among governments, producers, processors and traders, were adopted by the FAO COFI in February 2011. As non-binding in nature, the guidelines cover animal health and welfare, food safety, environment integrity and socio-economic aspects associated with aquaculture.

The use of the guidelines will help the public and private standards work in the same direction, reducing pressure on non-tariff barriers. During the discussion at the Regional Technical Consultation on International Fisheries-related Issues (2011) in January 2011, it was suggested that issues related to social aspects in the technical guidelines should be left under the purview of the International Labor Organization to avoid duplication of efforts. There are also concerns on the possible increased production costs resulting from the adoption of the Guidelines and under environmental integrity. The concerns should be made on the effect of the creation of trade barriers when exporting aquaculture products. Therefore, the possible assistance from FAO and developed countries in the adoption of the Guidelines should be explored.

Box 6. Traceability

The Codex Alimentarius Commission (2004) defines traceability or product tracing as "the ability to follow the movement of a food through specified stage(s) of production, processing and distribution". Traceability makes it easy to pinpoint the source of a food safety problem very quickly. Contamination in a particular area, authorities can quickly determine exactly where the contaminated products originated. Without traceability it can take weeks to find the source of the problem. Lengthy food-safety scares can result in large recalls, unnecessarily discarded food and reduced consumer confidence. Traceability systems are basically record-keeping systems and the concepts generally used to distinguish theoretically between different kinds of traceability systems (Codd, *et al.*, 2008). Internal Traceability is traceability of the product and the information relating to it, within the company. Internal traceability systems are also aimed at productivity improvement and cost reduction. The "one step forward and one step back" approach articulates the required state at each link in the chain knowing where the products come from and where they are delivered. Chain traceability is information on the origin of materials and parts, processing history, and the distribution and location of the product at various points in its production.

By using traceability measures (ICTSD, 2006), regulators seek to: identify unsafe products that can be withdrawn and distinguished from post market safety aspects; provide consumers with information on quality *e.g.* nutritive or medical claims and air practices; comply with security aspects of food marketing such as those that fall under the US Bioterrorism Act; and achieve business management goals associated with quality controls, business partnerships, production and distribution and industry integration. Recently, governments and organizations around the world have also been developing different systems on seafood traceability *e.g.* TraceFish (EU), TraceShrimp (Thailand). For example, TraceFish, the short title for the "Traceability of Fish Products", was the project funded by the European Commission. The objectives were to bring together companies and research institutes to establish common views with respect to what data should follow a fish product through the chain from catch/farming to consumer. The main outputs were three voluntary consensus-based standards for recording and exchange of traceability information in the seafood chains including Farmed Fish Standard, Captured Fish Standard and Technical Standard (Tacefish, 2011).

In order to achieve full traceability for the entire food industry, it must have traceability system of the products in the whole supply chain. Meanwhile, the costs associated with technical compliance to these tracing systems are often costly and would be economical in large volume production and exports. These costs normally paid by exporting countries, and it relatively creates problems and difficulties in accessing international market to exporting countries where small-scale and artisanal fisheries are main contributors. During the 12th Session of the COFI Sub-Committee on Fish Trade, 2010 it was agreed that traceability initiatives were useful tools to verify the integrity of the supply chain however, recognized that the traceability requirements for food safety were somewhat different from those linked to sustainability. Then, FAO was suggested to have an ongoing role in providing technical assistance to countries implementing traceability systems or seeking to integrate their traceability systems. The FAO should also monitor technical developments and assess their applicability in traceability systems (FAO, 2010).

In addition, SEAFDEC Program on "Traceability for the Aquaculture Products in the ASEAN region" implemented from 2010-2014 aims to provide a platform for the sharing of information and experiences among the ASEAN Member Countries on traceability systems to better enable the regional aquaculture industries to implement appropriate traceability systems for aquaculture products and to meet international traceability requirements in the network of aquaculture production, marketing, and trade.

Box 7. Eco-labeling

Eco-labeling was first publicly promoted by Unilever PLC/NV and the World Wide Fund for Nature (WWF) at their Marine Stewardship Council (MSC) initiative in early 1996 (FAO, 2011). The failure of traditional governance structures to successfully implement sustainable fisheries management policy has created a niche for environmental non-governmental organizations to play an active role in drawing public attention to unsustainable fishing practices around the world and bringing pressure to bear on governments and RFMOs entrusted with fisheries management to implement more conservation-minded and sustainable measures (Shelton, 2009). The eco-labeling issues have become a special interest in the international fish trade forum which views as a potential tool to stimulate more responsible fisheries and aquaculture practices and hence improving sustainability. Whilst the eco-labeling principles are consistent with the sustainability concepts, there are however major concern given to its impacts on barriers to trade due to compliance cost and/or lack of capacity to comply (where there is a strong demand for labeled products) as well as burden of compliance particularly on small-scale producers.

SEAFDEC-Sida project has since the SEAFDEC Council meeting in Brunei Darussalam 2006 worked towards the aim of developing a regional strategy regarding eco-labeling. In this effort, consultations and an expert meeting on the role of the government has been held. The major outputs were that the government has several important roles to play, particularly when it comes to being pro-active and facilitate the prerequisites for opening up for labelling and certification (food safety, infrastructure, combat illegal fisheries, market access etc.) However, the overall impressions about eco-labeling (Bjerner *et al.*, 2006), which are the main cause of hesitation in adopting eco-labeling, and the general perceptions about eco-labeling include: Eco-labeling is seen as a regulation imposed by importing countries to discriminate ASEAN products; Eco-labeling criteria is not practical for multi-species fisheries in ASEAN; Eco-labeling market is not guaranteed, neither is the premium price; and Costs associated with certification systems can be a major barrier especially for small-scale producers. However, the study found that there are national eco-labeling schemes in some countries which could be adopted or adjusted to fisheries and aquaculture products as well as the concern on its potential to add value on traditionally produced products and to facilitate market access.

Box 8. Marine Stewardship Council Initiative

The initiative led by *Marine Stewardship Council (MSC)* is to provide support on certification, which is regarded as market incentive. The MSC became an autonomous, global, non-profit organization in 1999 whose role is to recognize, via a certification program, well-managed fisheries and to harness consumer preference for seafood products bearing the MSC eco-labeling of approval. The MSC has established a process for third-party certification of fisheries or fish stocks as well as for fishing practices. It recognizes that a sustainable fishery should be based on three principles: (1) maintain and recover healthy populations, (2) maintain integrity and diversity of ecosystems which the fishery depends, and (3) maintain and develop an effective fisheries management systems including compliance with relevant local and national laws and standards and international understandings and agreements (MSC, 2010). Its eco-labeling program fully consistent with the guidelines for eco-labeling of fish and fishery products developed in 2005 by the Food and Agriculture Organization of the United Nations (FAO).

The greatest challenge for MSC, however, has been certifying small-scale tropical fisheries. The first small-scale tropical fishery from a developing country to be certified to MSC was the rock lobster fishery in Baja California, Mexico, in 2005. The certification expired in 2009, and is now under reassessment. So far, MSC has certified the hard clam fishery of Vietnam which is the only case of a tropical fishery certified in the Southeast Asian region (MSC, 2011).

During the Regional Technical Consultation on Adaptation to a Changing Environment in November 2010 in Bangkok, Thailand, the RTC mentioned that as MSC is not universal standards therefore, it is not possible for MSC to modify its standards to suit any particular region. However, in order to meet standards/requirements, the region could emphasize the attempts to: improve fisheries management; implement harvest strategies and harvest control rules; support catch documentation scheme and data collection; and support traceability systems.

Conclusions

In order to strengthen fisheries trade in the Southeast Asian region and beyond, it is necessary to ensure that the various measures and instruments imposed by importing countries are regularly examined in order that such requirements do not comprise the unnecessary barriers to trade. In addition, the regulatory requirements for food safety and the general voluntary schemes made many exporting countries to look into voluntary labels or certifications allowing producers and exporters of fish and fisheries products to target specific segments of consumers, and thus gaining a competitive advantage. Furthermore, the criteria on environmental sustainability and social stability should be viewed from the aspect of gaining increased access to new markets.

Although the growing global concern on environmental status, including climate change, human rights, social wellbeing also comprise the more stringent requirements of importing countries, such concern should also be considered from the advantage of tracing the quality of the products through the whole production chain. Therefore in order to ensure the effectiveness and credibility of the production processes from catching the fish to processing and transporting, non-voluntary schemes should be considered and complied by the countries and mainstreamed with their national regulations. Considering that the ASEAN countries are main exporters of fish and fisheries product to the world market, the countries should keep track of the developments of the various schemes, measures and instruments especially those which are binding with respect to sustainable fisheries and environmental practices. In this way, the countries could secure the benefits from fisheries trade as well as ensure smooth intra-regional-international trade and at the same time promote the sustainable utilization of the fisheries resources.

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Annex 24

JAPANESE SHARK RESEARCH ACTIVITIES IN RESPONSE TO RECENT CHANGE OF WORLD'S OPINIONS ON THE FISHERY STOCK MANAGEMENT

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Global situation over fishery stock managements

Recently, there is a growing concern about the sustainable use of natural resources. This tendency accelerates the recognition on promoting the sustainable fishery by the appropriate stock management and the aspect for conservation of ecosystem throughout the ocean range from the coastal to the deep sea. Looking back the history of the fish stock managements, the movements of the protection of the environments and fish stocks occurred in several time, *e.g*., when the many nations introduced the 200 miles zone as their exclusive economic zone, many scientists and managers stressed the importance of the protection of fish stocks, and also, when the principal of precautionary approach was defined, same situation was occurred.

The notable difference of the recent world movements of the environmental protection from those in the past is that the recent movements has great supports by the popular opinion especially in the Europe and North America, and also, the public opinion in these countries demands the environmental protection in the world wide scale, not only in the area related to them, but also in the area they do not have direct relationship. This means the power and the influence of the recent world movements of the environmental protection is higher than those in the past. Thus, Asian courtiers including Japan should take the positive actions to cope with this world movement to support our fisheries and fish stocks.

Traditionally, the regulation for fishery used to be implemented only when sufficient information about stock status is available. Unfortunately, the collection of "sufficient information" took too long to save the fishery and fish stock from the introduction of moratorium. By learning from these unfortunate experiences, the idea of precautionary approach was developed. However, the discussions about how long we should be precautionary are still going on, and still there seem some gaps among scientists, managers as well as stakeholders of fisheries. At the same time, the governments and environmental groups in Europe and North America are trying to spread the idea of precautionary approach and necessity of protection of environments to all over the world by receiving strong supports of their public opinions.

One of the symbolic topics for the current movements of the protection of the environments and fish stocks is the opinion that "fisher should take responsibilities to prove the fact that their fishery is clean". This idea, however, is not widely accepted in the world, and it exposes the severe aspect of the recent situation around the world fishery. Under such hard situation which arose in the western countries, we should recognize that we could not continue our fishery as in the 10 years ago. Though the current environmental movement demands many changes to fisheries, the final goal of coexistence between fishery and nature is still alive. Thus, for the fishery side, it would be important to clarify what we can change and we cannot change. To reveal this, we need more data about fish and fishery.

Topic of shark can be the one of the good sample to think about this global situation. Sharks are generally characterized by the long life and low productivity which indicates they are weak for fishing pressures. In addition, data of shark is generally rather limited in both coastal and offshore areas, but some of information suggesting that fishing pressure on sharks is increasing recently. Thus, the preparation of data and information about shark is necessary to attain sound management of shark stocks, and also this could be one of the best ways to protect your fishery from the pressures by the recent world movements of the environmental protection.

Sharks

Conservation of sharks has attracted an intense interest from environmental protection groups in the world. This is supposed to be, at least partially, because sharks are familiar with the public through animations and movies in particular countries and popular support for their conservation activity is easy to be obtained. In addition, many pelagic sharks are viviparity, and this biological character also appeals to the sympathy of the mass. These facts suggest that the managements and conservation of sharks attract more attentions of people conscious of environments. This should be supported by the fact that many shark species were proposed to be on the list of the appendices in the last CITES meeting. Thus, it is necessary for fishing country to collect the

reliable fishery data which can be the base to counter this kind of publicities by indicating the difference between the fact and just one aspect of the fishery.

Shark research activity in Japan

Japan had started the shark research since 1992 in response to the growing interest to pelagic sharks caught as bycatch in the high seas. At the same time, Japan made a positive approach to FAO to organized experts to consult on an International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks), and also Japan created National Plan of Action for the conservation and Management of Sharks (NPOA-Sharks) of Japan. Japan has been updated its NPOA-Sharks in every two years since 1999.

There are many difficulties in shark research including the many species regularly caught by tuna fisheries and low interests by fishers compared to main target species such as tuna and swordfish. At first, the correct classification of sharks is primal step for data collection. However, there are many "look-alike" species (*e.g.* hammerhead shark and thresher shark) and many local names for a single species depending on the locality (*e.g.* yoshikiri-zame or aota for blue shark in Japan).

Second, the rough classification of sharks in the market prohibits the researcher to collect the species-specific catch data from the wholesale fish market. In some markets, the shark meat and shark fin are landed separately and this tends to cause duplicative count for catch number.

Finally, the low value and interest by fishers often make the data of sharks incomplete and imprecise. For example, the fishers do not record the (precise) number of shark hooked, especially when they discard. It is excessive work for fishers to record the number of shark by species because sharks are not their target species.

Dealing with these problems, National Research Institute of Far Seas Fisheries (NRIFSF) made the leaflets and posters to enlighten and propagate fishermen and fishery related peoples to record precise shark data. These can help fisher to classify their catch and to record species-specific catch data. Furthermore, NRIFSF has continued to collect precise biological data from research and training vessels which operate tuna longline fishery, since 1992. Using biological samples from this program, variety of biological information of pelagic sharks such as the life history, sex specific migration pattern, and reproductive biology have been revealed, and they are utilized in the discussion in many RFMOs.

Future direction

For the sustainment and growth of the shark related fishery and fishers livelihood, we encourage the manager and fishers in the fishing country to keep the following points in mind.

1) Construction of cooperation system among countries

Because the demand for the sustainable fishery through the sound stock management becomes largest in recent years, one of the best ways to protect fish stock and fishery is to conduct good stock managements developed based on the scientific information with high quality (*e.g*. the result of stock analysis such as the trend of standardized CPUE). At the same time, when the multiple sources of scientific data exist, the quality of the total information for the stock is usually limited by the worst data series.

Distribution area of sharks usually extends over the coastal area of multiple countries as well as open sea area. Thus, it would be better to adjust the quality of data among all countries which catch each shark stock. In this context, the unification of names for the same species and the construction of common data format would be important.

2) Training young scientists

It is imperative that the scientists who work on fishery should be increased and trained. The fishers usually have "best" knowledge and information about the real situation of the fish stocks, because they are thinking about fish throughout year, and collecting information directly from their operations. Therefore, it is necessary to have close communication and exchange the information with fishers to collect good quality of data and to conduct the rational stock assessment and the effective management.

Fishery scientists should not produce the results of stock analysis which is very different from what fishermen feeling about stock (though sometimes fishers do not say what they really think about the stock which they are

exploiting). To attain this, NRIFSF adapts the strategy that single scientist conducts both collection of fishery data and analysis of it. This system is also good for a fishery scientist to have the senses of responsibility to protect the fishery studying on.

3) Having the sense of the fishery scientist of the fishing country

It should be clearly recognized that the work of the fishery scientist is generally unrewarded. For example, while the scientists on biology focuses on working with his biological samples, fishery scientist need to work on several occasions, communicating with fishers, attending to variety of meeting, and conducting error check of fishery data etc. So, the number of scientific publication of the scientists on biology can be larger than that of the fishery scientist, and in many case, the evaluation of scientists is decided by the number of scientific publication producing. This would be also the case for the scientists on mathematic, as they can conduct their study with simulation data. As a result of this, many young scientists do not want to work on fishery, but to work on biology or modeling study using simulation data.

This had been a problem even in NRIFSF. The important thing is to develop the system to support the work of fishery scientists, because they are the scientists directly working for the supporting fishery and the protection of fish stock. Without the energetic activity of fishery scientists, the value of the work of scientists on biology and mathematic would be diminished greatly.

Another important thing for the fishery scientists is that they tend to receive large pressure from both fishery managers and stakeholders. Management of fishery and fish stock is usually rather tough work because this largely affects on the stakeholders of fishery as well as the environment protection groups. Thus, cultivations of the spirits of service, sense of justice are believed to be important for fishery scientists.

Lastly, self-confidence is also important for fishery scientists. Without good quality of data, any kinds of sophisticated model cannot produce good information about stock status. But if one can collect data of good quality, it would not be so difficult to produce reliable information about stock. The truth can only be found in the Sea, not in the computer.

Annex 25

CHALLEGES ON FOREIGN TRADE AND MARKETING OF FISH AND FISHERY PRODUCTS

Saut P. Hutagalung[1]

Introduction

1. Fish is one of the world's most highly traded commodities and also one of the most important export commodities for developing countries. FAO (2010) reported that in 2008, world exports of fish and fishery products reached US$ 102.0 billion, 9% higher than 2007 nearly doubling the US$ 51.5 billion corresponding value in 1998. Developing countries represented 55% of world exports of fish and fishery products in value terms. By volume, developing countries produce about 60% of fish world production, while purchasing less than 20% of total imports. Therefore, for many developing countries, including Indonesia, fish trade provides a vital influx of foreign currency earnings in addition to the sector's important role in employment, income generation and food security.

2. Although the major bulk of fish productions are consumed domestically in Indonesia, foreign trade of fish and fishery products has been given higher priorities. The development objectives include: (i) improve compliance to market requirements, (ii) improve competitiveness of fishery products, (iii) improve export quality infrastructure, and (iv) strengthen fisheries associations. While the seafood stakeholders - primarily industry, government, academia, have shown strong commitment to food safety system, similar level of commitment is badly needed on sustainability issue as this would be a far more pressing issue. The future of fisheries industry is dependent upon having a renewable resource of quality seafood products.

Challenges in seafood trade

3. Seafood quality and safety has been significantly received increasing attention due to several worldwide trends affecting seafood systems. The primary forces driving stringent regulations are: the increasing scientific evidence of food-borne illnesses, greater consumer awareness on safe food and expansion of international trade in seafood products. These concerns are materialized in stringent regulations among others on:
   1) Stronger emphasis on public health and consumer welfare
   2) Adoption of the HACCP approach to assuring safety
   3) Adoption of more stringent standards
   4) Increased reliance on certification, including traceability
   5) Greater transparency for national regulations

4. To protect consumers health, meeting the market requirements of importing countries is of primary importance. Exporting countries that cannot comply with the regulations will lose their market share. As the result of the on-going trade liberalization, import tariffs have been reduced, but the role of non-tariff barriers (NTBs) has grown. While developing countries may have benefited from reduced tariffs and improved market access, these benefits are being counteracted by the growing non-tariff measures by major (developed) importing countries. Non-tariff measures in fish and fishery products include the followings:

   1) Sanitary and Phytosanitary Standard (SPS): covers seafood safety (sanitary) and animal/plant health measures (phytosanitary) that involves inspection, testing and certification procedures.
   2) Certification and labeling: ideally is designed to create market-based incentives for better management of fisheries.
   3) Traceability: relates to the origin of materials and parts, the processing history, and the distribution and location of the product after delivery. This is important to ensure quality and safety and increase consumer's demand of information on the food they consume.

While commitment to food safety including the required corrective measures both by governments and the industry has improved significantly, compliance in the sense of consistency to meet the market requirements (standards) should be improved. Compliance efforts should be exercised along the quality assurance system. The issue is that costs for compliance are considerably expensive.

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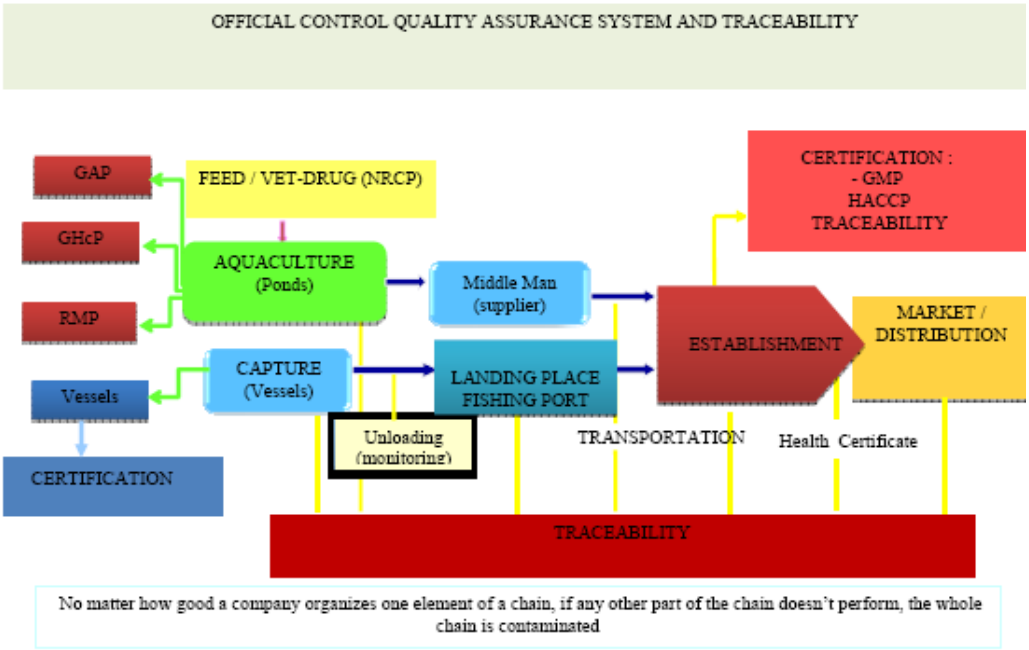
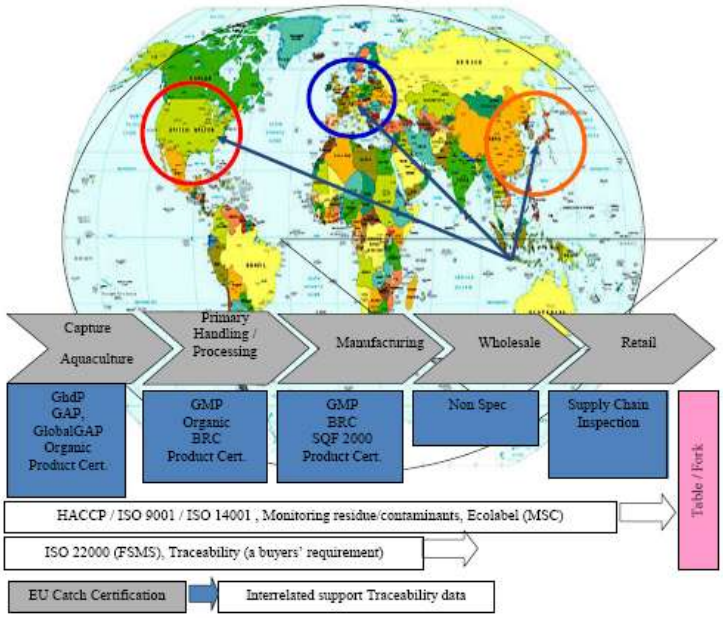


5. Major challenge facing fisheries industry is its sustainability. The future of fisheries industry is primarily dependent upon having renewable resources that sustainably meet the market requirements. In this relation, sustainability should be seen in the changing market or trade access requirements not only in the aspect of food safety but also in social and environmental aspects. Take as examples, illegal fishing practices, the EU catch certification, RFMO's Catch Documentation Scheme (for tuna), eco-labelling (Marine Stewardship Council/MSC). Impact of climate change to fisheries and aquaculture should be as well closely observed. What is actually required? Fisheries industry needs strong partnership amongst stakeholders that not only to ensure sustainability of resource exploitation, utilization and business but also improve incomes of primary producers (fish farmers, fishermen, fish ponds/fishing boats operators). Important market requirements appear as below.



Some concerns related to barriers to seafood trade

6. It is widely accepted that non-tariff barriers (NTBs) cause more distortions to trade and economic efficiency in the importing country than import tariffs which instead directly alters the volume or composition of imports. Even when the exporters can meet the market requirements, their

competitiveness may diminish due to higher compliance costs relative to other exporter. For full compliance, a developing country will spend a huge investment in human resources, infrastructure and equipments. Moreover, to meet requirements for an MSC certification for instance, it will need significant spending for research/stock assessment, to improve regulatory measures and governance, and surveillance.

7. With regard to the eco-labeling based private standard, some wholesalers in Europe and USA apply preferential suppliers that hold certain eco-labeling certification. In short, it is not mandatory by the government but mandatory by importers/buyers of importing country. In this regard, for instance, the US supermarket chain Wal-Mart and United Kingdom retailers, such as Sainsbury and Waitrose, have preferential fish and seafood supplier with Marine Stewardship Council (MSC) certification. This kind of certification to help ensure sustainability is very important and no question about it. Such certification is however quite expensive that hard for small scale producers to fulfill.

Below few issues that concern exporting countries

1. Improving Sustainability, Whose to Pay?

Stronger commitment towards sustainability has increased reliance on certification. A growing certification initiatives for fisheries and aquaculture products especially those of national initiatives', bring good news towards sustainability. Issues such as destructive fishing practices, limited enforcement and monitoring on one hand and potential growth in market demand for products on the other hand potentially threaten long-term sustainability of resource use. Certification does improve market access. For such good mission, whose to pay? Cost for certification is relatively high. So far producers (fishermen and fish farmers) and exporters pay the related costs. Although producers and exporters should also responsible for long-term resource sustainability, importers and consumers however should have significant stake in the cost sharing. Can more national initiated certifications with international support/recognition be promoted? In other words, it is required to promote a more effective partnership among producers, exporters - importers, consumers.

2. Reducing Tariff Barrier, Do Help Producers?

With the on-going trade liberalization process including in fisheries, it is the global trend that tariff barrier decreasing. Take the ASEAN-China Free Trade Agreement as an example, that became effective in January 2010, for China and most of the ASEAN member countries, has brought nearly all import tariffs to zero. Reducing import tariff certainly could increase market access. The question is whether such tariff cuts affect price received by producers. So far, there has no sufficient evidence that reduction even elimination of import tariff improves incomes of producers. There should be a fairer margin distribution amongst producers-traders involved, resulted from trade liberalization.

3. Improves Market Access, Endanger ecosystems?

As stated earlier, trade liberalization has brought reduction of import tariff including in fisheries. Even from a number of Free Trade Agreements (FTAs) concluded, has resulted in elimination of tariff that encourage improvement in market access. Take live reef food fish trade (groupers) in Asia as an example. Hong Kong and China has been the major market for live groupers coming from the Philippines, Indonesia, Vietnam, Malaysia and Australia. Depending on the effectiveness of enforcement and monitoring, sufficient evidence shows there has been strong sign of over-exploitation of different size of groupers and degradation of coral reefs in some areas. At the national level, it is needed strong cooperation between government, association, researchers and also between exporting countries and importing countries for better management of the supply.

Annex 26

LESSONS LEARNT ON THE EC REGULATION TO COMBAT IUU FISHING: THAILAND IMPLEMENTATION ON THE EC REGULATION TO COMBAT IUU FISHING

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The EC regulation on Combat IUU Fishing has been initiated in 2010. In 2009 and 2010 the fishery products from Thailand were exported to other countries equal 1,883,579.67 and 2,058,353.73 metric ton with value 224,541.88 and 236,902.25 million baht respectively. This quantities and values were 260,703.07 and 251,443.58 metric ton with 33,581.01 and 34,969.88 million baht were exported to the European community.

Supply of Raw material:

Raw materials for fishery products of Thailand which are exported to the European Community derived from the following 2 channels;

1. Catching from Thai vessels which have been conducting fishing activities in Thai waters, foreign waters, and in the high seas.
2. Importation from foreign countries, tuna and tuna-like species are the main imported raw fish materials for processing and then exporting.

Combat IUU Fishing

To combat IUU fishing 3 methods are consider as follow;

1. From illegal to become legal by vessel registration, fishing license, fishing under Thai laws/regulations (Right area, right fishing gear, right period).
2. From unreported to become reported by fishing Logbook (Thai Flag), fishing Logbook (RFMO).
3. From unregulated to become regulated by fisheries laws and regulation, fisheries Act Notification of Ministry of Agriculture and Cooperatives, Notification of Department of Fisheries *e.g.* Determination of spawning area, prohibit area for trawler, mesh size control, fishing record, RFMO regulations.

Thailand Catch Certification Scheme

1. Department of Fisheries (DOF) was assigned from Royal Thai government to be a Competent Authority (CA) for handling combating IUU Fishing.
2. The 2 types of Catch Certification are provided;
   - 2.1 Catch Certification (CC) Issued for large scale fishing vessels (> 20 GT).
   - 2.2 Simplified Catch Certification (SCC) Issued for small-scale fishing vessels (categorized in the EC IUU Regulation), especially < 20 GT.
3. Processing Statement (Annex IV) Issuance Issued for exporters / processors whom import marine catch with a catch certificate for further processed and exported to the EU.
4. The Catch Documentations compose of;

   4.1 Fishing Logbooks (FLB)
   Reported on 6 Types of Thai Fishing Logbook for various fishing gears are;
   - 4.1.1 Fishing Logbook for trawler and push net
   - 4.1.2 Fishing Logbook for purse seine
   - 4.1.3 Fishing Logbook for gill net
   - 4.1.4 Fishing Logbook for lift net
   - 4.1.5 Fishing Logbook for trap
   - 4.1.6 Fishing Logbook for other gears

Including reported on the RFMO Fishing Logbook. Thai fishing vessels have to submit their Fishing Logbook to report their fishing activities in order to collect fishing period, area and volume of capture fish data and statistic. The DOF has established data computerized network centers. Fishing operators have to arrange their fishing activities data and record in Fishing Logbook with their certification of the catches that are no involved with IUU fishing. Besides, the filling Fishing Logbook form has to be submitted to the Provincial Fishery Office to computerize fishing record and enable the access of fishing data network system.

4.2 Marine Catch Transshipping Document (MCTD)
This document provide for the transship vessel that carry aquatic animals from the capture fishing vessels outside through the fishing port. The transship vessel has to prepare the MCTD form and collect the FLBs from capture fishing vessels. After landed, both MCTD and FLBs were submitted to the Provincial Fishery Office.
4.3 Marine Catch Purchasing Document (MCPD)
A movement of aquatic animal which has been caught from Thai fishing vessel to the factory is controlled via a MCPD to facilitate a traceability system. MCPD is as a record of the transshipment operation through fish landing at a landing port, collectors, and frozen storage to processing plants. Eventually the MCPD documents will be transmitted along with the aquatic animals, and gathered at the processing plant. The document will be used as a database to provide an attachment list of respective fishing vessels for requesting a catch certificate from the DOF. However, the fishery products do not undergo the processing operations more than such data declared on the vessel's fishing logbook.

5. Manual for Implementation
   - 5.1 EC Regulation on IUU Fishing (Thai Version)
   - 5.2 Manual for Officers (Thai)
   - 5.3 Manual for Fish Collectors and Processing Operators (Thai)
   - 5.4 Manual for Fishermen (Thai)
   - 5.5 Promotion Documents and Posters

Recommendations of way forwards for ASEAN region

Thailand implementation on EC Regulation to combat IUU Fishing is just beginning. The collaboration among sectors of fishers, collectors, processing plants and exporters are needed for fishery products exporting to EC. While the international collaboration of ASEAN region is also importance for combating IUU fishing aim the sustainable of fishery resources.

Annex 27

LEGISLATION AND REGULATION RELATED TO TRADE MEASURES

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Overview

During the past decade, the fishing industry has seen some dramatic changes in terms of requirements to guarantee good quality, healthy products and other aspects that could indicate that the product is safe for human consumption. In addition there are increasing demands with regards to the production and production methods and that producers have to guarantee/certify that all steps of the production are in line with acceptable environmental standards and that the production can be sustained including the important habitats. To be able to manage the fisheries, there is a regional/ASEAN and global call to combat IUU fishing – the binding agreement of Port State Measures and EU requirements for catch documentation are testimony to this. The trends, and emerging requirements, are looking not only at quality and environmental sustainability but increasingly also on the requirements to certify fair trade standards as well as social and labor related standards.

This thematic session, which also deals with the Integration of Fisheries into the ASEAN Economic Community on trade-related matters is envisaged to cover the intra-ASEAN trade, international trade, traceability, catch documents, labor and working conditions, certification/validations including the perspective of work and working conditions as key factors for fisheries trade (requiring certificates) and the ASEAN Community.

The session also addresses the central aspects of trade in fish and fisheries products which, given the importance of the sector to the countries of the region, is vital to the economies and well-being of the people. The emerging requirements are also central to maintaining and improving the well-being of the ecosystems and habitats, sustaining the fisheries and combating IUU fishing. These issues tend to underpin sustainable fisheries and food security.

Legislation and Regulations related to Fish Trade Sources of Fisheries Regulation

I. International Agreements/Conventions
- A. UNCLOS
- B. UNFSA [Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks]
- C. Rules and Principles of General International Law
- D. International Plan of Actions such as IPOA for reducing incidental catch of seabirds in longline fisheries, IPOA for the conservation and management of sharks and IPOA for the management of fishing capacity.
- E. 1993 Torremolinos Protocol

II. Regional Fisheries Management Organizations Conservation and Management Measures
- A. IOTC
- B. WCPFC

III. National Legislation
- A. EU IUU Regulation 1005/2008
- B. EU Regulations on Food Hygiene

IV. Private Sector Certification
- A. Marine Stewardship Council
- B. International Seafood Sustainability Foundation

INTERNATIONAL AGREEMENTS/CONVENTIONS

UNCLOS 1982

A Historical Perspective
[*http://www.un.org/Depts/los/convention_agreements/conventionhistorical_perspective.htm*]

The oceans had long been subject to the freedom of-the-seas doctrine - a principle put forth in the seventeenth century essentially limiting national rights and jurisdiction over the oceans to a narrow belt of sea surrounding a nation's coastline. The remainder of the seas was proclaimed to be free to all and belonging to none. While this situation prevailed into the twentieth century, by mid-century there was an impetus to extend national claims over offshore resources. There was growing concern over the toll taken on coastal fish stocks by long-distance fishing fleets and over the threat of pollution and wastes from transport ships and oil tankers carrying noxious cargoes that plied sea routes across the globe. The hazard of pollution was ever present, threatening coastal resorts and all forms of ocean life. The navies of the maritime powers were competing to maintain a presence across the globe on the surface waters and even under the sea.

A tangle of claims, spreading pollution, competing demands for lucrative fish stocks in coastal waters and adjacent seas, growing tension between coastal nations' rights to these resources and those of distant-water fishermen, the prospects of a rich harvest of resources on the sea floor, the increased presence of maritime powers and the pressures of long-distance navigation and a seemingly outdated, if not inherently conflicting, freedom-of-the-seas doctrine - all these were threatening to transform the oceans into another arena for conflict and instability.

In 1945, President Harry S Truman, responding in part to pressure from domestic oil interests, unilaterally extended United States jurisdiction over all natural resources on that nation's continental shelf-oil, gas, minerals, etc. This was the first major challenge to the freedom-of-the-seas doctrine. Other nations soon followed suit.

In October 1946, Argentina claimed its shelf and the epicontinental sea above it. Chile and Peru in 1947, and Ecuador in 1950, asserted sovereign rights over a 200-mile zone, hoping thereby to limit the access of distant-water fishing fleets and to control the depletion of fish stocks in their adjacent seas.

Soon after the Second World War, Egypt, Ethiopia, Saudi Arabia, Libya, Venezuela and some Eastern European countries laid claim to a 12-mile territorial sea, thus clearly departing from the traditional three-mile limit.

Later, the archipelagic nation of Indonesia asserted the right to dominion over the water that separated its 13,000 islands. The Philippines did likewise. In 1970, Canada asserted the right to regulate navigation in an area extending for 100 miles from its shores in order to protect Arctic water against pollution.

From oil to tin, diamonds to gravel, metals to fish, the resources of the sea are enormous. The reality of their exploitation grows day by day as technology opens new ways to tap those resources.

In the late 1960s, oil exploration was moving further and further from land, deeper and deeper into the bedrock of continental margins. From a modest beginning in 1947 in the Gulf of Mexico, offshore oil production, still less than a million tons in 1954, had grown to close to 400 million tons. Oil drilling equipment was already going as far as 4,000 metres below the ocean surface.

The oceans were being exploited as never before. Activities unknown barely two decades earlier were in full swing around the world. Tin had been mined in the shallow waters off Thailand and Indonesia. South Africa was about to tap the Namibian coast for diamonds. Potato-shaped nodules, found almost a century earlier and lying on the seabed some five kilometres below, were attracting increased interest because of their metal content.

And then there was fishing. Large fishing vessels were roaming the oceans far from their native shores, capable of staying away from port for months at a time. Fish stocks began to show signs of depletion as fleet after fleet swept distant coastlines. Nations were flooding the richest fishing waters with their fishing fleets virtually unrestrained: coastal States setting limits and fishing States contesting them. The so-called "Cod War" between Iceland and the United Kingdom had brought about the spectacle of British Navy ships dispatched to rescue a fishing vessel seized by Iceland for violating its fishing rules.

Offshore oil was the centre of attraction in the North Sea. Britain, Denmark and Germany were in conflict as to how to carve up the continental shelf, with its rich oil resources.

It was late 1967 and the tranquility of the sea was slowly being disrupted by technological breakthroughs, accelerating and multiplying uses, and a super-Power rivalry that stood poised to enter man's last preserve - the seabed.

It was a time that held both dangers and promises, risks and hopes. The dangers were numerous: nuclear submarines charting deep waters never before explored; designs for antiballistic missile systems to be placed on the seabed; supertankers ferrying oil from the Middle East to European and other ports, passing through congested straits and leaving behind a trail of oil spills; and rising tensions between nations over conflicting claims to ocean space and resources.

The oceans were generating a multitude of claims, counterclaims and sovereignty disputes.

The hope was for a more stable order, promoting greater use and better management of ocean resources and generating harmony and goodwill among States that would no longer have to eye each other suspiciously over conflicting claims.

Third United Nations Conference on the Law of the Sea

On 1 November 1967, Malta's Ambassador to the United Nations, Arvid Pardo, asked the nations of the world to look around them and open their eyes to a looming conflict that could devastate the oceans, the lifeline of man's very survival. In a speech to the United Nations General Assembly, he spoke of the super-Power rivalry that was spreading to the oceans, of the pollution that was poisoning the seas, of the conflicting legal claims and their implications for a stable order and of the rich potential that lay on the seabed.

Pardo ended with a call for "an effective international regime over the seabed and the ocean floor beyond a clearly defined national jurisdiction". "It is the only alternative by which we can hope to avoid the escalating tension that will be inevitable if the present situation is allowed to continue", he said.

Pardo's urging came at a time when many recognized the need for updating the freedom-of-the-seas doctrine to take into account the technological changes that had altered man's relationship to the oceans. It set in motion a process that spanned 15 years and saw the creation of the United Nations Seabed Committee, the signing of a treaty banning nuclear weapons on the seabed, the adoption of the declaration by the General Assembly that all resources of the seabed beyond the limits of national jurisdiction are the common heritage of mankind and the convening of the Stockholm Conference on the Human Environment. What started as an exercise to regulate the seabed turned into a global diplomatic effort to regulate and write rules for all ocean areas, all uses of the seas and all of its resources? These were some of the factors that led to the convening of the Third United Nations Conference on the Law of the Sea, to write a comprehensive treaty for the oceans.

The Conference was convened in New York in 1973. It ended nine years later with the adoption in 1982 of a constitution for the seas - the United Nations Convention on the Law of the Sea. During those nine years, shuttling back and forth between New York and Geneva, representatives of more than 160 sovereign States sat down and discussed the issues, bargained and traded national rights and obligations in the course of the marathon negotiations that produced the Convention.

The UNCLOS recognized the sovereignty of archipelagic states over their archipelagic waters, of the air space over archipelagic waters and of their bed and subsoil. [Article 49 UNCLOS] As regards the exclusive economic zone, the coastal State has sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds. UNCLOS also stated that the coastal State shall determine the allowable catch of the living resources in its exclusive economic zone. [Article 56 UNCLOS]

Even as it recognized these sovereign authorities of Coastal States, Article 63 mentions that where the same stocks occurring within the exclusive economic zones of two or more coastal States or both within the exclusive economic zone and in an area beyond and adjacent to it, these States shall seek, either directly or through appropriate sub-regional or regional organizations, to agree upon the measures necessary to

coordinate and ensure the conservation and development of such stocks without prejudice to the other provisions of this Part. Where the same stock or stocks of associated species occur both within the exclusive economic zone and in an area beyond and adjacent to the zone, the coastal State and the States fishing for such stocks in the adjacent area shall seek, either directly or through appropriate sub-regional or regional organizations, to agree upon the measures necessary for the conservation of these stocks in the adjacent area.

Thus, to a certain degree, fishing activities have now become "*limited*" or "*regulated*" to the extent where these two or more Coastal States, either through mutual agreements, or regional or sub-regional agreement, agree to a measure on limits to catches. The apparent purposes of these limitations or regulations are for purposes of sustainability.

United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks or UNFSA
[http://www.un.org/Depts/los/convention_agreements/convention_overview_fish_ stocks.htm]

The United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks sets out principles for the conservation and management of those fish stocks and establishes that such management must be based on the precautionary approach and the best available scientific information. The Agreement elaborates on the fundamental principle, established in the Convention, that States should cooperate to ensure conservation and promote the objective of the optimum utilization of fisheries resources both within and beyond the exclusive economic zone.

The Agreement attempts to achieve this objective by providing a framework for cooperation in the conservation and management of those resources. It promotes good order in the oceans through the effective management and conservation of high seas resources by establishing, among other things, detailed minimum international standards for the conservation and management of straddling fish stocks and highly migratory fish stocks; ensuring that measures taken for the conservation and management of those stocks in areas under national jurisdiction and in the adjacent high seas are compatible and coherent; ensuring that there are effective mechanisms for compliance and enforcement of those measures on the high seas; and recognizing the special requirements of developing States in relation to conservation and management as well as the development and participation in fisheries for the two types of stocks mentioned above.

The Agreement was adopted on 4 August 1995 by the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks and opened for signature on 4 December 1995. It remained open for signature until 4 December 1996 and was signed by 59 States and entities.

The requirements for the entry into force of the Agreement were met on 11 November 2001, when the Minister for Foreign Affairs of Malta deposited an instrument of accession to the Agreement with the Secretary-General. The instrument was the thirtieth instrument of ratification or accession deposited. The Agreement entered into force on 11December 2001, *i.e.*, 30 days after the date of deposit of the thirtieth instrument of ratification or accession, in accordance with article 40 (1) of the Agreement.

Rules and principles of general international law: customary international law

a. What is customary international law?

1. Widespread repetition by states of similar international acts over time (state practice).
2. Acts must occur out of sense of obligation.
3. Acts must be taken by a significant number of states and not be rejected by a significant number of states.

"Customary international law develops from the practice of states. To international lawyers, 'the practice of states' means official governmental conduct reflected in a variety of acts, including official statements at international conferences and in diplomatic exchanges, formal instructions to diplomatic agents, national court decisions, legislative measures or other actions taken by governments to deal with matters of international concern." (*Public International Law in a Nutshell*, pp. 22-23)

b. Evidence of state practice.

When doing research in this area, the objective is to find evidence of State practice. Evidence of State practice is found in a variety of primary source materials. A good source for locating sources of State practice for a number of countries is Sources of State Practice in International Law (Gaebler & Smolka-Day eds., Ardsley, NY: Transnational Publishers, 2001-). One can consider the following:

1. Records of a state's foreign relations and diplomatic practices such as compiled state papers or diplomatic archives.

2. Legislation concerning a country's international obligations which may be found in its session records, laws, gazettes and statutory compilations.

3. Resolutions, declarations, and legislative acts of intergovernmental organizations (UN).

In 1950, the International Law Commission listed the following sources as forms of evidence of customary international law treaties, decisions of national and international courts, national legislation, opinions of national legal advisors, diplomatic correspondence, and practice of international organizations. This list, which was not intended to be exhaustive, is useful as a starting point and a basis for discussion." ([1950] 2 Y.B. Int'l L. Comm'n 367, U.N. Doc. A/CN.4/Ser.A/1950/Add.1 (1957)).

This segues us to the next topic for discussion, three examples of IPOA developed by the UN FAO. These are the International Plan of Action for reducing incidental catch of seabirds in longline fisheries, International Plan of Action for the conservation and management of sharks and International Plan of Action for the management of fishing capacity.

International Plan of Actions such as IPOA for reducing incidental catch of seabirds in longline fisheries, IPOA for the conservation and management of sharks and IPOA for the management of fishing capacity.

The **IPOA-SEABIRDS** is a voluntary instrument that applies to all States whose fishermen engage in longline fisheries. The text sets out a set of activities which implementing States are expected to carry out, including an assessment of whether a problem exists with respect to the incidental catch of seabirds in its longline fishery, adopting a National Plan of Action for reducing the incidental catch of seabirds in longline fisheries (NPOA-SEABIRDS) as well as procedures for national reviews and reporting requirements. The calendar years by when these actions preferably should have been taken, are indicated .

The **IPOA-SEABIRDS** also provides a summary description of appropriate mitigation measures which States that determine that they have a problem with the incidental catch of seabirds in their longline fisheries, should consider for inclusion in the NPOA-SEABIRDS.

The mitigation measures described are either already used or in an early stage of development. References to appropriate literature are provided.

The **IPOA-SHARKS** is a voluntary instrument that applies to all States whose fishermen engage in shark fisheries. The text sets out a set of activities which implementing States are expected to carry out, including an assessment of whether a problem exists with respect to sharks, adopting a National Plan of Action for the conservation and management of sharks (NPOA-SHARKS), as well as procedures for national reviews and reporting requirements.

The calendar years by when these actions preferably should have been taken, are indicated. The **IPOA-CAPACITY** is a voluntary instrument that applies to all States whose fishermen engage in capture fisheries. The first part of the text describes the nature and scope of the International Plan of Action, the underlining principles and defines the objective of the IPOA.

The remainder of the text describes urgent actions and identifies mechanisms to promote implementation. The urgent actions include *assessment and monitoring of fishing capacity* and the *preparation and implementation of national plans.* The text on mechanisms to promote implementation describes *scientific and technical co-operation*, national and international *reporting*, and, *the role of FAO*. The calendar years by when recommended actions should be completed, have been identified.

Another document that was developed for similar purpose if the IPOA-IUU. What is the **INTERNATIONAL PLAN OF ACTION TO PREVENT, DETER AND ELIMINATE ILLEGAL, UNREPORTED AND UNREGULATED FISHING [IPOA-IUU]**?

The **IPOA-IUU** was developed as a voluntary instrument, within the framework of the Code of Conduct for Responsible Fisheries, in response to a call from the Twenty-third Session of the Committee on Fisheries (COFI). A draft text for an IPOA-IUU was elaborated at an Expert Consultation in Sydney, Australia, in May 2000. This document formed the basis for negotiations at Technical Consultations that were held at FAO Headquarters, Rome, in October 2000 and February 2001. The IPOA-IUU was adopted by consensus at the Twenty-fourth Session of COFI on 2 March 2001 and endorsed by the Hundred and Twentieth Session of the FAO Council on 23 June 2001.

The **IPOA-IUU** is a voluntary instrument that applies to all States and entities and to all fishers. Following the IPOA's introduction, the nature and scope of IUU fishing is addressed. This is followed by the IPOA's objective and principles and the implementation of measures to prevent, deter and eliminate IUU fishing. These measures focus on all State responsibilities, flag State responsibilities, coastal State measures, port State measures, internationally agreed market-related measures, research and regional fisheries management organizations. Special requirements of developing countries are then considered, followed by reporting requirements and the role of FAO.

The objective of the IPOA is to prevent, deter and eliminate IUU fishing by providing all States with comprehensive, effective and transparent measures by which to act, including through appropriate regional fisheries management organizations established in accordance with international law.

The IPOA to prevent, deter and eliminate IUU fishing incorporates the following principles and strategies. Due consideration should be given to the special requirements of developing countries in accordance with Article 5 of the Code of Conduct.

1. Participation and coordination: To be fully effective, the IPOA should be implemented by all States either directly, in cooperation with other States, or indirectly through relevant regional fisheries management organizations or through FAO and other appropriate international organizations. An important element in successful implementation will be close and effective coordination and consultation, and the sharing of information to reduce the incidence of IUU fishing, among States and relevant regional and global organizations. The full participation of stakeholders in combating IUU fishing, including industry, fishing communities, and non-governmental organizations, should be encouraged.

2. Phased implementation: Measures to prevent, deter and eliminate IUU fishing should be based on the earliest possible phased implementation of national plans of action, and regional and global action in accordance with the IPOA.

3. Comprehensive and integrated approach: Measures to prevent, deter and eliminate IUU fishing should address factors affecting all capture fisheries. In taking such an approach, States should embrace measures building on the primary responsibility of the flag State and using all available jurisdiction in accordance with international law, including port State measures, coastal State measures, market-related measures and measures to ensure that nationals do not support or engage in IUU fishing. States are encouraged to use all these measures, where appropriate, and to cooperate in order to ensure that measures are applied in an integrated manner. The action plan should address all economic, social and environmental impacts of IUU fishing.

4. Conservation: Measures to prevent, deter and eliminate IUU fishing should be consistent with the conservation and long-term sustainable use of fish stocks and the protection of the environment.

5. Transparency: The IPOA should be implemented in a transparent manner in accordance with Article 6.13 of the Code of Conduct.

6. Non-discrimination: The IPOA should be developed and applied without discrimination in form or in fact against any State or its fishing vessels.

All of these IPOAs are voluntary documents but help generate state practice which helps to generate customary international law.

1993 Torremolinos Protocol [http://www.imo.org/About/Conventions/ListOfconventions/Pages/The-Torremolinos-International-Convention-for-the-Safety-of-Fishing-Vessels.aspx] **entitled " The Torremolinos International Convention for the Safety of Fishing Vessels** [Adoption: 2 April 1977; superseded by the 1993 Torremolinos Protocol]

The 1977 Convention, adopted at a conference held in Torremolinos, Spain, was the first-ever international Convention on the safety of fishing vessels. The safety of fishing vessels had been a matter of concern to IMO since the Organization came into existence, but the great differences in design and operation between fishing vessels and other types of ships had always proved a major obstacle to their inclusion in the Conventions on Safety of Life at Sea (SOLAS) and Load Lines.

While other vessels load cargo in port, fishing vessels must sail empty and load their cargo at sea.

The 1977 Convention contained safety requirements for the construction and equipment of new, decked, seagoing fishing vessels of 24 metres in length and over, including those vessels also processing their catch. Existing vessels were covered only in respect of radio requirements.

In the 1980s, it became clear that the 1977 Torremolinos Convention was unlikely to enter into force, largely for technical reasons, and IMO decided to prepare a replacement in the form of a Protocol.

The 1993 Torremolinos Protocol was adopted in April 1993, and will enter into force one year after 15 States with at least an aggregate fleet of 14,000 vessels of 24 metres in length and over, has ratified the Protocol.

The Protocol updates, amends and absorbs the parent Convention, taking into account technological evolution in the intervening years and the need to take a pragmatic approach to encourage ratification of the instrument. The Protocol applies to fishing vessels of 24 metres in length and over including those vessels also processing their catch.

The Protocol takes into account the trend to exploit deep water fishing grounds on a large scale and to conduct fishing operations in distant waters, resulting in the building of a new generation of more sophisticated fishing vessels. To be successful in their operations, these vessels have to be fitted with advanced fish finding and navigation equipment. Fishing vessels must also be equipped to carry out environment-friendly trawling, introduced to preserve fishing resources as well as the seabed.

The general trend in modern designed fishing vessels, if they are to be economically profitable, must include improvements in machinery and fishing gear, improvements in safety features as a whole and better working conditions for fishermen.

The safety provisions addressed by the Protocol, incorporating and amending the 1977 Convention, are included in an Annex consisting of ten Chapters. The provisions include automatically controlled machinery spaces, improved life-saving appliances, immersion suits and thermal protective aids, satellite communication systems and other components of the global maritime distress and safety system.

IMO's Sub-Committee on Stability and Load Lines and on Fishing Vessels' Safety (SLF) is currently reviewing the options available to tackle the lack of sufficient ratifications to the 1993 Torremolinos Protocol in order to bring this important treaty on fishing vessel safety into force. In particular, the following two options have been considered:

a. development of an agreement on the implementation of the 1993 Torremolinos Protocol, amending certain requirements of the Protocol. Following this, countries could consider ratification of the 1993 Torremolinos Protocol under the terms and conditions contained in the agreement (countries would declare that they accept the 1993 Torremolinos Protocol under the terms of the agreement, when they deposit an instrument of ratification); and

b. development of an Assembly resolution to facilitate the implementation of the 1993 Torremolinos Protocol, under which Parties to the Torremolinos Protocol would be able to implement the necessary amendments immediately after the entry into force of the current Torremolinos Protocol, even before the amendments are formally adopted under article 11 of the Torremolinos Protocol and put into force.

The above agreement would be a new legally binding instrument, offering a firm foundation to implement the amended Torremolinos Protocol, but Parties that have already ratified the Protocol may have to ratify the agreement as well. On the other hand, an Assembly resolution is not legally binding but would provide a reasonable basis for Member States to ratify the Protocol, while Parties which have already ratified the Protocol would not have to ratify it again.

A correspondence group was instructed to prepare both a draft agreement and a draft Assembly resolution, and list the pros and cons for each option, for consideration at SLF 53, in 2011. The correspondence group was also tasked further to develop amendments to the 1993 Torremolinos Protocol, which are needed to bring it up to date and thereby encourage the ratification of the treaty.

The Sub-Committee 's intersessional working group on fishing vessel safety is meeting during 2010, to finalize the options for the implementation of the 1993 Torremolinos Protocol and further develop he associated amendments, so that the final instrument(s) could be adopted at the Assembly, in late 2011, or by a conference.

The Torremolinos Protocol has, to date, been ratified by 17 States, with an aggregate fishing vessel fleet of approximately 3,000 vessels of 24 metres in length and over. It will enter into force one year after 15 States with at least an aggregate fleet of 14,000 vessels of 24 metres in length and over, have ratified the Protocol. The aggregate fleet total has yet to be reached.

On the fishing vessel safety code and voluntary guidelines, the IMO has developed, in collaboration with the Food and Agriculture organization (FAO) and the International Labour Organization (ILO), a number of non-mandatory instruments. These include the FAO/ILO/IMO Document for Guidance on Fishermen's Training and Certification and the revised Code of Safety for Fishermen and Fishing Vessels, 2005, and the Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, 2005.

Regional Fisheries Management Organizations Conservation and Management Measures

IOTC [http://www.iotc.org/English/index.php]

The Indian Ocean Tuna Commission (IOTC) is an intergovernmental organization mandated to manage tuna and tuna-like species in the Indian Ocean and adjacent seas. Its objective is to promote cooperation among its Members with a view to ensuring, through appropriate management, the conservation and optimum utilization of stocks and encouraging sustainable development of fisheries based on such stocks.

It is composed of twenty-eight members and four Cooperating Non-Contracting Parties. As of 22nd of March 2011, the Members are Australia, Belize, China, Comoros, Eritrea, European Union, France, Guinea, India, Indonesia, Islamic Republic of Iran, Japan, Kenya, Republic of Korea, Madagascar, Malaysia, Mauritius, Sultanate of Oman, Pakistan, Philippines, Seychelles, Sierra Leone, Sri Lanka, Sudan, Tanzania, Thailand, United Kingdom, Vanuatu. The four Cooperating Non-Contracting Parties Are Maldives, Mozambique, Senegal, and South Africa. Information herein are all found in the website of the IOTC.

RESOLUTIONS AND RECOMMENDATIONS BY THE INDIAN OCEAN TUNA COMMISSION

It was during the 3rd Regular Session of the Commission where Resolutions were first agreed upon. Here under is the list of all Resolutions as this list provides the historical perspective of what the IOTC had been doing for the past 15 years, namely:

3rd Regular Session

- Resolution 98/01 Mandatory Statistical Requirements For IOTC Members (superseded by resolution 01/05)
- Resolution 98/02 Data Confidentiality Policy And Procedures
- Resolution 98/03 On Southern Bluefin Tuna

- Resolution 98/04 Concerning registration and exchange of information on vessels, including flag of convenience vessels, fishing for tropical tunas in the IOTC area of competence (superseded by
- Resolution 05/04, Resolution 07/04)
- Resolution 98/05 On cooperation with non-Contracting Parties

4th Regular Session

- Resolution 99/01 On the Management of Fishing Capacity and on the Reduction of the Catch of Juvenile Bigeye Tuna by Vessels, Including Flag of Convenience Vessels, Fishing for Tropical Tunas in the IOTC Area of Competence
- Resolution 99/02 Calling for Actions Against Fishing Activities by Large Scale Flag of Convenience Longline Vessels
- Resolution 99/03 On the Elaboration of a Control and Inspection Scheme for IOTC
- Resolution 99/04 On the Status of Cooperating Non-contracting Parties (superseded by Resolution 03/02)

5th Regular Session

- Resolution 00/01 On Compliance With Mandatory Statistical requirements for IOTC Members and
- Requesting Cooperation with Non-Contracting Parties
- Resolution 00/02 On A Survey Of Predation Of Longline Caught Fish

6th Regular Session

- Recommendation 01/01 Concerning the national observer programmes for tuna fishing in the Indian Ocean
- Resolution 01/02 Relating to Control of Fishing Activities
- Resolution 01/03 Establishing a Scheme to promote compliance by Non-Contracting Party vessels with resolutions established by IOTC
- Resolution 01/04 On limitation of fishing effort of non members of IOTC whose vessels fish bigeye tuna
- Resolution 01/05 Mandatory statistical requirements for IOTC Members (superseded by Resolution 08/01)
- Resolution 01/06 Concerning the IOTC bigeye tuna statistical document programme
- Resolution 01/07 Concerning the Support of the IPOA-IUU Plan

7th Regular Session

- Resolution 02/01 Relating to the establishment of an IOTC programme of inspection in port (superseded by Resolution 05/03)
- Resolution 02/02 Relating to the establishment of a vessel monitoring system Pilot programme (superseded by Resolution 06/03)
- Resolution 02/03 Terms of Reference for the IOTC Compliance Committee
- Resolution 02/04 On establishing a list of vessels presumed to have carried out illegal, unregulated and unreported fishing in the IOTC area (Superseded by Resolution 06/01)
- Resolution 02/05 Concerning the establishment of an IOTC record of vessels over 24 metres authorised to operate in the IOTC Area (superseded by Resolution 05/02, Resolution 07/02)
- Recommendation 02/06 On the implementation of the Resolution concerning the IOTC Record of Vessels
- Recommendation 02/07 Concerning measures to prevent the laundering of catches by IUU large-scale tuna longline fishing vessels
- Resolution 02/08 On the conservation of bigeye and yellowfin tuna in the Indian Ocean
- Resolution 02/09 Establishment of the Standing Committee on Administration and Finance (SCAF) Updated April 2010

8th Regular Session

- Resolution 03/01 On the limitation of fishing capacity of Contracting Parties and Cooperating non-Contracting Parties
- Resolution 03/02 On criteria for attaining the status of co-operating non-contracting party
- Resolution 03/03 Concerning the amendment of the forms of the IOTC statistical documents
- Recommendation 03/04 Concerning Enhancement of Effectiveness of IOTC Measures to Eliminate IUU Activities in the IOTC Area
- Recommendation 03/05 Concerning trade measures

- Recommendation 03/06 Recommendation to commission a report on management options for tuna and tuna-like species
- Resolution 03/07 Recognizing the contributions of David Ardill

9th Regular Session

- Resolution 05/01 On conservation and management measures for bigeye tuna
- Resolution 05/02 Concerning the establishment of an IOTC record of vessels authorized to operate in the IOTC area (superseded by Resolution 07/02)
- Resolution 05/03 Relating to the establishment of an IOTC programme of inspection in port
- Resolution 05/04 Concerning registration and exchange of information on vessels, including flag of convenience vessels, fishing for tropical tunas and swordfish in the IOTC Area of competence (superseded by Resolution 07/04)
- Resolution 05/05 Concerning the conservation of sharks caught in association with fisheries managed by IOTC
- Recommendation 05/06 Concerning the Terms of References for an IOTC Working Party on Management Options
- Recommendation 05/07 Concerning a management standard for the tuna fishing vessels
- Recommendation 05/08 On sea turtles
- Recommendation 05/09 On incidental mortality of seabirds

10th Regular Session

- Resolution 06/01 On establishing a list of vessels presumed to have carried out illegal, unregulated and unreported fishing in the IOTC area (superseded by Resolution 09/03)
- Resolution 06/02 On establishing a programme for transhipment by large-scale fishing vessels (superseded by Resolution 08/02)
- Resolution 06/03 On establishing a vessel monitoring system programme
- Resolution 06/04 On reducing incidental bycatch of seabirds in longline fisheries (superseded by Resolution 08/03)
- Resolution 06/05 On the limitation of fishing capacity, in terms of number of vessels, of IOTC contracting parties and co-operating non contracting parties (superseded by Resolution 09/02)

11th Regular Session

- Resolution 07/01 To promote compliance by nationals of contracting parties and cooperating non-contracting parties with IOTC conservation and management measures
- Resolution 07/02 Concerning the establishment of an IOTC Record of Vessels Authorized to operate in the IOTC area
- Resolution 07/03 Concerning the recording of catch by fishing vessels in the IOTC area
- Resolution 07/04 Concerning registration and exchange of information on vessels fishing for tunas and swordfish in the IOTC Area (superseded by Resolution 10/07 and by Resolution 10/08)
- Resolution 07/05 Limitation of fishing capacity of IOTC Contracting Parties and Cooperating non-Contracting Parties in terms of number of longline vessels targeting swordfish and albacore (superseded by Resolution 09/02)

12th Regular Session

- Resolution 08/01 Mandatory Statistical Requirements For IOTC Members and Cooperating non-Contracting Parties (CPC's) (superseded by Resolution 10/02)
- Resolution 08/02 On establishing a programme for transhipment by large-scale fishing vessels
- Resolution 08/03 On Reducing the Incidental Bycatch of Seabirds in Longline Fisheries (superseded by Resolution 10/06)
- Resolution 08/04 Concerning The Recording Of Catch By Longline Fishing Vessels In The IOTC Area

13th Regular Session

- Resolution 09/01 On the performance review follow-up
- Resolution 09/02 On the implementation of a limitation of fishing capacity of Contracting Parties and Cooperating non-Contracting Parties
- Resolution 09/03 On establishing a list of vessels presumed to have carried out illegal, unregulated and unreported fishing in the IOTC area
- Resolution 09/04 On a Regional observer scheme (superseded by Resolution 10/04)
- Resolution 09/05 To prohibit the use of large-scale driftnets on the high seas in the IOTC area

- Resolution 09/06 On marine turtles

14th Regular Session

- Resolution 10/01 For the Conservation and Management of Tropical Tunas Stocks in the IOTC Area of Competence
- Resolution 10/02 Mandatory Statistical Requirements For IOTC Members and Cooperating non-Contracting Parties (CPC's)
- Resolution 10/03 Concerning the recording of catch by fishing vessels in the IOTC area
- Resolution 10/04 On a Regional observer scheme
- Resolution 10/05 On the Establishment of a Meeting Participation Fund for Developing State Members
- Resolution 10/06 On Reducing the Incidental Bycatch of Seabirds in Longline Fisheries
- Resolution 10/07 Concerning a Record of Licensed Foreign Vessels Fishing for Tunas and Swordfish in the IOTC Area
- Resolution 10/08 Concerning a Record of Active Vessels Fishing for Tunas and Swordfish in the IOTC Area
- Resolution 10/09 Concerning the Functions of the Compliance Committee
- Resolution 10/10 Concerning Market Related Measures
- Resolution 10/11 On Port state measures to prevent, deter and eliminate illegal, unreported and unregulated fishing
- Resolution 10/12 On the Conservation of Thresher Sharks (Family Alopiidae) caught in Association with Fisheries in the IOTC Agreement Area
- Recommendation 10/13 On the Implementation of a Ban on Discards of Skipjack Tuna, Yellowfin Tuna, Bigeye Tuna, and Non Targeted Species Caught By Purse Seiners

15th Regular Session

- Resolution 11/01 Development of a Compendium of Resolutions and Recommendations
- Resolution 11/02 On the Prohibition of Fishing on Data Buoys
- Resolution 11/03 Establishing a List of Vessels Presumed to Have Carried Out Illegal, Unreported and Unregulated Fishing in the IOTC Area of Competence
- Resolution 11/04 On a Regional Observer Scheme
- Resolution 11/05 On Establishing a Programme for Transshipment by Large-Scale Fishing Vessels
- Recommendation 11/06 Recording of Catch by Fishing Vessels in the IOTC Area of Competence

WCPFC [http://www.wcpfc.int/]

The Western and Central Pacific Fisheries Commission (WCPFC) was established by the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF Convention) which entered into force on 19 June 2004. The Convention was concluded after six years of negotiation which commenced in 1994. The period between the conclusion of the Convention and its entry into force was taken up by a series of Preparatory Conferences that laid the foundations for the Commission to commence its work.

The WCPF Convention draws on many of the provisions of the UN Fish Stocks Agreement [UNFSA] while, at the same time, reflecting the special political, socio-economic, geographical and environmental characteristics of the western and central Pacific Ocean (WCPO) region. The WCPFC Convention seeks to address problems in the management of high seas fisheries resulting from unregulated fishing, over-capitalization, excessive fleet capacity, vessel re-flagging to escape controls, insufficiently selective gear, unreliable databases and insufficient multilateral cooperation in respect to conservation and management of highly migratory fish stocks. A framework for the participation of fishing entities in the Commission which legally binds fishing entities to the provisions of the Convention, participation by territories and possessions in the work of the Commission, recognition of special requirements of developing States, and cooperation with other Regional Fisheries Management Organizations (RFMO) whose respective areas of competence overlap with the WCPFC reflect the unique geo-political environment in which the Commission operates.

The Commission supports three subsidiary bodies; the Scientific Committee, Technical and Compliance Committee, and the Northern Committee, that each meet once during each year. The meetings of the subsidiary bodies are followed by a full session of the Commission. The work of the Commission is assisted by a Finance and Administration Committee. Information herein are all found in the website of the WCPFC.

The following are the Members of the WCPFC. These are Australia, China, Canada, Cook Islands, European Union, Federated States of Micronesia, Fiji, France, Japan, Kiribati, Korea, Republic of Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Chinese-Taipei, Tonga, Tuvalu, United States of America, Vanuatu.

The following are the Participating Territories, namely: American Samoa, Commonwealth of the Northern Mariana Islands, French Polynesia, Guam, New Caledonia, Tokelau, Wallis and Futuna. These are the Cooperating Non-member(s), namely: Belize, Ecuador, El Salvador, Indonesia, Mexico, Senegal, Vietnam, Panama, Thailand.

Since its first meeting in December 2004, there has been many Conservation and Management Measures [CMM] agreed to by its members. These are:

1. CMM 2004-01 Record of Fishing Vessels and Authorization to Fish (Replaced by CMM 2009-01) agreed on 8 December 2004
2. CMM 2004-02 Cooperating Non-Members (Replaced by CMM 2008-02) agreed on 8 December 2004
3. CMM 2004-03 Specifications for the Marking and Identification of Fishing Vessels agreed on 8 December 2004
4. CMM 2004-04 Resolution on Conservation and Management Measures agreed on 8 December 2004
5. CMM 2005-01 Conservation and Management Measures for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean (Replaced by CMM 2008-01) agreed on 16 December 2005
6. CMM 2005-02 Conservation and Management Measure for South Pacific Albacore (replaced by CMM 2010-05) agreed on 16 December 2005
7. CMM 2005-03 Conservation and Management Measure for North Pacific Albacore agreed on 16 December 2005
8. CMM 2006-01 Conservation and Management Measures for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean (Replaced by CMM 2008-01) agreed on 15 December 2006
9. CMM 2006-02 Conservation and Management Measure to Mitigate the Impact of Fishing For Highly Migratory Fish Stocks on Seabirds (Revised and replaced by CMM 2007-04) agreed on 15 December 2006
10. CMM 2006-03 Conservation and Management Measure for Swordfish in the South West Pacific (Replaced by CMM 2008-05) agreed on 15 December 2006
11. CMM 2006-04 Conservation and Management Measure For Striped Marlin in the Southwest Pacific agreed on 15 December 2006
12. CMM 2006-05 Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean (Replaced by CMM 2008-06) agreed on 15 December 2006
13. CMM 2006-06 Commission Vessel Monitoring System (Revised and replaced by CMM 2007-02) agreed on 15 December 2006
14. CMM 2006-07 Conservation and Management Measure for the Regional Observer Programme agreed on 15 December 2006
15. CMM 2006-08 Western and Central Pacific Fisheries Commission Boarding and Inspection Procedures agreed on 15 December 2006
16. CMM 2007-01 Conservation and Management Measure for the Regional Observer Programme agreed on 7 December 2007
17. CMM 2007-02 Commission Vessel Monitoring System agreed on 7 December 2007
18. CMM 2007-03 Conservation and Management Measure to Establish a List of Vessels presumed to Have Carried out Illegal, Unreported and Unregulated Fishing Activities in the WCPO (Replaced by CMM 2010-06) agreed on 7 December 2007
19. CMM 2007-04 Conservation and Management Measure to Mitigate the Impact of Fishing for Highly Migratory Fish Stocks on Seabirds agreed on 7 December 2007
20. CMM 2008-01 Conservation and Management Measure for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean agreed on 12 December 2008
21. CMM 2008-02 Cooperating Non-Members (Replaced by CMM 2009-11) agreed on 12 December 2008

22. CMM 2008-03 Conservation and Management of Sea Turtles agreed on 12 December 2008
23. CMM 2008-04 Conservation and Management Measure to Prohibit the use of Large Scale Driftnets on the High Seas in the Convention Area agreed on 12 December 2008
24. CMM 2008-05 Conservation and Management of Swordfish (Replaced by CMM 2009-03) agreed on 12 December 2008
25. CMM 2008-06 Conservation and Management of Sharks (Replaced by CMM 2009-04) agreed on 12 December 2008
26. CMM 2009-01 WCPFC Record of Fishing Vessels and Authorization to Fish agreed on 9 November 2010
27. CMM 2009-02 Conservation and Management Measure on the Application of High Seas FAD Closures and Catch Retention agreed on 11 December 2009
28. CMM 2009-03 Conservation and Management for Swordfish agreed on 11 December 2009
29. CMM 2009-04 Conservation and Management for Sharks (Replaced by 2010-07) agreed on 11 December 2009
30. CMM 2009-05 Conservation and Management Measure Prohibiting Fishing on Data Buoys agreed on 11 December 2009
31. CMM 2009-06 Conservation and Management Measure on Regulation of Transshipment agreed on 11 December 2009
32. CMM 2009-07 Conservation and Management Measure for Pacific Bluefun Tuna (Replaced by CMM 2010-04) agreed on 11 December 2009
33. CMM 2009-08 Charter Notification Scheme agreed on 11 December 2009
34. CMM 2009-09 Conservation and Management Measure for Vessels without Nationality agreed on 11 December 2009
35. CMM 2009-10 Conservation and Management Measure to Monitor Landings of Purse Seiners at Ports so as to Ensure Reliable Catch Data by Species agreed on 11 December 2009
36. CMM 2009-11 Cooperating Non-Members agreed on 11 December 2009
37. CMM 2010-01 Conservation and Management Measure for North Pacific Striped Marlin agreed on 10 December 2010
38. CMM 2010-02 Conservation and Management Measure for the Eastern High-Seas Pocket Special Management Area 04112011 agreed on 10 December 2010
39. CMM 2010-03 Conservation and Management Measure for Compliance Monitoring Scheme agreed on 10 December 2010
40. CMM 2010-04 Conservation and Management Measure for Pacific Bluefin Tuna agreed on 10 December 2010
41. CMM 2010-05 Conservation and Management Measure for South Pacific Albacore agreed on 10 December 2010
42. CMM 2010-06 Conservation and Management Measure to establish a List of Vessels presumed to have carried out Illegal, Unreported and Unregulated fishing activities in the WCPO agreed on 10 December 2010
43. CMM 2010-07 Conservation and Management Measure for Sharks agreed on 10 December 2010

Each and every new CMM means additional regulations intended for the purposes for which are described at the beginning of each.

National Legislation

EU IUU Regulation 1005/2008

The information here is largely drawn from the EU's own website page: http://ec.europa.eu/fisheries/cfp/ext ... ns/illegal_fishing_en.htm

Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, amending Regulations (EEC) No 2847/93, (EC) No 1936/2001 and (EC) No 601/2004 and repealing Regulations (EC) No 1093/94 and (EC) No 1447/1999.

The EU Regulation provides that the trade with the Community of fishery products obtained from IUU fishing will be prohibited [EC Regulation 1005/2008 Art 12 (1)]. To ensure the effectiveness of this prohibition,

fishery products shall only be imported into the Community when accompanied by a catch certificate [EC Regulation 1005/2008 Art 12 (2)]. Through this instrument, the competent authorities of flag state country of the vessel catching the fish will certify that the catches concerned have been made in accordance with applicable laws, regulations and international conservation and management measures. This certificate shall be validated by the competent authority of the flag state country, and if necessary, other documents envisaged by the certification scheme in the event of an indirect import after transshipment, transit or processing of the products in another third country.

The catch certification scheme will apply to all unprocessed or processed catches, except for freshwater fish, ornamental fish, aquaculture products obtained from fry or larvae or certain molluscs, contained in Annex I of the Regulation.

Inspired by RFMO's catch documentation schemes, it is a flexible instrument that can take into account different situations such as the nature of products, the type of fisheries, existing control systems and other factors.

The detailed technical note on the catch certification scheme:
http://ec.europa.eu/fisheries/cfp/ext ... pdf/technical_note_en.pdf

APFIC also maintains an information section on this subject based partly on inputs/recommendations from this forum:
http://www.apfic.org/modules/xfsection/article.php?articleid=81

The regulations makes reference to the FAO adopting in 2001 an international plan of action to prevent, deter and eliminate illegal, unreported and unregulated fishing [IPOA - IUU], which the Community has endorsed. Furthermore, regional fisheries management organizations, with the active support of the Community, have established an array of measures designed to counteract illegal, unreported and unregulated fishing.

It is a textbook response to adopting the measures available under the IPOA - IUU. Acting as if the EU is a regional fisheries management organization [RFMO], it imposed upon itself the obligations as one in preventing, deterring and eliminating illegal, unreported and unregulated fishing by adopting the regulations. Its definition of illegal, unreported and unregulated fishing found in Article 2 thereof is textbook drawn from the IPOA - IUU with some slight changes to reflect the fact that the EU is not a state but a regional economic integration organization. It added the word "*maritime*" in Article (2) (a) and *"conducted by fishing vessels*" in Article (2) (c).

It imposed port state measures by preventing the entry of fish and fishery products emanating from IUU fishing activities, coming from its members and coming from sources outside of its membership. It also does the same thing when it provides third country fishing vessels access to its members' port only upon compliance with textbook conditions imposed under Article 4, 5, 6, 7 & 8 of Chapter II.

Its catch certification procedure is said to have been drawn from RFMO. However, not all RFMOs have drawn their own procedures. Both the IOTC and WCPFC have yet to draw its own. The Convention on the Conservation of Antarctic Marine Living Resources [CCMLAR] has its own catch documentation scheme [CDS]. To a certain degree it is quite similar to that contained in the EU IUU regulations.

EU Regulations on Food Hygiene [http://www.cip.ukcentre.com/food1x.htm] Background to the 2006 food hygiene legislation. A presentation prepared by Great Yarmouth district council

From 1 January 2006, new EU food hygiene legislation has applied throughout the UK.
The legislation

The package of legislation:

- modernizes, consolidates and simplifies the previous EU food hygiene legislation
- applies effective and proportionate controls throughout the food chain, from primary production to sale or supply to the final consumer
- focuses controls on what is necessary for public health protection
- clarifies that it is the primary responsibility of food business operators to produce food safely

As EU regulations, the legislation is directly applicable law. The regulations are:

- Regulation (EC) 852/2004 on the hygiene of foodstuffs
- Regulation (EC) 853/2004 laying down specific hygiene rules for food of animal origin
- Regulation (EC) 854/2004 laying down specific rules for the organization of official controls on products of animal origin intended for human consumption

The general hygiene requirements for all food business operators are laid down in Regulation 852/2004. Regulation 853/2004 supplements Regulation 852/2004 in that it lays down specific requirements for food businesses dealing with foods of animal origin. Regulation 854/2004 relates to the organization of official controls on products of animal origin intended for human consumption.

The legislation introduces a 'farm to fork' approach to food safety, by including primary production (that is, farmers and growers) in food hygiene legislation, for the first time in the majority of cases.

All food businesses need to be registered with the competent authority, such as the Meat Hygiene Service or the local authority environmental health department, depending on the type of business. A key part of the legislation is the requirement for food business operators (except farmers and growers) to put in place, implement and maintain a permanent procedure, or procedures, based on HACCP principles. The legislation is structured so that it can be applied flexibly and proportionately commensurate with the nature of the food business.

Under the application of sub-sidiarity, certain requirements in the legislation are given effect by national legislation. A wide range of straightforward information on the legislation is given in the 'Hygiene legislation' link below.

There were two other parts to the package: Directive 2004/41 repeals the previous EU legislation or, in some cases, amends still existing legislation and Directive 2002/99 (which falls under Defra policy responsibility) lays down the animal health rules on products of animal origin for human consumption.

Amended copies of the food hygiene regulations were published on 2 June (2004/41) and 25 June 2004 (852, 853 and 854/2004). The regulations have been amended since by the EU implementing measures (see below) and in the case of 854/2004 by Regulation (EC) 882/2004, the Official Feed and Food Controls Regulation.

Private Sector Certification

Recent develops in markets have shown tremendous development of what we call third party initiatives in certifications including voluntary schemes and fisheries eco-labeling. There are issues on this such as one that recently happened. That is another matter. Here are some examples of third party certification.

Marine Stewardship Council *[http://www.msc.org/]*

The MSC's fishery certification program and seafood ecolabel recognize and reward sustainable fishing. We are a global organization working with fisheries, seafood companies, scientists, conservation groups and the public to promote the best environmental choice in seafood.

What we do

The MSC runs an exciting and ambitious program, working with partners to transform the world's seafood markets to a sustainable basis.

MSC standards and methodologies

With experts we developed standards for sustainable fishing and seafood traceability. They ensure that MSC-labeled seafood comes from, and can be traced back to, a sustainable fishery.

How we meet best practice

The MSC meets the highest benchmarks for credible certification and ecolabelling programs, including the UN Food and Agriculture Organization guidelines and the ISEAL Code of Good Practice.

International Seafood Sustainability Foundation *[http://iss-foundation.org/about-Us]*

In 2008, acclaimed scientists, leaders in industry and environmental champions, founded the International Seafood Sustainability Foundation (ISSF). This group shared concerns about the future of tuna fisheries and a desire to do something about it together. The global coalition launched publically in March of 2009 and today has partners and supporters working in Europe, Asia, Africa, North America, South America and Australia.

A diverse Board of Directors sets the agenda with the counsel of an independent Scientific Advisory Committee, an Environmental Stakeholder Committee, a Project Steering Committee, a Vessel Committee and staff.

ISSF's actions reflect the principles of governance that defines its mission to undertake science-based initiatives for the long-term conservation and sustainable use of tuna stocks, reducing bycatch and promoting ecosystem health:

Work with RFMOs to achieve their objectives of conservation of tuna stocks and their ecosystems;

- Employ sound science for attaining maximum sustainable yields of targeted tuna stocks;
- Strive to eliminate illegal, unregulated, and unreported (IUU) tuna catching;
- Provide for the health and care of the marine ecosystem;
- Facilitate use of the precautionary approach;
- Minimize bycatch, discards, and abandoned gear;
- Collect and exchange data to promote better scientific understanding of tuna stocks;
- Support certification programs that meet the 2005 eco-labeling guidelines of the United Nations Food and Agriculture Organization.

ISSF puts the focus on the fishery pushing governments and industry to favor more responsible, sustainable practices on the water.

Conclusions

From the time that the UNCLOS and the UNFSA was agreed upon, a host of other agreements have arisen, each applying the principles contained in these agreements and developing in a full system of regulations designed to attain sustainability for the fisheries resources.

As was previously stated, states have been granted additional sovereignty over territorial seas and exclusivity in the exploitation of natural resources. However, additional burden was also imposed as regards the conservation of living resources under Article 61 as coastal states "shall determine the allowable catch of the living resources in its exclusive economic zone" and, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation. As appropriate, the coastal State and competent international organizations, whether sub-regional, regional or global, shall cooperate to this end.

Perhaps, this should be our guide in determining the need to cooperate, as ASEAN in avoiding over-exploitation of our fisheries resources.

To certain degree, this session will hopefully address also the central aspects of trade in fish and fisheries products which, given the importance of the sector to the countries of the region, is vital to the economies and well-being of the people. We need to put in place measures to ensure the sustainability of our fisheries resources. This also means that we put in place procedures to maintaining and improving the well-being of the ecosystems and habitats, sustaining the fisheries and combating IUU fishing.

Our response to these issues will tend to answer the question as to whether can sustain fisheries and ensure food security.

Annex 28

TRACEABILITY AND FOOD SAFETY ASSURANCE

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Globalization of the food industry has expanded dramatically over the past decade due to international sourcing of raw material, advances in food processing technology and especially rapid developments in electronic communications. At the same time, consumer concerns for food safety and industry concerns for increased supply chain length, providing greater opportunities for loss in food quality, have increased significantly. As a consequence, government officials and industry leaders concerned with ensuring food safety and quality, are exploring means to provide more information on sourcing, processing and distribution of food products within supply chains and ultimately to the consumers.

Recently established food law in different countries has placed responsibility for ensuring product safety and quality on individual producers, processors and retailers. Even without direct legislation, manufacturers have always maintained a degree of traceability in the food industry, individual companies are able to identify both suppliers and customers. However, mandatory traceability for control of food security has been singled out as an area where greater watchful and transparency is needed. The global concern for food safety and security is being addressed by development of new international standards, industry guidelines and legislation. Food stuffs traceability has become an essential issue to guarantee safety and quality of the food products delivered to clients.

A traceability system is a useful tool to assist an organization operating within a feed and food chain to achieve defined objectives in a management system. The choice of a traceability system is influenced by regulations, product characteristics and customer expectations. The complexity of the traceability system can vary depending on the features of the product and the objectives to be achieved. The implementation by an organization of a traceability system depends on technical limits inherent to the organization and products (*i.e.* nature of the raw materials, size of the lots, collection and transport procedures, processing and packaging methods), and the cost benefits of applying such a system. A traceability system on its own is insufficient to achieve food safety.

The traceability system is a technical tool to assist an organization to conform with its defined objectives and is applicable when necessary to determine the history, or location of a product or its relevant components. Traceability systems should be able to document the history of the product and/or locate a product in the feed and food chain. Traceability systems contribute to the search for the cause of nonconformity and the ability to withdraw and/or recall products if necessary. Traceability systems can improve appropriate use and reliability of information, effectiveness and productivity of the organization.

The objectives in developing a feed and food chain traceability system are the following:

a) to support food safety and/or quality objectives;
b) to meet customer specification(s);
c) to determine the history or origin of the product;
d) to facilitate the withdrawal and/or recall of products;
e) to identify the responsible organizations in the feed and food chain;
f) to facilitate the verification of specific information about the product;
g) to communicate information to relevant stakeholders and consumers;
h) to fulfill any local, regional, national or International regulations or policies, as applicable;
i) to improve the effectiveness productivity and profitability of the organization

Traceability systems should be able to achieve the technical and economic point of view. Movement can relate to the origin of the materials, processing history or distribution of the feed or food, and should address at least one step forward and one step backward for each organization in the chain. On agreement amongst the organizations concerned, it may apply to more than one part of the chain.

For technical aspects of traceability, in order to keep track of items within a food supply chain it is decision to identify items in each step of the chain. This is done by data carriers. Data carriers are a mark or tag that follows the item and can be read further down the supply chain. Data carriers carry an identifier which is a character based or alphanumeric code. Different code systems are in use. Examples of code systems are: barcodes, matrix codes, contact memory and Radio Frequency Identification (RFID) etc.

In practical applications of traceability, traceability is not just a question of legislative mandates or technical capability but what practical. As with all new technology, it takes time to make 'things work.' Driving forces behind implementation of traceability systems include both legislative and market driven forces. Especially rapid changes in electronics and information technology are occurring as well.

Moreover, with the need of global market for the quality and safety products, the better and more efficient traceability system is need for ASEAN member countries.

Recommendations:

- Provide a platform for the sharing of information among ASEAN member countries on implementation of traceability systems in fish and fishery products in the region.
- Promote the implementation of traceability systems for fish and fishery products in the ASEAN region

Annex 29

INTERNATIONAL TRADE: CHALLENGES FOR SMALL-SCALE FISHERS IN THE ASEAN REGION

Dr. Sebastian Mathew
International Collective in Support of Fishworkers (ICSF)

"Indeed, the objective of establishing the ASEAN Economic Community (AEC) by 2015, as mentioned in a declaration signed by ASEAN leaders in January 2007 in Cebu Summit, is to present this region of about 530 million people to the global community as a single market and production base with a free flow of goods and services and relatively free flows of capital and labour."

--Menon, J. 2007. Building blocks or stumbling blocks? The GMS and AFTA in Asia. ASEAN Economic Bulletin, 24 (2): 254–66.

Introduction

The *Enclyclopaedia Britannica* defines international trade as "economic transactions that are made between countries". Merchandise trade forms a significant part of these economic transactions. International trade in fish and fishery products in the ASEAN region dates back to the 18th century when species associated with the coral reefs such as sea cucumber were traded with itinerant Chinese traders (Butcher, 2004). The products of the sea that were traded from the region in the 19th century included salted roe of shad, swim bladders of fish, shark fin and oil, squid, and seahorses (Butcher, 2004). Small-scale fisheries thus have a long tradition in international trade in fish and fishery products even before the mechanization of fishing vessels in Asia in the 20th century.

Fish is now the most heavily traded food commodity and the fastest growing agricultural commodity on international markets (World Bank, 2005). The global export of fish and fishery products reached US$102 billion in 2008. The share of fish production in live weight equivalent entering international trade has increased from 26 percent in 1976 to 39 per cent in 2008 (FAO, 2010). This is attributed mainly to increasing consumption of seafood, trade liberalization policies, globalization of food systems and technological innovation (FAO, 2010). Developing countries from being traditional exporters of raw fish are fast emerging as exporters of value-added fish. In the process, some countries, in particular, East and South East Asian countries, have emerged as the fish processing hub of the world. There is significant change in trade flows in recent years, as a result. Thailand and Viet Nam in the region have emerged as the third and fourth largest exporters of fish and fishery products, after China and Norway.

ASEAN Member Countries and international trade in fishery products: New dimensions

The ASEAN Member Countries (AMCs) undertake international trade in fish and fishery products at the intra- and extra-ASEAN levels, although intra-ASEAN trade contributes only a small percentage of aggregate trade. The AMCs accounted for 20.62 per cent of global trade in fish and fishery products in 2008 (exports, imports and re-exports, combined) (FISHSTAT). The ASEAN countries imported and exported fish and fishery products worth US$4.5 billion and US$16 billion, respectively. This is about 4.32 per cent and 16. 22 per cent of the world total. The most important export items from the ASEAN region are shrimp, tunas, catfish, squid, and cuttlefish, mainly frozen, prepared or preserved. The ASEAN export of fish and fishery products other than processed and preserved fish, and fishmeal, stood at US$7.4 billion in 2009, which included about 11 per cent of fish and fishery products in intra-ASEAN trade (http://www.aseansec.org/stat/Table23.pdf).

Raw fish, as well as unprocessed crustaceans and molluscs in smaller quantities, are mainly imported into the ASEAN region to be exported back as processed fish. Thailand, followed by Malaysia and Singapore, are the largest importers in the region (FISHSTAT). The import of fish and fishery products into the ASEAN region included frozen fish worth US$170 million from the EU-27 countries in 2010 (COMTRADE), of which over 81 percent comprised imports into Thailand and Viet Nam alone. Thailand, among developing countries, has emerged as the third largest import market, after China and the Republic of Korea (FISHSTAT). The import of frozen fish, crustaceans and molluscs from the United States into Thailand increased five-fold, from US$40 million in 2005 to US$208 million in 2010 (COMTRADE). During the same period, the import from EU-27 more than doubled – from US$30 million to US$78 million. In quantity terms, frozen fish imported from the United States to Thailand increased eight-fold, from 20,000 tonnes in 2005 to 148, 000 tonnes in 2010, and the

frozen fish imports from EU-27 into Thailand increased nearly four-fold, from 14,000 tonnes in 2005 to 51,000 tonnes, in 2010 (COMTRADE).

The large-scale import of fish and fishery products for processing and export from ASEAN is rather unprecedented. The import of raw fish into – and export of processed fish from – the ASEAN should be viewed against growing globalization of the fisheries value chain, and by the outsourcing of processing to countries where relatively low wages and production costs provide a comparative advantage (FAO, 2010). The ASEAN Comprehensive Investment Agreement (ACIA) of 2009 (http://www.aseansec.org/documents/ FINAL-SIGNED-ACIA.pdf), which makes indirect provisions for liberalized foreign investment, inter alia, in fisheries under section 3 (c) of the Agreement also seems to facilitate creation of modern fish processing facility through foreign investment towards export promotion.

The ASEAN exports of fish and fishery products originate mainly from ASEAN capture and culture fisheries, in addition to import of fishery products. The AMCs accounted for nearly 23 million tonnes of global fish production in 2008 (FISHSTAT), of which 16 million tonnes originated from capture fisheries (this included 14 million tonnes from marine capture fisheries). The ASEAN region thus accounted for about 16.4 percent of the total world capture fishery production in 2008. Indonesia, the Philippines and Myanmar are among the top ten fish producing countries in the world from capture fisheries.

Small-scale fishers in AMCs

The AMCs are home to nearly half the world's population of 32 million small-scale fishers. They account for 15 million-nearly 47 percent of the estimated global population, and about 65 percent of the estimated Asian population, of small-scale fishers (World Bank, 2010). Myanmar has the largest estimated population of small-scale fishers in the world, followed by Viet Nam and China (World Bank, 2010). AMCs like Thailand, Indonesia and the Philippines also have significant share of small-scale fishers' population.

Who are the small-scale fishers of the AMCs? Although there is no standardized definition for small-scale fisheries in the ASEAN region (Kato, 2008), all fishers, both men and women, associated with subsistence and small-scale fishing may be considered as small-scale fishers. They also include the specialized fishing communities in Southeast Asia such as the Sea Gypsies of Malaysia, the Lamalera fishing communities of eastern Indonesia (Barnes, 2007), and the Tagbanua (Capistrano, 2010) and Badjao peoples of the Philippines (Macalandag, 2009) who are dependent on fishing for their life and livelihood. The non-trawl fishing vessels of a certain tonnage or horse power, fishing in designated near-shore waters are considered small-scale fisheries in AMCs such as Indonesia and Malaysia. While vessels below 25 GT and less than 50 HP operating in designated near-shore waters are considered small-scale in Indonesia, non-trawl/non-purse seine traditional fishing vessels below 10 GT are considered small-scale in Malaysia. Other characterization of small-scale fisheries in the ASEAN region include: fishing vessels below 5 GT operating in designated near-shore waters in Thailand; vessels below three GT operating in designated near-shore waters in the Philippines; and vessels with engines up to 50 HP or without engines, and vessels below 40 HP, in Viet Nam (Funge-Smith *et al*., 2005).

In the Philippines, fishing vessels below 60 GT undertaking multiday tuna handling have been considered small-scale distant water fishing vessels (Vera and Hipolito, 2006). In Indonesia, under national fisheries law, the characterization of small-scale fisheries is further complicated by treating all those who meet their daily needs from fishing as small-scale fishers. Indonesia also has used a different yardstick to define small-scale fisheries in a submission to the World Trade Organization (WTO) where all vessels "below 20 m dimension" and fishing in archipelagic waters, or in the territorial sea, are defined small-scale (WTO, 2007).

How much of small-scale fisheries production of AMCs enters international trade? There is no estimate, so far, although it is surmised at the international level that more of small-scale fishery production is for domestic human consumption than for the export market (Kelleher, 2009). However, small-scale fishers have a share in all species that are caught for the export market, especially in species such as shrimp, crab, squid, cuttlefish, tuna, shark, as well as other high-value species. Some of the highest value fish species such as yellowfin, bigeye and southern bluefin tuna are also caught by small-scale fishers, especially in the Philippines and Indonesia (Vera and Hipolito, 2006; http://www.sustainablefish.org/fisheries-improvement/tuna/indonesia-yellowfin-tuna). Conversely, several fresh, chilled or frozen fish entering intra- or extra-ASEAN import trade are also caught by small-scale fishers in the ASEAN region in traditional fishing grounds for both domestic and export markets.

International trade and small-scale fishers: Issues for consideration

Considering that nearly half the world's small-scale fishers live in the ASEAN region, international trade policies and programmes in the region may need a balanced approach to protect their interests while promoting export of fish and fishery products from domestic production as well as from intra- and extra-ASEAN trade. Trade liberalization in fish and fishery products should not lead to removal of protection for domestic producers (Kelleher, 2009). In this context, it is important to ensure that unprecedented growth in import of frozen fish into the ASEAN does not lead to a situation where domestic fish have to compete unsuccessfully with cheaper imports with adverse consequences for the food security of local fishers. Tariff protection at the eight-digit level may be necessary to safeguard the share of fish species traditionally caught, particularly small-scale fishers, to domestic and export markets.

Small-scale fishers and food safety standards

All AMCs are members of the Codex Alimentrius Commission. Regarding access to extra-ASEAN markets, especially to EU-27, the United States and Japan, exporting countries are required, under the guidelines developed by the Codex Alimentarius Commission, to comply with a Hazard Analysis and Critical Control Point (HACCP)-based approach to enhance food safety. Although dating back to 1969, and periodically amended, the food safety guidelines became legally-binding only in 1994 under the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). As far as fish and fishery products are concerned, the Codex General Principles on Food Hygiene extends from primary production stage such as fishing, through to final consumption stage. As per the Codex, all fishers are expected to adopt practices and measures to ensure fish is caught under appropriately hygienic conditions and from an environment that does not pose any threat to food safety (ftp://ftp.fao.org/docrep/fao/005/Y1579e/Y1579e.pdf.).

One of the actions identified by the 2008 ASEAN Economic Community (AEC) Blueprint is to apply fisheries quality management systems to ensure food safety and to support the competitive position of ASEAN fishery products on world markets by 2009 through the implementation of HACCP-based systems (ASEAN, 2008). How far this ASEAN action programme has been implemented by AMCs in relation to capture fishery production is a moot point, considering that the AMCs account for nearly a million powered fishing vessels.

In a recent submission on fisheries subsidies to the WTO, Malaysia pointed out how fishing vessel operators have to redesign the spatial layout of vessels to prevent contamination of fish on board in order to implement food safety standards. Fishing vessels would need to, among other things, build toilets, create provisions for hand cleaning and hygiene; partition fish hold from the engine room and crew quarters; and provide fiber-glass coating and epoxy food grade painting for wooden sorting deck. Fishing vessels not meeting these standards may have serious trade implications, it was argued. Since the costs of such redesign of fishing vessels can be prohibitive, Malaysia favored granting subsidies to alleviate the economic burden on fishers so as to improve fishing vessels and to ensure market access for their fish catch (WTO, 2011a).

Significant modifications are warranted in small-scale fishing vessels to make them comply with a HACCP-based system. Subsidies programmes therefore are required to implement food safety standards in small-scale fishing vessels. Even then how far all small-scale fishing vessels can successfully adapt to HACCP-based food safety standards is debatable. Perhaps a threshold size of fishing vessel may become necessary to implement food safety standards for the export market.

Small-scale fishers and environmental standards

Access to extra-ASEAN markets is also sometimes conditional on complying with multilateral environmental agreements (MEAs) that the importing countries have particularly ratified and often made conditional for market access. The EU-27-world's largest import market for fish and fishery products and an important destination for AMC exports-in an attempt to crack down on illegal, unreported and unregulated (IUU) fishing, has now shifted the burden of proof for demonstrating compliance with conservation and fisheries management measures to the fishing vessel and the flag State (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:280:0005:0041:EN:PDF).

The ongoing debate on fisheries subsidies at the WTO is deliberating exceptions to prohibitions on capacity and effort enhancing subsidies to developing countries under special and differential treatment (S&DT). Such exceptions, however, would be conditional upon fisheries management obligations, guided by international fisheries management instruments (WTO, 2011b). These instruments include: the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the 1979 Bonn Convention on

the Conservation of Migratory Species (CMS), the 1982 United Nations Convention on the Law of the Sea (LOSC), the 1992 Convention on Biological Diversity (CBD); the 1993 Convention for the Conservation of Southern Bluefin Tuna (CCSBT); the 1995 United Nations Fish Stocks Agreement (UNFSA), the 1995 FAO Code of Conduct for Responsible Fisheries, and the 2000 Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western Central Pacific Ocean (WCPFC). Of these instruments, only LOSC and CBD enjoy a healthy number of ratifications among the AMCs as of May 2011.

However, with the adoption of the ASEAN Vision 2020 (which is now advanced to 2015) some of the above MEAs may be ratified or adopted in an accelerated manner. Combating IUU fishing and implementing FAO's International Plan of Action on IUU fishing (IPOA-IUU) and establishing an ASEAN Fisheries Consultative Forum (AFCF), for instance, are recognized as action programmes under the ASEAN Political-Security Community (APSC) blueprint (ASEAN, 2009a). Similarly, combating illegal fishing is an action programme identified in the AEC blueprint (ASEAN, 2008). Further, promoting the sustainable use of coastal and marine environment and sustainable management of coastal and marine resources are recognized under the ASEAN Socio-Cultural Community (ASCC) blueprint (ASEAN, 2009b).

Most of the MEAs of relevance to fisheries make provisions to protect the interests of coastal fishing communities and indigenous communities, as well as to recognize the rights of artisanal and small-scale fishers to their traditional fishing grounds. The ratification of all MEAs of relevance to fisheries and development of national legislation, as well as their effective and progressive implementation taking into account local specificities, in a consultative and participatory manner, might help to better establish the legality of fish and fishery products originating from well-managed fisheries. However, as in the case of food safety standards, subsidies would be required towards implementing environmentally sustainable fishery standards, especially to build up capacity at different levels to effectively manage small- and large-scale fisheries. Even with subsidies, how far the lower end of small-scale fisheries can successfully adapt to new demands of fisheries management, and remain competitive in an export market is something that would remain a challenge.

Small-scale fishers and social standards

Promotion of human and social development, respect for fundamental freedoms, gender equality, protection of migrant workers, the promotion and protection of human rights and the promotion of social justice are identified as important characteristics of a people-centred and socially responsible ASEAN community (ASEAN, 2009b). It further upholds protecting the rights of women and children. The 2007 ASEAN Declaration on the Protection and Promotion of the Rights of Migrant Workers makes it the obligation of 'migrant worker receiving' AMC to protect fundamental human rights of migrant workers, to promote their welfare and human dignity, to ensure fair and appropriate employment protection, payment of wages, and adequate access to decent working and living conditions (http://www.aseansec.org/19264.htm). The ASCC blueprint makes it an obligation of AMCs to implement the above Declaration. Fishing industry-both small- and large-scale fishing vessels, as well as fish processing enterprises-employs a large number of migrant workers in countries like Malaysia and Thailand, from LDC-AMCs such as Myanmar, Cambodia and Lao PDR.

The recognition of human rights and social justice at the ASEAN level if translated to national policies and programmes would benefit migrant fishers and fishworkers to uphold their human dignity. The revised 2010 set of criteria for sustainable fishing of the Marine Stewardship Council (MSC) include how a fishery to be certified not only meets minimum substantive requirements and criteria in relation to the management system, the status of fish stocks under consideration, and impact of the fishery on the ecosystem, but also how it recognizes the legal and customary rights and long term interests of people dependent on fishing for food and livelihood (http://www.msc.org/documents/scheme-documents/mscstandards/MSC_environmental_standard_ for_ sustainable_fishing.pdf/view.). Thus there are already signs of convergence of environmental and social standards in relation to trade in fish and fishery products. Ratifying international labour and fisheries legal instruments, including Work in Fishing Convention, 2007, and developing and implementing national legislation can act as a disincentive for market States to employ MEAs and international labour standards as non-tariff barriers to trade.

Conclusions

With the ASEAN regional policy framework moving towards greater convergence with the international policy framework in relation to food safety, environmental and social standards by 2015, international trade in fish and fishery products is likely to expand in the region if AMC regimes also move in tandem. There is

already an unprecedented growth in import of fish and fishery products into ASEAN for the processing industry to export value-added products. An increase in the volume of import trade-both intra- and extra-ASEAN – without adequate safeguards may have negative consequences, especially for large sections of small-scale fishers by depressing domestic fish prices. Compulsions to comply with international food safety and environmental standards are likely to lead to greater differentiation within small-scale fisheries. While the top tier of small-scale fisheries might be in a position to meet new standards, cater to extra -ASEAN markets, and benefit from international trade, the bottom tiers a source of life and livelihood to majority of small-scale fishers might be at the receiving end, unable to sell their fish and fishery products to extra-ASEAN markets. As a result, there is likely to be widening income inequality in fishery-dependent communities. Liberalized investment regimes, another aspect of international trade, might also lead to the phenomenon of 'contract small-scale fishers', where the fishers might have little autonomy in decision-making and are reduced to mere cogs in the wheel of an economic activity, which is small-scale fishing only in a narrow sense. Investment in contract small-scale fishing units, payment of operating costs and marketing of fish are likely to be underwritten by multinational supermarket chains or their agents. The challenge to AMCs in an age of fast-paced globalization is to make ASEAN Economic Community subservient to the ASEAN Socio-Cultural Community, to realize the goal of a "people-centred and socially responsible" ASEAN Community (ASEAN 2009b), which is inclusive also of small-scale fishing communities.

Acknowledgement

The assistance of Ramya R. of International Collective in Support of Fishworkers (ICSF) is gratefully acknowledged in culling out statistical information from COMTRAD E and FISHTRADE databases.

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Annex 30

PARTNERSHIPS WITH THE PRIVATE SECTOR: KEY TO SUSTAINABLE SEAFOOD & TRADE

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Abstract

This presentation describes the on-going approach of WWF work in the Coral Triangle area to engage the business sector along the supply chain to become key partners in moving fisheries towards the path of sustainability.

Food security, livelihood and continued access to food is linked to healthy oceans. While historically we have relied on key government fisheries agencies to maintain healthy fisheries, unsustainable capture, increased consumption and demand (domestic and international) increasingly threaten the food bases of many ASEAN countries. Traditional approach to fisheries management does not take into consideration the market aspects of the seafood.

Over the last decade, market driven approaches are being promoted that seek to compliment and in some cases catalyze government actions to improve management of fisheries resources. Over the last three years, WWF in general and our work in the Coral Triangle in particular, have utilized this approach by directly engaging with the seafood business players either on specific issues or working with major supply chain actors as well as holding of sector forums as platform for business engagement or exchange of information. Some of our approaches in working with the private sector include:

1. Engaging with fishing sector companies/ fishing associations to have circle hooks more widely adopted in order to minimize turtle by-catch;
2. Promoting a business to business platform to connect the business sector along the supply chain and move them towards agreement to commit to sustainable fisheries through championing and supporting responsible behavior and promoting best practices;
3. Supporting Importers, Retailers and processors to directly invest in Fisheries Improvement Projects (FIP), sites that showcase better practices, improved management with the end goal of leading the fishery towards MSC certification;
4. Developing Seafood guides for different countries and using these to guide consumers, restaurateurs, retailers towards responsible purchasing and consumption

Holding of sectoral fora – such as the CTI Business Summit (B2B), CT Fisheries Forum that brings together players of each sector to share information, do business dealings and get informed on developments and trends

Annex 31

NEW STANDARDS DRIVE INTEREST IN FISH USED FOR FISH MEAL

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Summary

Fisheries sustainability in Southeast Asia is increasingly focusing the attention of government and industry alike. After several decades of unfettered expansion there is an urgent need for improvements in management, whether the fish are used for fish meal or other products.

For aquaculture production in SE Asia to meet the production targets being adopted by governments there is a need to rebuild many fish stocks which are already overexploited or subject to unsustainable fishing pressure. Standards for the management of fisheries that produce fish meal have become available in recent years, produced by organizations such as the International Fishmeal and Fishoil Organization, Global Aquaculture Alliance and Aquaculture Stewardship Council.

These standards can be treated as a threat or an opportunity. Many companies are using the standards as a mechanism for helping to assure their supply base and assuring the buyers of their products that sustainability issues are being acted upon.

Introduction

Asia is the powerhouse of world aquaculture production and is set to expand further, driven by government policies that seek to capitalize on the growing world demand for seafood.

Although not all species require fish meal as part of their diet there are not only well established species but new species being commercialized which require this important ingredient. Moreover, demand from animal industries remains strong even though there is a gradual, price driven shift in demand away from this sector. The better known sources of fish meal are a variety of small pelagic species found in the waters of South America and the North Atlantic. In Asia most small pelagics are used for human food and, with some exceptions, only end up in fish meal indirectly as processing wastes. A more common source of fish meal is a wide range of small or otherwise unusable species caught in trawl fisheries. Considered 'bycatch' in many western fisheries that target shrimp and/or fish, in Asia these species are commonly called 'trash fish'.

At a large scale the expansion of aquaculture relies on a sustainable supply of suitable fish meal. There are strategic considerations involved in ensuring suitable domestic supplies, rather than relying on interregional trade. At a company level it is important that good fisheries management ensures long term supplies. Finally, fishing communities and the marine environment need to be protected by good management.

Issues

Over the past fifty years there has been enormous growth in the production of wild harvest seafood from the waters of Asian countries. The headline growth in overall catches often masks the depletion of a species or an area and then this production being replaced by new sources. This 'serial depletion' has been documented in many heavily used parts of South East Asia and is continuing as new fisheries develop in previously underexploited parts of the region.

The literature also documents the need for significant improvement in the management of the vast majority of fisheries in Asia. Poor management is resulting in the depletion of slower growing, larger species which may be valuable from a human food (*e.g.* snappers and groupers) or ecosystem perspective (*e.g.* sharks). However, even faster growing, more resilient species such as small pelagics and many benthic species are also becoming overexploited as the fishing pressure remains unconstrained.

In recent years there has been a well-documented and growing interest in the management of fisheries and aquaculture in some markets. This has resulted in the creation of production standards which specify the need for seafood supplies to be well managed and/or sustainable. These voluntary standards are in place for both

farmed and wild harvest seafood. In the case of fish meal, these standards come together as the requirements for sustainable aquaculture commonly specifies a requirement for well managed/sustainable fish meal.

Three of the most relevant standards are as follows:

1. IFFO Responsible Sourcing scheme: the International Fishmeal and Fishoil Organization (IFFO) has created a scheme aimed at encouraging best practice amongst its member producers. The scheme offers a certificate to fish meal production plants which has requirements for the performance of the supply fisheries. These requirements are not subject to certification but unless the supply fishery performs well in an evaluation the supply factory cannot be issued a certificate of compliance with the scheme.
2. Global Aquaculture Alliance (GAA): has a number of standards for aquaculture species and for various aspects of the production process such as farms and product processing facilities. The GAA has also issued standards for fish meal plants which include requirements for the sustainability of the source fisheries.
3. The Aquaculture Stewardship Council (ASC): has a number of species based standards which, where appropriate (*i.e*. some standards are for species not requiring fish meal such as bivalves), have requirements for the sustainability of source fisheries. In particular, there is a requirement that, five years after the standard is adopted, wild harvest sources of fish meal need to be from fisheries certified to the Marine Stewardship Council Standard.

For many of the world's better known fish meal fisheries the standards present no major hurdles as management regimes are commonly in place and there is a reasonable level of knowledge about the status of exploited stocks. However, such conditions commonly don't occur in many parts of Asia.

Whilst some may perceive the standards as a threat the reality is that even without such standards there is a need to improve the management of the supply fisheries. The standards help focus the attention of industry and government and even encourage a co-management philosophy such that those that depend on the ongoing supplies of fish meal have an interest in ensuring that management is improved.

Annex 32

SUSTAINABLE TUNA TRADE IN THE SOUTHEAST ASIA

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Abstract

Area, gear type or species specific fisheries groups have been formed all over the globe in response to conflict. Getting the parties together to discuss and resolve the conflict is a response norm. Global fisheries and environmental instruments have evolved side by side with these to provide responsive and guiding frameworks within which disputes could be resolved. Regional Fisheries Management Organisations (RFMOs) have been established as the preferred formal mechanisms for the management of fisheries resources in the High Seas and to foster conservation within an environment of degrading stock abundance. Estimates and assessments of stocks have wide confidence limits and have provided an imprecision merry-go-round of indecision. Precautionary caveats have been introduced to slow the merry-go-round but still decision making is too slow, too little too late. Considerable discussion and debate has emerged in the literature as to the lack of effectiveness of the RFMOs and the reasons for this. Successful management of sustainable tuna stocks is *a priori* the basis for sustainable tuna trade. This paper examines the current status of tuna stocks, production and trade. RFMOs are critiqued the foundation instruments examined and areas identified where changes to RFMOs are required and where global harmonization may aid the long term sustainability of the Tuna Resources and Trade in Southeast Asia.

Annex 33

CLIMATE CHANGE AND FISHERIES: THE PHILIPPINES EXPERIENCES

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Summary

Climate change, as defined by the United Nation's Convention on Climate Change (UNCCC), is already evident in the Philippines. Sea level rise, atmospheric temperature increase, changes in typhoon patterns, increase incidence of harmful algal bloom occurrence etc. have been recorded in the past decades in the country. In terms of vulnerability, the Philippines have been consistently predicted as among the most vulnerable to Climate Change. This is largely because majority of the population lives in the coastal areas, are heavily dependent of fisheries and have low capacities for adaptation. This is compounded by the poor state of the country's resources and habitats, and increasing threats such as overpopulation, overfishing, destructive practices etc. In addition to various predicted impacts of climate change to Philippine fisheries and aquaculture, a relatively more accurate way to know such potential impacts can already be drawn from the country's past experiences and events including the El Nino of 1997 and 2010, where there were recorded changes in tuna migration, increased incidence of "ice-ice" in seaweeds, bleaching in corals, and fish kills in culture ponds. Here we present the various plans and activities being undertaken by the Philippines to address climate change impacts to fisheries and aquaculture at various levels following the overall framework of the Philippine Strategy on Climate Change Adaptation (PSCCA). This includes CC-related knowledge management, vulnerability assessments, risk reduction, mariculture parks establishment, climate-proofing using indigenous knowledge, coastal habitat monitoring among others. Lastly, since the Philippines is the lead country under the ASWGFi for Climate Change, we also present initial plans to start forming an ASEAN fisheries climate change initiative.

Background

Climate Change, as defined by the United Nations Convention on Climate Change, is rapid change of climate of which can be attributed directly to anthropogenic causes. It is the alteration of global atmospheric components in addition to natural changes observed through time. Climate change is a threat to the society's fundamental way of life, to biodiversity, economy, food security and to human life, The effects of climate change are evident all throughout the world. Unfortunately, Southeast Asian countries are most economically vulnerable to climate change because they highly depend on fishery resources for livelihood and their population has low levels of capacity to adapt to stressors or threats.

The development and progress of the Philippines, a Southeast Asian nation, is critically hinged to our preparedness with emerging effects of climate change. Its fisheries sector, which has consistently contributed to the country's economy, is a sector that is predicted to be one of the sectors to be adversely affected. This is compounded by the fact that its major coastal and marine resources are in declining and degraded state, and is the hottest of hotspots in the world in terms of marine biodiversity conservation. It is the 8th top fish producing country and 10th in aquaculture production, is highly dependent on fishery resources of which 70% of protein diet of about 1.6 million Filipinos. It also yields an approximately 2.2% (143 B) of GDP and exports about 570 million dollars. On the socio-economic perspective, our coastal areas are home to the marginal sector in the country or about 70% of communities, almost all of which depend largely on the coastal resources for their livelihood. In the fisheries sector in the Philippines, various impacts of climate change in the different fisheries sub-sectors such as for capture, aquaculture, post-harvest and socio-economic sectors and its corresponding potential adaptation measures have been proposed in response to potential CC impacts.

Issues

In strategizing to adapt to climate change, many things are needed, many of which are non-existent. For example, climate change is a new issue and only few or almost none have experienced such transition in temperature for the last century. Hence, there is generally a lack of expertise on this specific field that adds to the slow progress of climate change studies. Aside from financial constrains, knowledge of this phenomenon, its effects, risks, and mechanism, is still insufficient to formulate an effective adaptation strategy.

Conclusions and Recommendations

As mentioned, various reports have already identified specific recommendations for Climate change adaptation strategies for Philippine fisheries. A number of these strategies are currently being implemented at various levels, which can be divided into 5 namely; Policy, Biophysical, Socio-economic, Research and Development and Mainstreaming:

Policy: A strategy for Climate Change Adaptation has been passed by the Philippine Congress last 2010.
Biophysical: This includes the increase focused on establishment of protected zones *e.g.* fishery reserves, fish sanctuaries, marine protected areas, and *refugias*; putting up of environment friendly mariculture parks; sustainable capture fisheries, and climate change – ready infrastructures.
Socio-Economic: This involves vulnerability assessment and monitoring, education, decrease demographic pressure, and role of women.
Research and Development: Some of the researchable areas include data collection and monitoring, modeling and prediction (GIS), database development and climate proofing through traditional knowledge.
Mainstreaming: Awareness and understanding climate change and its impacts are needed to be implemented at all levels from international up to the individual as it affects everyone. Some of the regional offices of BFAR have already started doing consultations relative to climate change (Table 6).

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Annex 34

ADAPTATION TO THE CLIMATE CHANGE IN THE FISHERIES SECTOR IN JAPAN

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Summary

Japan is located at the eastern boundary of Asia, where the global warming, the climate change caused by anthropogenic greenhouse gas, is the most prominent in the world. AR4 does not include any information on the global warming impacts on fish populations or marine resources around Japan and/or the Asian waters. The objectives of this study are to clarify the effects of the recent climate change on marine resources, to show how to adapt the changes for the adaptation, monitoring and accumulation of the knowledge on biological characteristics of fisheries resources.

Background

Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) pointed out that even the most stringent mitigation efforts (*i.e*., reduction of greenhouse gases) cannot avoid further impacts of climate change in the next few decades. In 2010, Ministry of the Environment, Japan published "Climate Change Adaptation: Approaches for National and Local government". This study report is mainly intended for national and local government departments responsible for adaptation. It summarizes basic approaches common across multiple sectors, and also true in the fisheries sector. For the adaptation, the four steps below are important; (1) historical data analysis and monitoring, (2) project future climate change and impacts, (3) design and implement adaptation measure, (4) review and rotating the PDCA cycle.

Issues

Monitoring of fisheries resources and environment conditions in the hot spot for their recruitment are the basis of risk assessment, projecting future climate change effects, and design and implement adaptation measure.

For planning adaptive measures in the fisheries sector, accumulation of information on biological characteristics of the important fisheries resources is essential. To make the adaptation measure improved, assessing the effects of the measure and rotating the PDCA cycle (adaptive management) are important.

Conclusions and Recommendations

AR4 shows that the most stringent mitigation efforts (*i.e.* reduction of greenhouse gases) cannot avoid further impacts of climate change in the next few decades. Therefore the adaptation measures are essential to cope with the climate changes. For the adaptation in the fisheries sector, the four steps below are important; (1) historical data analysis and monitoring, (2) project future climate change and impacts, (3) design and implement adaptation measure, (4) review and rotating the PDCA cycle. For planning adaptive measures in the fisheries sector, accumulation of information on biological characteristics of the important fisheries resources is essential.

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Annex 35

IMPACT OF CLIMATE CHANGE ON SCOPE FOR GROWTH OF PENAEID SHRIMP: RESULTS OF NUMERICAL MODELING[1]

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Summary

The model presented in this study was able to simulate penaeid growth in pond culture environment during one crop cycle and examine impact of water temperature and salinity on shrimp weight. The model quantifies the different physiological processes involved in growth such as ingestion, assimilation, excretion and respiration. The output revealed that weight is a key variable of harvest yields. This simulation of growth can also be used to study the population dynamics and biomass in an earthen pond ecosystem. This model are useful for aquaculture planning and management as they provided estimates of growth conditioned by different impact of climate change such as temperature raise and low water salinity from heavy rain.

Background

Marine shrimp culture has proven to be one of the fastest growing food producing sectors in Thailand. Shrimp farmers tend to increase production simply by stocking at high density and increasing consumption of artificial feed (Williams et al., 1996; Arnold *et al.*, 2006). However, growth of shrimp in an intensive culture depends not only on feed supply but also environmental factors impacted by climate change parameters such as temperature and salinity (Franco *et al.*, 2006; Jiang *et al*., 2000). In this study, mathematical model was applied to simulate the growth of *Penaeus* individuals and provided more detailed information concerning physiological processes and growth condition by different factors of temperature and salinity. Additionally, results from this study will provide a better potential growth and reduce risk of production loss from climate change effect.

Objectives

1. To quantify the most importance physiological processes involved in growth.
2. To analyze impact of climate change parameter such as temperature and salinity on shrimp growth.
3. To simulate penaeid shrimp growth by means of an individual growth model.

Issues

Study site

The model was applied to white shrimp earthen pond in Songkhla Province, south of Thailand. The individual growth model was applied to *Penaeus vannamei*, as the species accounts for 99% of total shrimp production in Thailand, but the conceptual frame work is applicable to Penaeids in general.

Growth model

The growth model for penaeid shrimp is developed. The development of the model for penaeid growth involved the following steps:

1. Conceptualization based on main physiological processes influencing growth and parameterization according to existing literature regarding penaeid ecology and life cycle.
2. Implementation and testing in a visual modeling platform.
3. Validation of the modeled results.

The growth model includes four physiological processes including;

(1) Ingestion
(2) Assimilation
(3) Elimination/excretion
(4) Respiration

1 This study is funded by Office of the National Research Council of Thailand
2 Marine Shrimp Culture Research Institute, Department of Fisheries. Kaset-Klang, Chatuchak. Bangkok. Thailand 10900.
3 Coastal Aquaculture Research Institute, Department of Fisheries, 1/19. Moo3. Kaorupchang, Muang Songhkla. Thailand. 90000.

Model Implementation

A simulation period was based on one crop cycle (120 days) with a visual simulation package Stella 8.0, running on windows operation system. A 0.02 time step was applied and model equation was solved using Eurler's method.

Sensitivity analysis

A sensitivity analysis of an impact of water temperature and salinity on individual shrimp weight was carried out using a 10% change in the values of the forcing function.

Conclusions and Recommendations

Currently, white shrimp is an economic important product and very significant for Thailand economy. Growth of shrimp related to environmental factors potentially identified climate change such as water temperature and salinity has been study in order to understand better growth potential and reduce risk of production loss from climate change effect.

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Annex 36

CLIMATE CHANGE: A CHALLENGE FOR MARINE TRANSPORTATION

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Summary

The greenhouse gases are important factor for climate change which carbon dioxide is the most abundant. The burning of fossil fuels has contributed to the increase in carbon dioxide in the atmosphere. The marine transport is one of potential contributor of carbon dioxide. The International Maritime Organization is working with the parties to control and reduce carbon dioxide emission from ships through annex 6 of the international convention on prevention of pollution from ships. Regular package including technical and operational measure for all ships is nearing complete. And they are going to consider the market based measures to achieve the noble objective of climate change mitigation.

Background

The marine transport carries 90% of world trade and contributes about 3% of total greenhouse gases emission from all sources. However the world fleet of shipping is likely to increase even during the world economic crisis, hence the mitigate measure for greenhouse gases emission from ship is essential. This important task was carried out by the International Maritime Organization, the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. The purposes of the Organization are "to provide machinery for cooperation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships". The most important of all these measures was the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78). It covers not only accidental and operational oil pollution but also pollution by chemicals, goods in packaged form, sewage, garbage and air pollution. The prevention of air pollution from ship is mention in Annex 6 of MARPOL 73/78 which is in the process for developing technical and operational measure as well as the market-based measure to control and reduce the greenhouse gases from marine transport sector.

Issues

Note the present situation of greenhouse gases emission from ship and on-going procedure to issue the prevention and mitigation measure of the International Maritime Organization.

Conclusions and Recommendations

If shipping is to have a positive impact on climate change, it needs a global regime developed and enacted by International Maritime Organization and applied to all ships engaged in international trade, giving due consideration to the needs of developing countries.

International Maritime Organization should continue to work, in co-operation with the industry, the UNFCCC Secretariat and other relevant UN organizations, to achieve that noble objective.

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www.imo.org

Annex 37

CLIMATE CHANGE ADAPTATION AND MITIGATION: FISHERS IN THE PHILIPPINES

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Summary

More than half a million small fishers in the Philippines have been availing of loans from QUEDANCOR, the credit arm of the Philippine Department of Agriculture. The financing scheme has been quite successful, with a repayment rate at 95%. However, the occurrence of natural calamities, such as typhoons as well as pests and diseases, has affected the productivity of fisheries and food security, thus hindering fishers from paying and renewing their loans. Failure to access credit could greatly inhibit them from continuing to venture on fishing activities and could eventually jeopardize the welfare of their entire households. The inability of creditors to pay their loans and meet their obligations also impairs, to a large extent, the financial operation and viability of the lending institutions. This study analyzes the natural risks and risk management practices of these fishers and recommends mitigation mechanisms to minimize the impact of natural calamities. Moreover, it suggests a bridge financing scheme that can be an effective and efficient instrument for enabling fishers to carry on their livelihood activities and support their families' basic needs, while slowly recovering from their losses.

Background

The Quedan and Rural Credit Guarantee Corporation (QUEDANCOR) of the Philippine government, operated under the Department of Agriculture, is tasked to provide and distribute credit resources and initiate programs to help accelerate rural growth, generate employment and establish enterprises that provide better livelihood and income opportunities to small fishers. To support the government's overall goal of achieving food security and economic stability, QUEDANCOR developed a variety of innovative financing schemes to help intensify and sustain production of fisheries and aquaculture products.

While QUEDANCOR has the critical responsibility of providing and improving credit assistance to fishers, it also has the task of helping its beneficiaries meet the repayment obligations of their loans. One reason for defaults can be attributed to the devastating impact of natural calamities. Schemes currently in place at time of writing are still insufficient to help safeguard lending programs and operations from non-repayment of loans due to production losses and damages to personal property.

Natural calamities include the uncertainties and vagaries of weather and climate that bring about typhoons, floods, and droughts; earthquakes; volcanic eruptions as well as pests and diseases that affect the productivity of fisheries. Weather and climate disturbances are still considered major sources of risk, especially when they affect production and other related activities, taking heavy tolls among small fishers, laborers and traders. While the frequencies of disease and pest attacks have been decreasing due to continued development of improved technologies, they still inflict significant losses when they do occur.

When natural calamities hit, small fishers are unable to pay their loans from QUEDANCOR; moreover, they have difficulty renewing their loan applications from QUEDANCOR or accessing credit from other sources. Failure to access credit could prevent them from being able to continue to venture on fishing activities and could eventually jeopardize the welfare of their entire household. The inability of creditors to pay their loans and meet their obligations also impairs, to a large extent, the financial operation and viability of the lending institutions. Risk management schemes currently employed include price stabilization measures, targeted relief to typhoon and drought victims, and crop insurance systems, to name a few. Some of these schemes, however, are becoming very expensive to implement. Moreover, they fail to enable fishers to regain sufficient resources so that they may continue production.

One potential avenue that has not been explored is the continued extension of credit to fisher-borrowers who have suffered from natural calamities so that they can carry on their livelihood activities and slowly recover. Fishers usually require two to three cropping seasons to overcome losses due to inadvertent failure in production. The idea of a bridge fund is to provide assistance to fisher-borrowers who suffer major crop losses due to natural calamities. Such assistance can be provided in the form of loan restructuring and/or provision of low-interest (perhaps interest-free loans) to make it more affordable for borrowers to meet their loan obligations within a prescribed grace period and, at the same time, provide support to their families.

The purpose of this study is to analyze the natural risks and risk management practices of QUEDANCOR fisher-borrowers and to come up with appropriate measures to mitigate their adverse impacts on income and welfare.

Specifically, the objectives are as follows:

a. To estimate fishers' production losses due to natural calamities;
b. To document the coping strategies and mitigating measures taken by fishers during natural calamities; and
c. To recommend mitigation mechanisms to minimize the impact of natural calamities.

Issues

When a natural disaster strikes, the QUEDANCOR borrower copes by reducing his vulnerability through the following means: reducing his consumption and social obligations; selling his livestock; in some cases migrating some household members, so they can seek employment elsewhere to augment the family income; withdrawing from his grain inventory for household consumption and offering it for sale, but at a price lower than usual; and in some cases devising forms of collective action together with the community. Households with larger amounts of assets and other sources of income from non-farm activities are less vulnerable to natural risks and have a better ability to obtain credit from other sources.

The worst affected and most vulnerable during calamities are the respondents who are poor and marginalized. Not only are they the worst hit, but also their capacity to recover from a disaster is very low. Any extreme situation traps the poor in a situation of selling off productive assets that become difficult to retrieve and, thereby, reinforce poverty almost permanently. The majority of typhoon-stricken respondents have sustained damages to personal dwellings, loss of personal effects as well as their sources of livelihood: their farms. Those with off-farm income were able to retrieve some of those lost assets. However, those relying only on agriculture and fisheries as their source of livelihood were never able to buy back their assets, even during normal years.

In order to repay their loans, the borrowers look for other sources of credit, such as their close relatives or friends, or return to informal creditors offering higher interest rates so that they will have capital to start anew. In the process, they still cannot pay their loans from QUEDANCOR and become even more tied to their creditors. This vicious cycle continues as long as these fisher-borrowers are not provided with a credit scheme which has contingency measures that they can avail themselves of during times of calamity.

On the other hand, institutions on disaster management at the LGU level are in place. These offer temporary assistance to the QUEDANCOR fishers in the form of relief goods, disaster shelter, medical assistance, among other things. However, there is no institutionalized credit repayment or restructuring mechanism that assists them with changing their socioeconomic condition, particularly in helping them recover from the losses incurred on their livelihoods and personal effects.

Conclusions and Recommendations

In the agricultural sector, financial institutions are a vital component in the daily operations of farmers/fishers and their families. Only 60% of Filipino farmers were able to borrow, as revealed by a study conducted by the Agricultural Credit and Policy Council in 2000. Only 40% of the 60% were able to access loans from the formal sector, 8% from banks, in particular. Thus, Quedancor harnessed its resources from the capital market by lending money to the country side, in areas where the formal financial institutions are weak. Quedancor has devised several credit and guarantee programs, foremost of these is the SRT Model which is currently being implemented for the last four years to address the credit needs of farmers, fishers and small entrepreneurs belonging to the urban and rural poor.

For QUEDANCOR's loan operations, a bridge fund can serve as a potential buffer to recoup the loans of defaulting fisher-borrowers that suffer crop losses due to the effect of natural calamities. Such a bridge fund scheme in support of the QUEDANCOR credit program needs to be carefully studied and crafted. The total amount of the bridge fund should be based on the frequency of occurrence of natural calamities in a given area and their potential impact as expressed in terms of the value of crop losses. There are critical issues and concerns that need to be clearly understood and addressed for such a task to succeed. One issue would be the proper identification of borrowers who could and will avail themselves of such support services. Other issues include the circumstances under which extension of credit can be granted and determining appropriate amounts of credit for enabling the continuation of production and other

livelihood activities. A final issue pertains to the setting of a reasonable grace period that would be given to the affected borrowers, one that allows easy repayment of total loans taken (regular loan plus the extension loan granted through bridge financing). Different types of fisher-borrowers require different types of credit and risk alleviation assistance in order to recover. Identifying the specific form and amount of assistance for each type requires critical information that needs to be gathered and analyzed in order not to put the operation of the lending institutions at stake.

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Annex 38

ADAPTIVE RESPONSES OF TRADITIONAL FISHERS TO CLIMATE CHANGE IN INDONESIA

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Summary

Climate change is a global issue and the major environmental problem that has attracted government including inter-diciplinary scientiest as well as non-governmental organization worldwide to pay attention for mitigation activities. Eventhough, the mitigation on climate change to fisheries especially coastal fisheries that mainly involved traditional fishers in Indonesia is still limited. This paper discusses the adaptive responses of traditional fishers to climate change. The traditional (small) fishers are the people who conduct fishing for fulfilling their daily life by using boat of less than 5 GT. They are vurnerable to climate change due to some limitations in technology, capacity, and information access. However, they have simply though in order to response the climate change through adaptation strategies such as the use of multi purpose boat with multi gears, expansion of fishing ground, reducing crew member, mixing fuel, and doing other activities (agriculture, aquaculture, fish processing, and trading).

Background

Most of the fishing activities in Indonesia is catagorized into artisanal fisheries which involved traditional fishers. They engange fishing in the coastal waters operating simple fishing gears such as traps and small gillnets with non-powered boat, outboard motor or inboard motor of less than 5 GT. From the statistical data showed that the number of inboard motor fishing boat <5 GT and its household linearly increased during the period of 2004-2008, while the number of non-powered boat and outboad motor, and its household tended to decrease on that period. This phenomenon is related to the need on expansion of fishing ground to a distance waters using inboard fishing boat. Decreasing fish stock in the coastal waters due to over fishing as well as climate change is the reason.

The traditional fishers are vurnerable to climate change due to some limitations mainly in technology, capacity, and information access. The use of small fishing boat has limited them to go fishing at distance fishing grounds. They also have low capacity due to most of them are low educated people, therefore they meet difficulty to accept new technology innovation as well to access and use information related to fishing activities. This paper discusses the impact of climate change to fisheries, adaptive responses of traditional fishers to climate change, and also their response to information of weather forecasting.

Issues

The climate change gives impact on the broader aspects related to human life including fisheries. The impact on seawater environmental such as change of habitat, change of upwelling system, increase of temperature, and change of current give effect to fish resource as well as other marine biota. For example, the increase in sea temperature during the 1997 El-Nino has damaged about 18% of the coral ecosystem in South East Asia. Coral bleaching was observed in many places *i.e.*, the eastern part of Sumatra, Java, Bali, and Lombok. In Seribu islands (north of the Jakarta coast), about 90-95% of the corals located 25 m below sea surface has been bleached (MoE, 2007). The change of seawater environment will drive fish migrate to the new habitat, disturbance on fish recruitment and productivity, and cause fish mortality.

The traditional fishers are experienced with the climate change impact as their clearly perception on ecological and socio-economic impacts. They can understand the ocean condition that recently irregularly change due to the climate change, which limit them to go fishing. Therefore, the survey on the need and benefit of the weather forcasting information resulted that most of the traditional fishers did not need the information (CSF, 2010). There are four strategic adapatation of the traditional fishers to climate change, *i.e.*, (1) use multipurpose boat with multi fishing gears, (2) expansion of fishing ground to a distance water of more than 2 nautical mile, (3) reducing crew member for fishing, (4) mixing fuel to reduce operation cost, and (5) doing other activities such as agriculture, aquaculture, fish processing, and trading.

Conclusions and Recommendations

Climate change gives significantly impact to the traditional fishers on the catch decreasing due to difficulty to determine fishing ground/season and decreasing fish stock availability. The adaptation of traditional fishers to climate change is conditional response based on their skill and knowledge, capacity, and creativity to overcome the problem for struggling life.

Adaptation to climate change is a necessary part of the response of fishers in order to sustain their life through setting the adaptation strategies to reduce the adverse impacts of climate change and also to make benefit from it. Plans for adaptation of traditional fishers to climate change need to be developed. According to Jones *et al*., 2004 *vide* MoE, 2007) planned adaptation to the future climate will be based on current individual, community and institutional activities that, in part, have been developed as a response to current climate.

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Annex 39

EXPERIENCED AND CONCEPTUAL FRAMEWORK OF THE MODELING STUDY FOR MITIGATION OF THE IMPACTS OF CLIMATE CHANGE ON SHRIMP FARMING IN THAILAND[1]

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Summary

Implication of climate change on fisheries and aquaculture is an emerging issue of study to have more scientifically sound information for policy makers and shrimp farmers in security of production and sustainable of shrimp industry in Thailand and ASEAN countries. Shrimp farms in Thailand were hardly impacted by climate change during 2010-2011. The mathematical modeling is use as a tool to evaluate these impacts on alteration of shrimp pond ecosystem and production. The conceptual framework is considered to evaluate variation of scope for growth in shrimp, dynamics of phytoplankton and microbial process in pond ecosystem under several climate change scenarios. The outcome from this study will lead to suggestions of the adaption policy and good aquaculture practice (GAP) for mitigation the impacts of climate change on shrimp farming in Thailand.

Background

Thailand is one of the major food producing countries of ASEAN. Food production sectors play important role in economic development of Thailand in terms of GDP and livelihood of the rural people. Among these, shrimp production sector is a major sector of seafood production exporting 506.8×10^3 ton in 2008 (Department of Fisheries, 2010). Climate change has recently being a global emerging issue as it could occur regionally but impact globally. The effects of climate change are on ocean surface temperatures, stratification, circulation, coastal upwelling, sea level rise, acidification and climate variation patterns which cause significantly impacts and limitations on fisheries and aquaculture (Barange and Perry, 2009). Considering to marine shrimp farming, levels of production are depend on how to continually maintain a healthy ecosystem and nutrients balance in the pond throughout the production cycle. Variation of climate, raining/droughts could alter the function of pond ecosystem and/or damage farm facility and production in shrimp farming area.

The recent examples are the extreme variable climate during late 2010 and early summer of 2011 in the southern Thailand which destroyed shrimp farm facilities, production and threatened to the outbreak of viral and bacterial disease in the farmed shrimps. The loss was estimated at least 60,000 tons of shrimp production which is equivalent to 350 million US$.

Issues

In this paper, we aim to present a conceptual framework of the mathematical model to evaluate the impacts of climate change parameters such as temperature, salinity, light intensity on the variation of phytoplankton dynamic, re-mineralization of nutrients and oxygen availability under different climate change scenarios.

The model of shrimp pond ecosystem is constructed in to 3 sub-modules; 1) shrimp, 2) phytoplankton, and 3) bacteria (nitrifying and heterotrophic bacteria) in water column and bottom of the pond. Under the common condition, feed is supplied for shrimp growth and production and nutrients are cycled by organisms *i.e.* shrimp, phytoplankton, microbes that inhabited in water column and benthic of the ecosystem (Burford and Lorenzen, 2004, Montoya, *et al*., 1999).

The implication of climate change on temperature, salinity and food availability from feeding is used as parameters in the shrimp sub-module for estimation of scope for growth, metabolisms, wastes excretion and energy accumulation for growth of shrimp (Rosas *et al*., 2002; Franco *et al*., 2006).

Temperature, salinity, nutrients (nitrogen and phosphorus) and light intensity in shrimp farming area are used in the phytoplankton sub-module for evaluation the implication of raining/droughts on functions of phytoplankton in shrimp pond ecosystem such as photosynthesis, nutrients uptake, oxygen

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production/depletion, mortality and organic wastes accumulation in the pond ecosystem (Macedo *et al*., 1998; Niscklisch *et al*., 2007; *Dube et al*., 2010; Montoya, *et al*., 1999).

Temperature, dissolved oxygen and nutrient concentrations are used as parameters in the bacterial sub-modules for estimation of bacterial function on the re-mineralization of nutrients in shrimp pond ecosystem both in water column and bottom sediment (Burford and Lorenzen, 2004, Montoya, *et al*., 2002).

The long term weather information is analyzed to characterize the patterns of climate variation in the shrimp production area. The impact of climate change on scope for growth of shrimp, phytoplankton growth dynamics and nutrient uptake and photosynthesis, oxygen availability, re-mineralization and benthic microbial process will be evaluated under possible levels of climate change. The good aquaculture practice will be synthesized and suggested to shrimp farmers for mitigate the possible worst impacts of climate change on the shrimp pond ecosystem.

Conclusions and recommendations

The results from shrimp pond model simulation provide significant scientific based knowledge of the impacts of climate change on shrimp pond ecosystem under different scenarios. The suggestions from this study are useful for shrimp farmers in preparation of management tools/facilities for possible mitigation measures to prevent loss in production and investment from the impacts of climate change. The conceptual framework and outcomes from this study could be also applied to evaluate in different farmed aquatic species systems operated in coastal and inland aquaculture which enable to security of seafood production of the ASEAN region.

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Annex 40

PROMOTION OF LIVELIHOOD DIVERSIFICATION IN COASTAL FISHING COMMUNITIES

Don Griffiths[1], Chief Technical Advisor, Regional Fisheries Livelihoods Programme[2] (RFLP)[3]

Traditional livelihoods options in fishing communities are limited and the livelihoods of small-scale fishers are often insecure and extremely vulnerable.

An estimated 80% of the global population lives within 200 km of the coast, with many of the world's coasts becoming increasingly urban. 14 of the world's 17 largest cities are located on coasts. Eleven of these cities including Shanghai, Bangkok and Jakarta are in Asia and were established on river deltas around trading and fishing activities on the Yangtze, the Chaophraya and the Ciliwung rivers respectively. With migration from rural hinterlands and increasing urbanization the average population density of coastal areas at 80 people per km^2 is twice that of inland areas. Some Asian cities like Jakarta have population densities in excess of 14,000 people per km^2. Coastline urbanization brings with it coastal development, including demands for fresh water and sewage treatment, and damage to coastal ecosystems.

Coastal cities and communities are at risk of extreme weather events including typhoons, cyclones, tropical depressions, floods, droughts, etc. and to the impact of cataclysmic events such as earthquakes and tsunamis. These life threatening forces, combined with high population densities make coastal communities extremely vulnerable and poor households and small-scale fishers in particular are usually the most vulnerable and at risk.

In the Asian region many small-scale coastal communities, besides being vulnerable often face a variety of constraints including general under-development and limited government funding for infrastructure development including roads, electricity, potable water and basic sanitation and sewage systems, they often have limited telephone connectivity (land lines, mobile and internet coverage), and few schools, clinics and hospitals. Typically coastal communities have weak extension and other support services like micro-finances services, fisher households members are typically poorly educated and have high levels of illiteracy, and many are without land title deeds and therefore have little or no collateral and assets which can be used to obtain bank loans or credit. Moreover poor soil fertility and largely sandy soils also significantly limits the livelihoods options that are available to coastal fishing communities.

Traditionally coastal communities looked to the sea and fishing, for their main source of animal protein, income and their major livelihood. It is acknowledged that small-scale fisheries can generate significant profits, provide resilience to shocks and crises, and make meaningful contributions to poverty alleviation and food security. Fishing has also traditionally supported various other related livelihoods activities including fishing boat construction, maintenance, servicing and repair, fishing suppliers and servicers, fishing gear production and repair, aquatic product processors, fish traders and middle-traders, processor suppliers/servicers including ice producers, aquaculture, and aquaculture suppliers/servicers including seed, feed, chemicals and equipment.

However while for centuries the bounty of the seas was assumed to be without limit, this has since been challenged with startling reality and today FAO estimate that 77% of the world's fish stocks are depleted, over-exploited or fully exploited. In a recent baseline survey of over 3,000 small-scale fishers conducted by the Regional Fisheries Livelihoods Programme (RFLP) funded by the government of Spain and executed by FAO in Cambodia, Indonesia, the Philippines, Sri Lanka, Timor-Leste and Viet Nam, the majority of fishers reported declining health of fish stocks, bio-diversity, and catch per unit effort, and increased illegal, unregulated and unreported (IUU) fishing and conflicts and tension between inshore small-scale fishing fleets and offshore commercial vessels, with the latter increasingly entering inshore waters at night particularly, to fish illegally.

Today the fisheries related livelihoods of many small-scale fishing communities in Asia are under threat. Internal threats include the 'open access' nature of small-scale fisheries, the difficulty of keeping an inventory

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[2] The Regional Fisheries Livelihoods Programme (RFLP) which is funded by the government of Spain and executed by the Food and Agriculture Organization of the United Nations is conducting activities in collaboration with the national agencies responsible for fisheries in Cambodia, Indonesia, the Philippines, Sri Lanka, Timor-Leste and Viet Nam. The programme commenced on 01 September 2009 and will run until the end of August 2013.
[3] www.rflp.org

of small-scale fishing vessels, and weak fisheries management. As a result of increasing human population, people have moved into fishing as a livelihood of last resort and most fishing fleets have increased in number and size.

Coastal small-scale fishers need improved incomes, livelihoods security and resilience. Several current GEF funded projects in the Asia region are promoting the establishment of large MPA's. But when no-take MPA's are established, fishers need to be provided with alternative livelihood options. As governments strive to limit and even to reduce fishing effort, they have to provide alternative livelihoods options to coastal communities.

Diversifying livelihoods spreads risk and makes sense

A livelihood[4] comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base.

The livelihoods decision making process of people and households is complex and influenced by many factors. Why should fishers be encouraged to diversify their livelihoods? As stated above small-scale fishers and their communities are usually poor and therefore extremely vulnerable to shocks and trends. If they have a single or a dominant livelihood, then any negative impacts on that livelihood can be catastrophic. One obvious reason for livelihood diversification is therefore to reduce vulnerability, by spreading risk across several livelihoods and to offset for example the effects of fishing seasonality and the likely impacts of climate change trends on fisheries. Another reason for diversification is to allow the accumulation of assets and wealth, to improve the well-being people, to reduce poverty and to promote economic growth.

Donor funded development projects and governments also encourage fishers to diversify their livelihoods with the ultimate goal and taking some fishers out of fishing, of reducing the negative impacts of aquaculture on natural ecosystems (for seed and feed requirements) and the intention of reducing fishing pressure on threatened over-exploited aquatic resources. As yet there are no citable examples available where this has worked.

Livelihoods diversification is complex and needs careful, considered, holistic approaches

Parachuting into a fisher community with a new off-the-shelf livelihood will seldom work. Plug-in livelihoods options promoted by development projects have a high failure rate when the project mechanism closes and leaves The factors which impact on the likely success of a new livelihood are many and all interact, so livelihoods diversification requires careful, considered, holistic and multi-sectoral approaches, which should include the mainstreaming of gender.

The international NGO CARE and the Department for International Development (DfID) of the British government were both instrumental in the development of the Sustainable Livelihoods Approach (SLA) in the late 90's. The SLA provides a framework for evaluating the various capitals that households/communities have available to them with which to strengthen existing or to undertake new livelihoods including environmental, human, social (political), financial, physical (facilities/infrastructure), philosophical capitals. Figure 1 below shows the SLA developed in a participatory process by staff of the Regional Fisheries Livelihoods Programme (RFLP) and indicates the complexity of factors impacting on livelihoods choices and on the likelihood of sustainable long term adoption for new livelihoods options.

Before recommending livelihoods modification, change and new livelihoods there is a process which if followed will increase the likelihood of successful adoption and sustainability.

- Extension practitioners should begin by learning from past and on-going livelihoods diversification activities and by identifying constraints and opportunities;
- Current sustainable livelihoods options should be studied and strengthened before thinking of promoting new alternative livelihoods options;
- A participatory process should be followed to identify, analyze and agree viable options before promoting an alternative livelihood option;
- Use the Sustainable Livelihoods Enhancement and Diversification (SLED) approach which has the following steps i) **Discovery** (learning about livelihoods; building consensus for change; and building

[4] Carney D. (ed) 1998. *Sustainable Rural Livelihoods: What Contribution Can We Make?* Papers presented at the DFID Natural Resources Advisors' Conference, July 1998. DFID.

visions); ii) **Direction** (scoping opportunities; selecting options for SLED action; and detailed planning for livelihood change); and iii) **Doing** (action driven by people). Change must be built on a shared recognition of the need for change and on shared visions and goals.

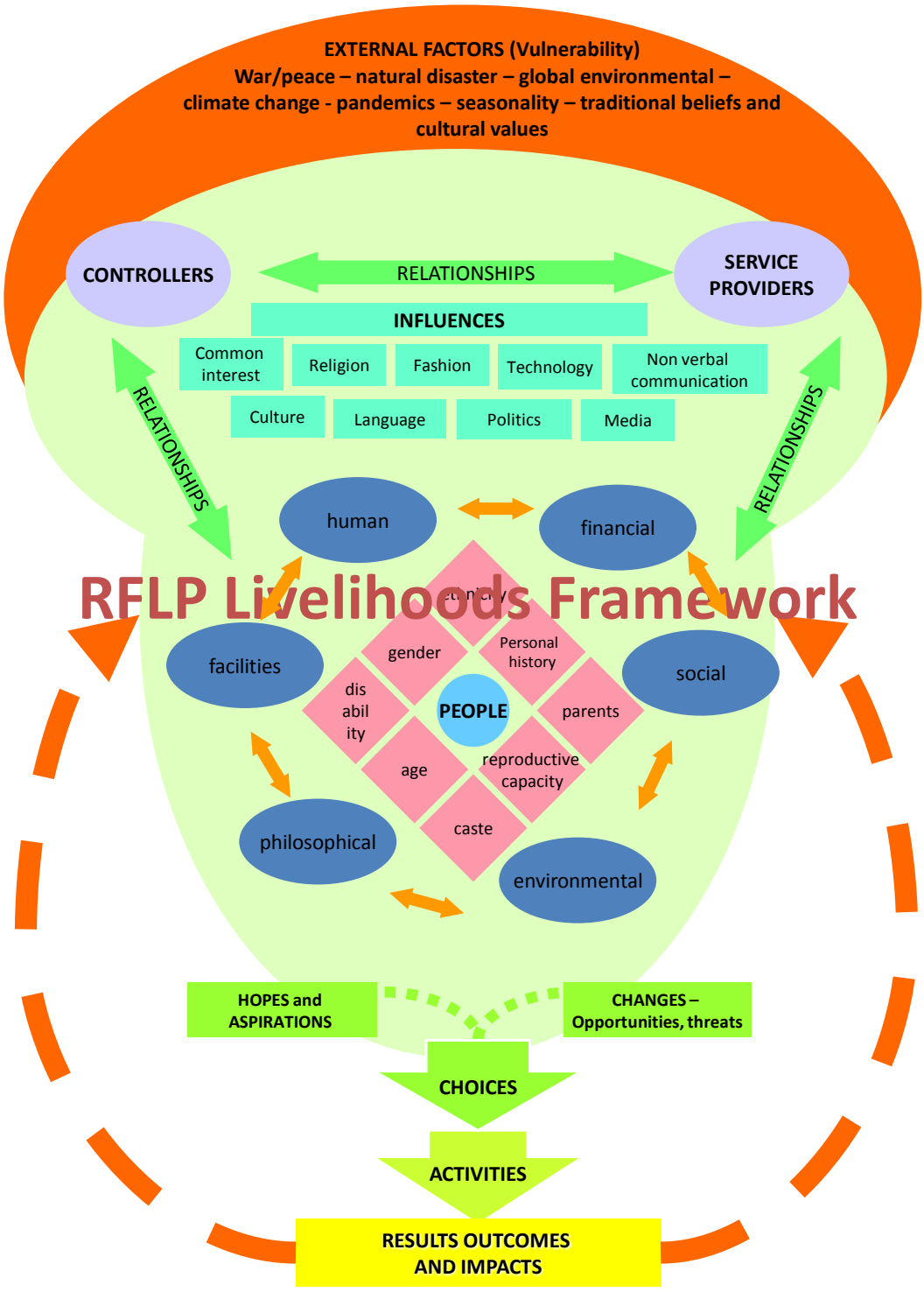

Figure 1. RFLP sustainable livelihoods approach

The assessment process for livelihoods can require bringing in outside expertise, but they can be used to train local communities and local support institutions (fisher and community organizations, NGOs and local government) in the process.

The RFLP has followed the above process in its target countries and is piloting a variety of alternative livelihoods options including seaweed culture, catfish culture, mushroom production, weaving, bee keeping, small-livestock rearing (chickens, pigs, ducks) etc.

Consulting the invisible women

Development practitioners often miss or under-value the importance of women. FAO estimates that by addressing gender inequality, world food insecurity could be reduced by as much as 30%. When conducting livelihood diversification activities, 50% of the community cannot be ignored. Women have significant reproductive and productive roles in fishing communities. Women fish, glean, mend nets and gear, and have significant roles particularly in post-harvest activities like fish drying, smoking, and selling aquatic products in the market. There are a variety of alternative livelihoods options which are particularly relevant for women including home garden, chicken rearing, and services (hairdressing, sewing etc).

It is therefore vital to consider the role of women in any livelihoods activity. It is important therefore to analyze:

- Daily activities and routines of both women and men;
- The differences in access to and control over resources and benefits (*e.g.* income, information etc.); and,

To identify any specific gender needs (*e.g.* access to training, credit, etc).

Non-fisheries related livelihoods options may offer the best potential

Unfortunately when considering livelihoods diversification options for coastal fishing communities, the majority of people/projects/NGO's/government institutions immediately think of aquaculture. For low in the food chain species like seaweeds and molluscs, this is usually OK. However promotion of the culture of high value predatory species like grouper can lead to increased fishing pressure on already over-exploited inshore fisheries resources as trash fish is frequently used as a feed source. Culturing species like lobsters is also dependent on wild caught seed, which can again lead to sustainability issues. Promotion of poorly planned aquaculture can negatively impact on the aquatic environment as wild seed and trash fish and undersized juveniles of valuable species are harvested as seed and feed.

This situation requires people to think outside the box and to consider land-based and none-aquatic resource fish related livelihoods options of which there are many ranging from mushroom growing to eco-tourism, home-gardening, hair-dressing, dress-making and tailoring.

Seeing is believing – if communities can see for themselves what has worked well elsewhere there is a better chance of it being embraced. Farmers and fishers relate well to each other and can be more convincing than an extension worker trying to convince a sceptical farmer or fisher.

Groups like the ILO and others are able to scope the job markets to identify needed vocational skills and provide appropriate training to meet job market needs. RLFP is collaborating with the ILO EAST project in Indonesia to identify opportunities and to provide vocational job training skills for unemployed youth.

Sustainability depends on a number of factors

Livelihoods are more likely to be sustainable when technical support and follow up is provided beyond the training course and the life of development projects. It is therefore vital to train the right local fisher community, fisher community organization members and NGO and government staff, who can provide technical back-stopping until alternative livelihoods are routine.

Three things, i) empowering people; ii) enabling policies and iii) effective service provision can significantly contribute to making livelihoods diversification more sustainable.

Empowering people – RFLP is working to develop the capacity of fishers, fisher's groups/associations etc, and institutions which support fisher communities including NGO's and government institutions from national to local level, with much of the effort being directed at local level institutions.

RFLP is also assisting both national and local government to revise and draft new legislation and policies that create a more enabling environment for the development of diversified livelihoods. Legislative revisions are contributing to facilitate co-management, land, coast and sea access use rights.

Access to micro-finance services goes hand in hand with sustainable livelihoods diversification

The lack of access to capital and micro-finance services constrains the livelihoods development/diversification options of many small-scale fishers and poor households in coastal communities. There are large coastal areas of the Philippines and Indonesia where seaweed culture could be conducted for relatively small investments, especially since seaweed buyers typically travel to the growers seeking raw material for processing and onward sale. Seaweed culture is low technology, low investment and low risk.

However micro-finance institutions (MFIs) and banks are risk adverse and see fishers and fishing communities generally as being a bad risk. This stems from their perceived low levels or education, high levels of illiteracy, the seasonal and high risk nature of fishing, and because fishers seldom have assets which can be used as collateral against a loan or credit. MFIs and banks therefore do not generally want to lend to fishers.

The RFLP is working to increase the understanding of MFIs of the needs of fishers for credit, savings and insurance and is hoping to facilitate tailoring of MFI products to better fit that need. Financial literacy is being provided to fishers so that they are better able to understand budgeting, and can present a proposal to an MFI or a bank for funding and also see the importance of savings. RFLP is facilitating group approaches to savings and credit, and while no guarantee against failure, peer pressure can be a very useful tool in protecting revolving credit funds.

Participation is key. Look out for and take advantage of the unexpected

The starting point of many donor funded rural development projects is often a large, costly, time consuming baseline survey, most of which are often only finalized near the end of a project and usually yield not particularly useful results. Learning from the baseline experience few development projects repeat the originally planned end of project survey which is intended to yield the results which will highlight impact.

Projects should move beyond large baseline surveys and make greater use of a mixture of both quantitative and qualitative M&E methodologies, including most significant change stories, case studies, examples of best practice etc. It is also vital to have the active participation of stakeholders in setting the criteria for success indicators and assessing progress towards target indicators as projects are implemented. Every effort should be made to talk to participants and stakeholders through consultations, meetings, focus group discussions ideally for different stakeholder groups before plenary discussions etc. M&E should also be made gender sensitive and women should be given enhanced opportunities to speak!

No project logical framework is going to pick up half of the issues which will occur during a project life. So project staff should always look out for the unexpected. The Overseas Development Administration of the British government funded construction a large hatchery in northwest Bangladesh under the Northwest Fisheries Extension Project (NFEP) to solve the fish seed shortage which was believed to constrain aquaculture development in the region. Later it was 'discovered' that over 200 million fingerlings a year were transported through the local train station at night and were distributed across the region by itinerant fry traders in patils[5] travelling on foot, by bus and by bicycle. Following this 'discovery' the NFEP trained the itinerant fry traders and used them to distribute better aquaculture practice messages to over 200,000 farmers. By taking advantage of the unexpected, the project was able to turn it to an opportunity.

Micro-level best livelihoods practices

- Put people at the centre of livelihoods development;
- Mainstream gender throughout;
- When promoting alternative and new livelihoods options guarantee meaningful participation of all the main stakeholders to ensure ownership;
- Build on existing livelihoods, people's aspirations, their strengths, existing initiatives and current levels of social capital and other SLA capitals;
- Where present use existing networks and organizations, rather than creating new ones;
- Consider potential impacts on **all** community members, women, men, young, old, resource users, non-resource users etc.;
- Use flexible process approaches to livelihoods diversification;
- Avoid grants and subsidies;

[5] Curved aluminium pot used to carry water.

- Where possible, promote self-help groups, peer pressure groups, social networks; and,
- Only promote activities with neutral or negative impact on fishing pressure.

Macro-level best livelihoods practices

- Invest in incentives, not compensation schemes;
- Don't pay people to attend training;
- Establish clear national and local policy aims and programme goals which are consistent from the national to the provincial and local level;
- Develop policy coherence across sectors through the use of more holistic and cross-sectoral planning of development projects, and avoid sectoral perspectives on the best entry points;
- If fisheries is to be made a sustainable livelihood, strengthen fisheries governance, and facilitate the development of political will to control entry and re-entry into fisheries;
- Strengthen support services that enable/facilitate diversification (*e.g.* social, judicial and financial services, markets, knowledge and innovation systems).

A final thought, livelihoods change is always a risk, are we sure that we are doing the right thing?

When dealing with people's livelihoods, extension practitioners have to get it right. For a poor (fisher) household, failure of a new livelihood can be disastrous.

Annex 41

DIVERSIFICATION OF LIVELIHOOD STRATEGY TOWARD SUSTAINABLE DEVELOPMENT OF FISHING COMMUNITY IN SOUTHEAST ASIA

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Introduction

The purpose of this paper is to identify how small-scale fisheries sector has approached to the diversification of livelihood at household and local level, to improve their quality of life. It is widely acknowledged that, in Southeast Asia, this strategy is very important not only for the sustainable development of fishing community but also for the sustainable use of coastal resources. Since ASEAN economy has rapidly developed with increasingly providing job opportunities and alternative income sources to rural society, agriculture and fisheries sectors have caused a drastic change of production and marketing at local level. Naturally, household economy in small-scale fisheries is also being diversified.

However, small-scale fisheries sector is still facing risk and vulnerability to the forces of nature which is further exacerbated by a wide array of pressure from the economies and societies (Cattermoul, B. *et al*, 2010). In reality, fishers and their families have suffered from great impact of global and domestic economy. Climate change is another important threat to small-scale fisheries, affecting directly to the livelihood of small-scale fisheries households. Thus, to mitigate threats and risks from economic, social and environmental changes, both fisheries household and coastal society should consider strategy toward diversification of livelihood.

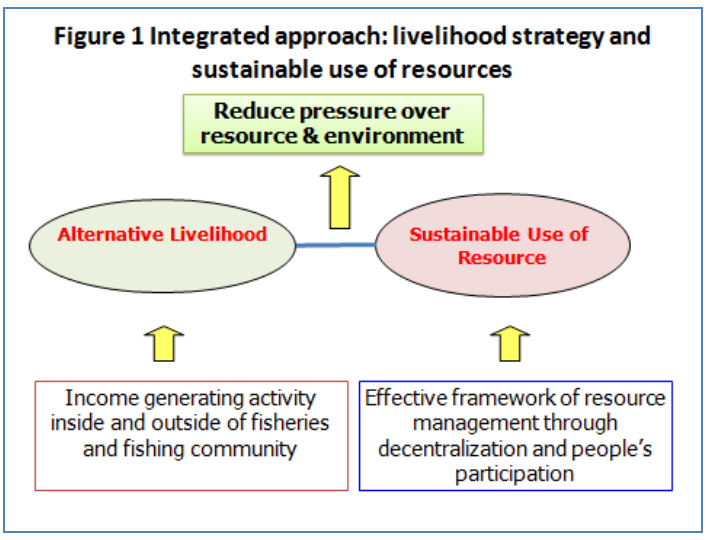
This paper consists of three parts. Firstly, diversification of livelihood activities in fishing community is discussed, considering the sustainable use of coastal resources. Secondly, roles of community-based organization and people's group are clarified through experiences and lessons according to livelihood improvement projects. Lastly, issues and recommendations are proposed for livelihood improvement in fishing communities.

Toward diversification of livelihood

Integrated approach to livelihood improvement

It is generally understood that, for improvement of livelihood in fishing community, people and society should establish strategic objectives as illustrated in Figure 1**.** This is a typical integrated approach to mitigate a threat from "vicious circle of poverty" and "vicious circle of resources depletion". In Southeast Asia as well as many parts of developing words, the most of problems as regards management and utilization of local food resources, such as agriculture, fisheries and forestry, would hardly be solved without any community development activities, in particular improvement of alternative livelihood (Saito 2004), although there may be disagreement over the statement that poverty gives a rise to resource degradation, and vice versa.

Figure 1 Integrated approach: livelihood strategy and sustainable use of resources



Sustainable use of resource as a key issue

With the economic growth of Southeast Asian countries, a coastal society has increasingly diversified its economic activity. Small-scale fishers and their families have more access to alternative job opportunities and income sources than before. However, in many parts of Southeast Asia, plenty of small-scale fishers are still under poverty line and vulnerable against growing market economy. They have tended to exploit coastal resource by employing effective, but destructive fishing devices for survival, as a result of which overfishing is a wide spread phenomenon in the region. How to achieve a sustainable use of coastal resource is still a key issue in the development of fishing community. Vicious circle of poverty often causes another vicious circle of depleting valuable resources, thereby leading to the collapse of common-pool resources that will expand further the vicious circle of poverty.

Development of coastal resource management (CRM)

A number of projects on coastal resource management (CRM) have been planned and implemented so far, with focusing community-based resource management (CBRM) and co-management (CM). Decentralized and participatory approaches are widely accepted in Southeast Asia, in order for CRM to fit in with local reality, even if decentralization policy differs from country to country. It is thought that empowering coastal society and resource users will lead to a more sustainable resource management system, through people's active participation in the decision-making process and implementation of CRM.

Two directions of livelihood diversification

Along with the establishment of a sustainable coastal resource management, the income generating activities will be implemented both inside and outside of fisheries and fishing community.

There may be a negative appraisal over promotion of alternative livelihood inside fisheries, because this possibly accelerates a speed of increasing catch effort and pressure over coastal resource is further expanded. Therefore, with a workable framework of coastal resource management, livelihood diversification inside fisheries should be well planned and cautiously undertaken. However, encouraging fishers to involve in alternative livelihood outside fisheries is not an easy task. Making alternative job opportunities and income sources inside fisheries or fisheries-related industries may be a practical way. Exploring underutilized aquatic resource, environmental-friendly aquaculture, and processing of local resources are a few examples.

In the recent years, strategy toward the creation of enhancing alternative livelihood outside fisheries has widely been adopted through Southeast Asia. To reduce vulnerability of fishers and their families, job creation is a key issue in coastal community. An increasing number of people hired as labors in establishments newly located in coastal area are. Wages are becoming an important income source of household economy. Improving post-harvest and marketing technology is included into this strategy. Activities of "one town, one product", "one tambol, one product", and "one village, one product", regarded as a activation of local economy, have also provided a great impetus to diversify livelihood with fishing communities, regardless of whether or not these challenges are successful. Whatever the type of alternative livelihood, poor fishers would require diversify their income sources, reducing over-dependence on decreasing coastal fisheries resources.

Development of conservation activity

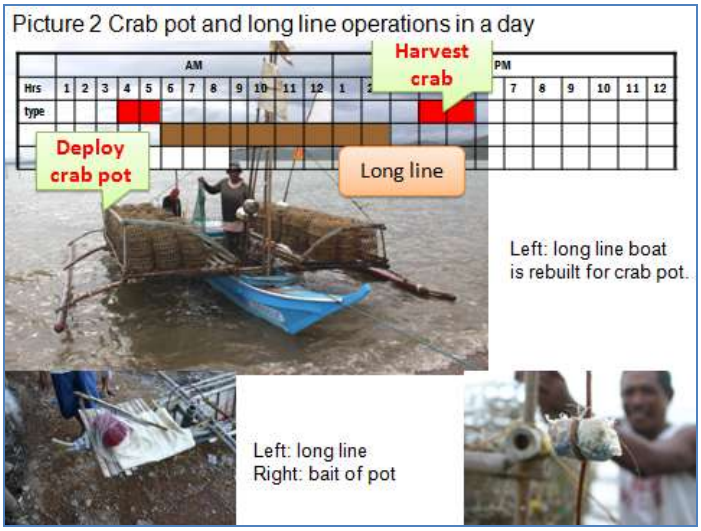
People and society rapidly increase their concern about environmental conservation and sustainable resource use in coastal areas. Establishing marine protected area (MPA) is widespread through the whole part of Southeast Asia. To conserve coral reef, mangrove, seaweed, endanger species and so on, local society and people participate in the decision making process of establishing a MPA and making a rule and regulation to be followed (Hind *et.al.* 2009). In particular, MPA for coral reef to conserve and enhance fish stock is a quite common in this region. Mangrove forestation is another significant activity to nurse aquatic animals and protect a coastal community from big waves and natural disasters.

Note: FAD=Fish aggregating devices, CBO=community-based organization
(Source) Photo by Yamao

However, these conservation activities let poor small-scale fishers face a reduction of their catch; as a result they suffer from a reduction of income. Consensus and agreement on the expansion of conservation projects may often require to prepare for any alternative ways to compensate income loss. Together with the implementation of coastal zoning with MPAs, many kinds of alternative income sources in the sea are provided for small-scale fishers, such as deployment of artificial reefs (ARs) and fish aggregating devices (FADs), and introduction of shell and seaweed culture.

Diversification of fisheries inside households and at local level

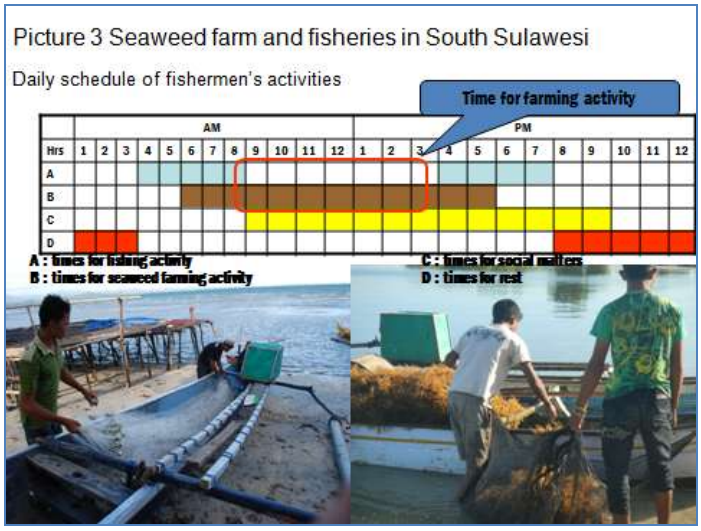
Diversification of livelihood is to be considered in different levels, different fields and different dimensions. Diversification of fisheries could be undertaken both inside household and at local level. In small-scale fisheries, employing plural types of fishing gears is to mitigate a risk from a seasonal change of target species, and adapt fishers to the operation of multi-species fisheries. It often happens, in poor coastal community, that small-scale fishers are likely to specialize on a single gear to target particular species, less likely to diversify their fishing operation. While reducing a risk from fluctuation of catch, economic and human resources of fisheries households could be effectively used.



(Source) Photo by Yamao

Due to lack of funds, small-scale fishers may hardly invest in any other fishing devices than the major gears they use. A large number of projects have introduced new kinds of fishing gear to fishers, by which some were very successful in the diversification of fishing activities on a daily and on a seasonal basis. Of course, more attention should be paid to avoid an excessive catch effort put into new target species. In many parts of the Philippines where small-scale fishers put enormous volume of catch effort into export-oriented crab fisheries, they have recently faced a deterioration of crab resource and often its collapse. Under a workable framework of resource management, diversification of fishing operation should be planned and encouraged to improve fishers' livelihood.

Picture 3 Seaweed farm and fisheries in South Sulawesi



(Source) Zamroni, A. 2011 (field survey)

Picture 4 Preparation for seaweed farming

(Source) Photo by Yamao

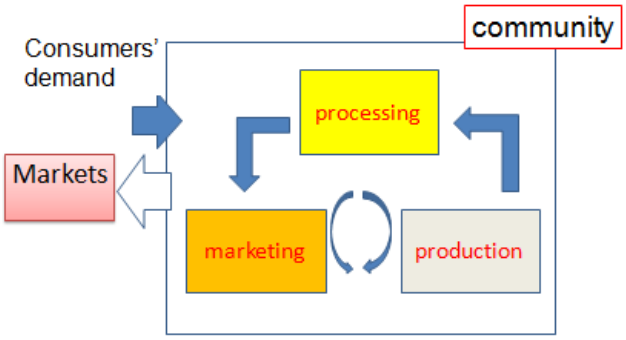
In Indonesia, seaweed culture is expanded rapidly on a nationwide scale. At local level, those fishers engaged in capture fisheries have shifted to seaweed culture with reducing catch effort in coastal zone, as a result of which seaweed farms occupy in a considerable part of coastal area. Booming seaweed culture brings more job opportunities to not only fishers but also local society as a whole, in particular, women. They work for preparation of seeds, harvesting, drying and even marketing. Such a seaweed farm generates income sources in fishing communities (Zamroni and Yamao 2011). While decreasing a heavy dependence on capture fisheries, people and society successfully increase income.

Development of fisheries-related community business

Fishing community has various kinds of available local resource, including fisheries and aquatic animals. By using these resources, fishers, their families and society process value-added products and market them inside and outside their immediate vicinity. In a small-scale production can be linked to processing, thus availing

poor fishers in looking for new marketing channels.Such a community business is an effective way to satisfy a small amount of market demand, and to secure a sustainable livelihood for the poor fishers. While adapting to market-oriented production on a nationwide scale, small-scale community business is another option to revitalize local economy.

Figure 2 Development of community business



In collaboration with processors, intermediaries and local government, fisheries sector develops community business with people's participation, which are often called as "one town, one product", "one tambon, one product", and "one village, one product" in Southeast Asia. To give an example, in the Philippines; accetess is an important species in a fishing community, which poor fishers catch during rainy season and process into paste for sale. This seasonal fishery secure an additional income source to fishers and processors. Their housewives usually involve in processing accetess and marketing its paste to nearby wet markets, and exchange with milled rice in agricultural community. With technical and financial support from a local government, community-based groups manufacture bottled and packed value-added pastes that will be sold through different marketing channels including super markets.

By relying on much support from local governments and NGOs, people are willing to explore such a new business even on a small scale. This lets local economy being diversified.

Picture 5 Push net fishery and processed products

Fisherman's wife processes shrimp paste. It is sold in wet market.

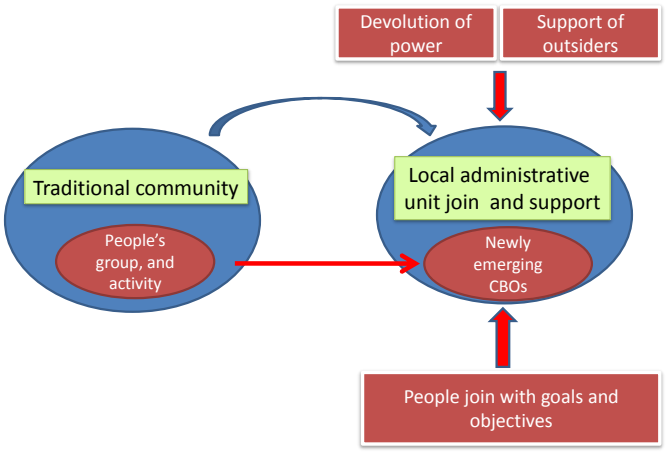
Bottled and packed pastes are sold in super market at a higher price.

(Source) Photo by Yamao

Roles of people's group and community-based organization Development of community-based microfinance for livelihood

People in fishing communities have increasingly participated in whatever types of groups and cooperative organization for improvement of livelihood activity. Both professional and community-based types have rapidly developed, providing meaningful services to members. Microfinance, including revolving funds, gives them a great impetus to generate income sources and diversify livelihood activities. Sumatra earthquake and Great Indian Ocean Tsunami in 2004 was the cornerstone of the microfinance development in fishing communities of Southeast Asia. This is chiefly because programs on the rehabilitation and reconstruction of fisheries and related livelihood had widely adopted decentralized and participatory methods, encouraging those tsunami-affected people and local society to establish microfinance groups.

Figure 3 A new type of CBOs encourage diversification of livelihood



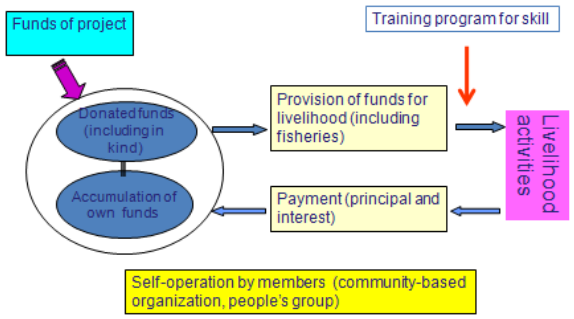
As shown in Figure 3, under decentralization scheme, local government and related agencies attain authority to allocate own budget for community business development. New types of community-based organization (CBO), which were transformed from a traditional type, develop with support from a local government and outside-donors. With capacity building programs such as skill training, book keeping and business administration, the new types are more effective for stimulating participatory and sustainable business operation rather than conventional ones. Cooperative idea is widely extended and adopted among those who joining the membership of CBOs. They are less likely to depend on donors and outside-supports than before.

In southern Thailand, Sumatra in Indonesia, and many parts affected by tsunami, on the rehabilitation and rebuilding of people's livelihood, fishers and women actively joined the membership of whatever the type of cooperative organization and CBO to restore their damaged livelihood. Many self-help activities and CBOs have already fallen into dormant, but many have still worked effectively to improve members' individual and cooperative activities.

Organization for revolving funds develop

Microfinance in fishing communities has a wide variety of organization and activity, among which revolving funds groups are dominant. Shown in Figure 4, with donated funds for implementing a certain project purpose, members contribute shares and set up a rotation of borrowing money among them (Pornprapa and Yamao, 2008). Through participating in training program, women can activate their livelihood activity and then raise the quality of life, and fishermen will be able to diversify fishing operations to reduce an excessive pressure over particular economic species.

Figure 4 Revolving funds after tsunami disaster



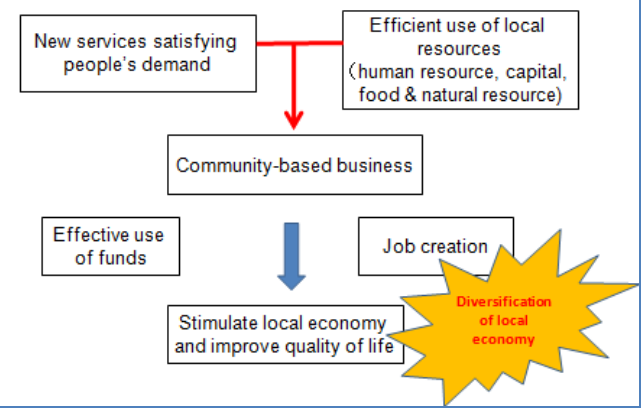
The appearance of community-based microfinance gives a great impact to livelihood strategy of households. In Southeast Asia, an enormous number of programs and projects on revolving funds have been planned and put into practice in many fields. It is noteworthy that they make a more forceful foundation of household economy and help to alter the strategy presently existing that sticks to scarce fisheries resources.

It was often pointed out that people's participation in any types of membership had a great difficulty in sustaining cooperative activities. However, nowadays, they have enthusiastically established both professional groups and community-based organizations according to their own will. Their organization and activity also extend operations, in accordance with developing a wider range of livelihood activities. Newly established groups and CBOs have much potential to evolve into a new stage of community business development, although they may still be instable in certain aspects.

Toward diversification of local economy

There appear various types of community-based business which devote to the exploitation of valuable local resource. On the one side efficient use of local resource is an important task for fishing community, on the other side new services should be commercially viable satisfying people's demand. These two requirements would develop such a community-based business, which will enable people to invest funds in a small-scale business effectively, and to contribute significantly to job creation.

Figure 5 Development of community business



Revitalizing local economy in poor fishing community is not an easy task, but the diversification of livelihood inside and outside fisheries may have a dramatic effect on the livelihood strategy of fishing households. It may have an adverse effect on coastal environment and fisheries resource. Social and economic development of fishing community is now going ahead.

Conclusions

Improvement of livelihood in fishing community is a common mission to be achieved for poverty alleviation and sustainable use of coastal fisheries resources. To avoid sinking into the vicious circles of poverty and resource depletion, people bring a balanced development in society. For further discussion on livelihood development in small-scale fisheries, author should propose the points at issue as follows.

Adaptation to food chain (supply and value chain)

Small-scale fishers can hardly adapt themselves to a dynamic change of food chain as a producer, and they are still vulnerable in marketing channels vis-à-vis traders and processors. With appropriate handling in post-harvest, they would afford to market in favorable terms. By reducing a heavy dependence on fish traders in their vicinity, small-scale fishers may attain more profit and accumulate funds invested in livelihood activities. They are to develop institutional and networking arrangement of marketing, processing and financing. To facilitate them to produce more marketable commodity, infrastructure and institutional development are a substantial element, but this does not mean that there should be any market intervention.

Structural change of production and marketing

Rapid economic growth of Southeast Asia is a decisive factor to cause a structural change of production and marketing in fisheries sector. Even in poor small-scale fisheries, fishers and their families alter occupation and generate alternative income sources. Due to economic crisis and deterioration of coastal resource and environment, small-scale and medium-scale fisheries are forced to downsize fishing operation and to stick to near seashore. Meanwhile, lack of crews and small processors in some developed regions of Southeast Asia accelerates dependence on migrant workers including foreign workers. In the near future, small-scale fisheries sector will develop, alongside international division of labor in the region.

Not unnaturally, all small-scale fishers will not be able to adjust to structural change of production and market. Many are left behind by the advance of highly commercialized fisheries. We should predict that a large part of small-scale fisheries sectors and fishing communities would suffer from deteriorating unfavorable conditions of production, being more vulnerable in expanding free trade of fisheries products.

Therefore, diversification of livelihood in coastal society would keep local economy and small-scale fishers stable.

Formulate an integrated policy for livelihood improvement

An integrated policy for livelihood improvement is a requisite for the development of small-scale fisheries, which consists of sustainable coastal resource and diversification of livelihood. Based on the recent experiences learned through many kinds of community-based business such as "OTOP", fishers, processors, traders, and local governments establish appropriate networks of production and marketing for value added products. To avoid collapse of common-pool resource, a sustainable use of coastal resource should be achieved along with alleviation poverty. This is a basis of livelihood improvement in fishing community.

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Annex 42

SOCIAL AND ECONOMIC ASPECTS OF THE MEKONG FISHERIES

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Department of Fisheries, Thailand

Boundary and profile of the Mekong Basin

From its origin in the Tibetan Plateau, with a total length of about 4,800 km, the Mekong is the world's 12th longest river. The river also ranks 8th in the world in terms of mean annual flow. The catchment of the Mekong covers an area of approximately 795,000 km^2. The Greater Mekong can be divided into two parts: the Upper Basin in China, and the Lower Mekong Basin from Yunnan of China to the South China Sea. The Mekong flows for almost 2,200 km from its source and decreases in altitude by nearly 4,500 m before it enters the Lower Basin where the borders of Thailand, Lao PDR, China and Myanmar come together in the Golden Triangle. Downstream from the Golden Triangle, the river flows for a further 2,600 km through Lao PDR, Thailand and Cambodia before entering the South China Sea via a complex delta system in Viet Nam.

Population in the Lower Mekong Basin (LMB)

About 60 million people live in the LMB, approximately 80 percent of the basin's population live in rural areas. The percentage of territory and population within the basin varies considerably from one country to another. Cambodia and Lao PDR lie largely within the basin, but together constitute only 27% of the basin's population. The basin territory in Thailand is only 37% of the country but comprises 42% of the basin's population. In Viet Nam, the Mekong Delta and Central Highlands comprise only 20% of the country, but contribute 31% of the basin's population.

Livelihood systems are dictated by climate and available natural resources. A general shared dependence on the seasonality of the Mekong River's highs and lows is also important because it creates a common vulnerability to flooding and drought. Agriculture is the single most important economic activity in the LMB. An estimated 70% of the people are subsistence farmers typically grow enough rice for household consumption, sometimes with a small surplus to sell. They supplement the rice they grow with the wild fish they catch and plants and animals foraged from nearby forests and wetlands for use as food and medicines (AFR 2005).

Socially, the Mekong fisheries range from individuals fishing part time for subsistence, to large-scale industrial operations with fishing labourers employed full time. Participation in capture fisheries is high throughout the Basin, especially at the small-scale and household level. Men, women and children of all ages are involved with roles influenced by gender, age and the type of fishing operation.

Mekong fisheries features and contributions

Economic contribution

The Mekong fisheries are a major factor in the well being and livelihoods of the 60 million people who live in the Lower Mekong Basin (LMB). The total catch of fish and other aquatic animals exceeds three million tonnes. Nearly 80% of the catch comes from capture fisheries, with reservoir fisheries and aquaculture contributing around 10% each. The total value of the fisheries is in the order of US$2,000 million and they make significant contributions to the economics of all four riparian countries. The fishery sector accounts for nearly 12% Cambodia's GDP and contributes more to the country's economy than does rice production. The value of catch in Lao PDR is equivalent to 7% of the country's GDP. Although they are proportionally less important, the fisheries sectors in Thailand and Viet Nam still contribute well over US$750 million to the economics of both countries.

Sources of food and income

The Mekong's fisheries also provide other, less tangible, benefits beyond their pure economic value. Local fisheries are at the hub of the way of life and culture of many rural communities.

Two thirds of the basin's population or an estimated 40 million rural people are involved in the fishery at least part-time or seasonally. Fishing and foraging are the primary sources of food security for many impoverished households and selling fish in excess of family needs is the only way that some can earn hard income.

In Lao, PDR more than 70% of rural households depend on fishing to varying degrees for subsistence livelihoods and additional cash income. In Cambodia, 40% of the total population is dependent the Tonle Sap Great Lake and its flood plains for their livelihoods. Over 1.2 million people residing in fishing communes around Tonle Sap Great Lake are reliant almost entirely on fishing as their main livelihoods. In the low land areas of the LMB, protein from aquatic animals comprises 40-80% of animal intake. In Cambodia, fish and aquatic animals provide more than 75% of animal intake in rural areas.

Annual consumption of fish and other aquatic animals is over 30 kg per person per year (Map 4). Fish consumption per person has remained stable during the last decade, indicating that the natural resource base has been strong enough to sustain the needs of the growing population. However, it is expected that demand for fish products will increase with population growth.

Women in fisheries

Women contribute significantly to almost all stages of fisheries activities in the LMB. They are actively involved in capture and culture fisheries, processing, marketing, fisheries education, research and development. Men and women are generally involved in different tasks within the fishing industry. For example, men build boats and catch fish whereas women make and mend nets, process the fish and sell the catch.

In some sectors, such as processing and marketing, women carry out almost all activities. In other areas, their contribution is just as significant as that of men. These divisions of labour are neither fixed nor absolute and several studies report that women also do many "male" duties as well as their own "female" tasks.

In all cases, women have an additional responsibility of raising a family. Yet, there are factors that still impede women's full access to benefits from natural resources. These include increasing demands on women's time and labour, unequal information and knowledge and the existence of fish marketing arrangements that deny them a significant part of the proceeds from fisheries. Nevertheless, women are increasingly participating in management decision-making.

Challenges of the Mekong fisheries

In the Mekong River Basin, social issues such as poverty, education, and economic growth all affect the ways in which people exploit the resources of the river. The conditions of these resources in turn have implications for how successful people are in raising their standard of living and bringing about related social improvements**.**

The followings are some crucial issues influencing sustainability of the LMB fisheries;

Overexploitation

Throughout the basin, more people are fishing every year, because of growing population, lack of alternative employment, and familiarity with fishing as a traditional enterprise for obtaining food and income. Nowadays, the Mekong fisheries are still bountiful and resilient, but the warning signs are clear. Although the size of the overall catch appears stable, the catch of some large, late-maturing species is declining and the average size of several other commercial species is getting smaller. These are symptoms of approaching "overexploitation". Reducing or not allowing an increase in fishing pressure is extremely complex, and extends far beyond fisheries to include governance and sociological issues. Co-management of fisheries, involving partnerships between communities and government, is now the preferred approach for fisheries management in the Mekong.

In many places, communities have established management practices, including limitations on fishing gear types, seasonal limitations and conservation zones in order to ensure that fish are harvested sustainably.

Loss of habitat

Loss of habitat takes many forms as result of development. Any action that removes waterways and wetlands formerly available to fish causes loss of habitat. It may be the removal of flooded forest from wetlands; the 'reclamation' of wetland for agriculture or farming; the removal of in-stream habitat for improvement of navigation; it may be a road embankment, which acts as a barrier preventing the dispersion of floodwaters. Moreover, habitat loss can be indirect; for example, rivers and lakes may silt up because the amount of fine sediment feeding into them has increased as a result of forest clearance.

Introduction of alien species

Among factors causing loss of biodiversity, alien species are considered second only to habitat loss. Indiscriminate introduction of alien species into the basin represents a serious threat to the fisheries, and can cause great economic and environmental damage. Invasive alien species (IAS) can cause habitat alteration, increased competition and predation, and further losses can be the co-introduction of disease.

In the past extension of aquaculture techniques in the Lower Mekong Basin promoted alien species, was a result of a lack of knowledge on the biology and culture of indigenous species. The introduction of established alien species was expedient, because seed production and culture systems could be extended rapidly and successfully without lengthy research and domestication processes.

Barriers to migration

About 70% of fish production in the LMB is from migratory species. The reproductive cycle of many indigenous Mekong fish involves seasonal migrations over long distances. These usually occur between floodplains and upstream spawning sites or dry-season refugees. Any barriers, such as dams or weirs that prevent migratory fish accessing these crucial habitats will affect fisheries production adversely.

The Lower Mekong Basin has more than 25,000 constructed small reservoirs, most with less than one km^2 of surface area and used mainly for irrigation or flood control. The larger reservoirs were built for hydropower generation. There are no dams on the mainstream in the Lower Basin currently.

The most obvious impacts on fish migration are caused by large dams. But even barriers on small tributary streams, such as weirs for irrigation or flood control, or road culverts, can isolate floodplain habitat and block migration of fish.

Mitigation of the effects of barriers on rivers has often been by stocking of hatchery bred fish, but maintenance of breeding populations of wild fish is far preferable for many reasons. Under natural conditions, recruitment of wild fish far exceeds any possible hatchery production, and the resulting fish will be healthier, more genetically diverse, and better adapted to the wild environment.

Changing hydrological regime

The Mekong is a highly seasonal river with extensive floodplain areas, approximately 70,000 km^2 (about 11 percent of the total area). The livelihoods of rural communities living on the extensive floodplains of the Mekong and its tributaries depend on fish and other aquatic animals caught on seasonally flooded wetlands.

The dependency of these communities on the wetland habitats, with the rich biodiversity it supports, means that any change in the hydrological regime that dampens the Mekong's seasonal flux also endangers their whole way of life. Development projects, such as hydropower plants, flood mitigation schemes and the reclamation of wetlands for agricultural purposes, although beneficial in many other aspects, seriously threaten fisheries and livelihoods of those depending on it.

How to integrate fisheries with development?

The fisheries are an open resource across much of the basin. Many rural poor communities depend on free access to this resource for their livelihoods. Any activity, in the fisheries or beyond, that cuts off or limits this access presents a major challenge to their well-being.

Because of this, conservation of fish stocks and fisheries are central to the poverty alleviation programmes of all riparian governments. They are also important factors in their plans for economic growth and national development.

The poverty reduction programmes proposed by the government of the countries in the LMB necessarily involve developing and exploiting the river's other natural resources. Incorporating this into an integrated water resource planning strategy will ensure that maximum benefit is derived from the river and its resources, and that generations that follow will still have access to highly productive fisheries in the Mekong.

In addition to the existing challenges mentioned above, new challenging climate change is emerging. The event of climate change is expected to result in modifications to weather patterns in the LMB in terms of temperature, rainfall and wind, not only in terms of intensity but also in terms of duration and frequency of extreme events. Seasonal water shortages, droughts and floods may become more common and more severe, as may saltwater intrusion into the Mekong delta (Hoanh *et al*., 2003; Snidvongs *et al*., 2003; Chinavanno, 2004b). Such changes are expected to affect natural ecosystems and agriculture and food production, and exacerbate the problems of supplying increased food demand to growing populations (Hoanh *et al*., 2003; Snidvongs & Teng, 2006). The consequences of such changes are likely to be particularly severe given the strong reliance of the LMB communities on natural resources for their livelihoods.

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Annex 43

LIVELIHOOD APPROACH TO FISHING GROUND USE IN THE LOWER MEKONG RIVER BASIN: A CASE STUDY IN A LAO VILLAGE IN THE KORAT PLATEAU

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Regional Context

The Mekong River Basin has the most diverse water system and bio-resources among the river basins in SE Asia. The Lower part of the basin accommodates about 60 million people, and a significant part of the population depends primarily on subsistence activities such as rice production and natural resource use, including fisheries. In the last few decades, water level change and market growth have been paid attention as major aspects to cause change in rural life.

LMB is comprised of mountains, plain, and delta, and the Korat Plain, the largest plain in the region, is a focus of this paper. Landscape of the plain consists of rain-fed paddy, forest, and seasonal floodplain. Population is scarce and local marketplaces are few compared to delta. Dry climate often constraints rice production, while irrigation often fails due to salt contamination. Under this environment, people developed various techniques for utilization of natural resources, which was basis for diversified livelihood for subsistence. Recently, labor market growth in Thailand is followed by growth in smaller cities, which is likely provides non-farm livelihood options. Also, commodity market growth is commonly seen in the cities, giving opportunities of cash income by farmed or wild natural resources. How these changes give impacts on subsistence? How the market growth impact on livelihood options to subsistence based communities? How the impact by market growth changes fisheries of rural communities?

Objective and Method

This paper provides a result of survey on livelihoods in the Vientiane Plain, a northern-most part of Korat plain which belongs to Lao PDR. Especially, impact of labor market growth on the livelihood option and fishing ground use of the community will be discussed. Baseline framework for description refers to livelihood approach by Ellis (2000). For describing livelihood choice process, household demography is especially paid attention as human capital (de Sherbinin *et al* 2008). Investigation of fishing gear choice by gender, and fishing ground identification by GIS were also employed. The village A for the case study is located at 20km from downtown Vientiane, and 4km north from the Mekong River. We conducted a household survey with all households in August 2005 and March 2010 (Nonaka *et al* 2008). Most of the analysis here will be based on 2010 survey. Also, semi-structured interview to 35 households and participatory observation of fishing ground use using GPS were conducted.

Result

Subsistence activities and farming

Among 265 households, 249 (94.0%) households owned farmland and 238 (89.8%) cultivated rain season rice in 2009. Fisheries is most common activity for subsistence, 96.6% of households were engaged. Only four household were engaged in aquaculture, while mushroom culture (12.5%) and vegetable garden (12.5%) were more commonly practiced.

Access to cash income source

Growing commodity market and labor market both promote access to cash income in various extents by type of household. Among on-farm activities, cattle and buffalo raising brought largest cash income per household and 68.8% of household operated for cash income purpose. Among off-farm options, selling fisheries products, including frog was most common. Average annual income per household was 1.1million, which was second highest after charcoal production. Wage work has become common in the village, and the income is about 5-10 times higher than fisheries. Income from remittance and shop operation were high, but it was limited in number. When we look at choice of cash income source by age of household head, it was found that younger households were more likely to choose fisheries and charcoal production. Cattle raising and wage work comprised larger part in cash income in age of 30-50.

Labor market and gender

One of the important backgrounds to difference in cash income choice was thought to be gendered engagement in wage labor. Age and sex composition of wage workers in village A showed that single young male have more access to wage works in Vientiane and Thailand. Among 27 workers in Thailand, 13 of them were single male in age of 10's to 30's, and 9 of them were working in fishing vessels in Thailand. Among 35 wage workers of married male of 10's to 20's, only 1 person worked in Thailand, while 68.5% of them chose work in the village, such as house building or wood sawing. This trend with marriage status was also observed for female workers, although married female of 20's seemed to have more access to wage works in Vientiane, such as textile factories. From interview, it was suggested that young households with small children prefer to stay in village, and try to find cash income source which is compatible with subsistence activities. It is likely especially when their farmland is far from settlement, where they have less support in childcare.

Fishing gear and fishing ground

Fishing gear choice seemed to reflect its importance in cash income and financial capital of household. Elder households often had financial capital to purchase locations for set net or enough knowledge to use set traps. There fishing grounds were tributaries of the Mekong River. Young households use more hook and line targeting frog or snakehead. They use floodplain and rice paddy for fishing, marsh in forests for forging.

Discussion and policy implication

I would like to discuss how social, economic, and environmental trend may affect livelihood options in the areas represented by village A. Demographic transition is seen widely in the LMB region, and less children in a household means less consumption pressure, while fewer siblings who are supposed to contribute to childcare. Although labor market is rapidly growing and becoming powerful option in the region, working in the city or other countries are unlikely to be chosen by younger household. Under this circumstance, on-farm or off-farm activities located in the village needs to be secured. Cash income by fishing requires low investment, however, more fishing population with set net and gill net are potential threat to fish stock. Whereas feasibility of aquaculture is unknown, off-farm activities such as mushroom farming seem to be favored. The result suggests that monitoring of river basin and its impact on floodplain is important even in the area with relatively good access to urban labor market. With consideration of compatibility with subsistence activities and conservation of natural capital, on-farm and off-farm activities with low investment should be enhanced.

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Annex 44

SOCIAL RIGHTS AND SOCIAL SECURITY IN TRADITIONAL SMALL-SCALE FISHERIES

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Introduction

Traditional small-scale fishers are recognized their important role, function and participation in sustainable coastal fisheries resources management towards community-based fisheries management and co-management approaches. Whereas FAO had completed Code of Conduct for Responsible Fisheries in 1995, Southeast Asian Fisheries Development Center had adopted the code to formulate the Regional Guidelines for Responsible Fisheries in Southeast Asian Region in 2003. As a result, rights-based fisheries approach is an article of the guideline to usefully secure the rights to access fisheries resources; consequently, it can secure job opportunity and employment to fishers. This leads to improve means of livelihood and poverty alleviation to small-scale fishers. Thus, social rights and social security in traditional small-scale fisheries is implicitly and fundamentally access if practices of fisheries management approaches as mentioned above accomplish.

Definition

- Social rights are those rights arising from the social contract, in contrast to natural rights which arise from the natural law, but before the establishment of legal rights by positive law. From a legal standpoint several approaches exercise and guarantee social rights; social rights under the constitution are rights of subjects or "subject rights". This assures that the public receives equal distribution of collective and private interests.
- Social security is primarily a social insurance program providing social protection or protection against socially recognized conditions, including poverty, old age, disability, unemployment and others. More rarely, the term is also used to refer to basic security, a term roughly equivalent to access to basic necessities-things such as food, clothing, shelter, education, money, and medical care.

Major social constraints

ASEAN Secretariat stated that *"poverty is a traditional threat to human security", in addition, "poverty leads to human insecurity by limiting people's chance of obtaining higher education, better job and increased income, major hindrance for an individual to have access to basic and proper health care".* Additionally, Tamang cited that *a person who does not have enough to eat is going to have only a little interest in voting for this or that political party. Moreover, it is likely that this individual cannot read or write to understand and participate in what the political party is doing*. Moreover, there are figures to tangibly explain how many ASEAN people have faced vulnerability and hardship of these major social constraints such as poverty, poor education and health care. Firstly, an international poverty line is defined $1 a day, ASEAN poverty rate was a ranged of 0.2 percent low to 77.7 percent high. According to this international definition, Cambodia, Lao PDR, Myanmar and Vietnam had average poverty rate was four times higher than other ASEAN member countries [6, *Ibid*]. Secondly, education was indicated by literacy rate with a range of 68.7 to 95.1 percent. Thirdly, provision of health care service is such as accessing safe drinking water, preventing outbreak of pandemic. This provision could signify by health expenditure. Additionally, governments of ASEAN member countries clarified that the ratio of health expenditure was a range of 1.3 to 7.8 percent of total government expenditures.

In Southeast Asian region, it is not surprisingly that poverty is relatively serious issue in fisheries sectors. There are documents stated that fisheries communities are exposed to multiple dimensions of poverty and remain impoverished. As a result, small-scale fisheries related agenda including poverty alleviation, creating job opportunities and achieving economic growth are chiefly recommended to be mainstreamed into the national policies. In addition, poverty in fisheries communities can be alleviated through sustainable utilization and management of resources.

To achieve poverty alleviation in fisheries sector, Charles cited that rights-based fisheries should mean to both the rights to access fish coupled with management and social, economic and human rights. Furthermore, traditional small-scale fishers themselves can manage and control utilization of local resource base with their customary knowledge and practice. According to this practice, they can access social rights and social security to primarily shelter livelihood, food security and community well-being.

Global and ASEAN aims

The UN Human Rights Council completed "Draft Guiding Principle on Extreme Poverty and Human Rights"[1] [8]. The draft was also integral to the way forward of Copenhagen three pillars: social inclusion, decent work and full employment, along with the eradication of poverty. Similarly, ASEAN Socio-Cultural Community (ASCC) is one of ASEAN Community. The ASCC would highlight the development and enhancement human resources. Besides, this sector is key strategy for contributing employment generation, poverty alleviation and socio-economic disparities and ensuring the equity of economic growth. In addition, FAO-Committee on Fisheries (COFI) notified that there is need to promote and provide adequate support to the small-scale fisheries and to ensure the access of the sector and fish workers to the resources necessary for sustainable livelihood in order to contribute small-scale fisheries to poverty alleviation and food security.

In the Southeast Asian region, small-scale fisheries sector is strongly needed to promote for both achieving sustainable development and management in order to secure food security, sustainable livelihood, poverty alleviation, and the increase of job opportunities. All beneficiary ASEAN countries agreed that the promotion should be considered for improving social, economic and human rights aspects:

- Livelihood and poverty
- High operating cost
- Market improvement
- Safety in fishing operations
- Vulnerability from natural hazards
- Gender Sensitivity
- Social welfare and health
- Human resource development

These indentified aspects help dealing with specific issue to enable defining proper and right solution and action along with the reduction of poverty. Additional social point of view is social security, which should be considered and set provision, to small-scale fishers for accessing a decent living and welfare. Likewise, FAO suggested that fishing (and fish-trading) as a safety-net activity for preventing poverty to the poor. Therefore, the organization significantly guided that social security program, which is either minimal or non-existent, should be put in place in order to play function as a welfare system. According to social security program, the program composes of:

- Medical care
- Sickness benefit
- Unemployment benefits
- Old-age benefit
- Employment injury benefit
- Family benefit
- Maternity benefit
- Invalidity benefit
- Survivors' benefit

Thus, both social rights and social security are prerequisite to sustain accessing basic needs to safeguard livelihood, preventing poverty and increase wealth and adequate living coupled with sustainable fisheries development and management.

Securing rights to traditional small-scale fisheries

To secure the rights to either traditional fishers or small-scale fishers for attaining sustainable resource use, there are recommendations proposed for considering to practice as following:

- Secure the inalienable rights, including customary rights, of coastal and inland fishing communities to their land and resources.
- Ensure collective, community-based access and management regimes-Preferential access rights via rights-based approaches.
- Ensure safe and decent working conditions

[1] A/HRC/2/2 Report of the sub-commission on the promotion and protection of human rights on its 58th session, p. 29. UN Geneva, September 2009 United Nations and A/HRC/ 15/41 report of the independent expert on the question of human rights and extreme poverty, Magdalena Sepulveda Carmon, on the draft guiding principles on extreme poverty and human rights, August 2010, United Nation at www.rscjinternational.org/.../3136-eradication-of-poverty-a-civil-society- perspective-2011.html

- Strengthen and protect women's rights to participate fully in all aspects of small scale fisheries and access of women of fisheries communities to lands; to fish resources for processing, trading and food.

Additionally, the FAO Code of Conduct for Responsible Fisheries is particular Article 6 strongly enabling promote securing the rights to traditional small-scale fisheries as follow:

- State and users of living aquatic resources should conserve aquatic ecosystems. The rights to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources.
- Fisheries management should promote the maintenance of the quality, diversity and availability of fisheries resources in sufficient quantities for present and future generation in the context of food security, poverty alleviation and sustainable development.
- Recognizing the important contributions of artisanal and small-scale fisheries to employment, income and food security, State should appropriately protect the rights of fishers and fish workers, particularly those engaged in subsistence, small-scale and artisanal fisheries, to a secure and just livelihood, as well as preferential access, where appropriate, to traditional fishing grounds and resources in the waters under their national jurisdiction.

Moreover, additional recommendations are proposed for securing the rights to fisheries management, the suggestions are as follows:

- To replace "open access" to fishery resources with "limited access regimes" through the co-management between governments and resource users' organization.
- To maximize the use of existing information including "local knowledge" to enhance better communication and improve management of fisheries.

Conclusion

Poverty alleviation is global and regional common mission to achieve; accordingly, vulnerable and poor people can access to basic needs, education and health care. To accomplish poverty alleviation in small-scale fisheries sector, the Code of Conduct for Responsible Fisheries (CCRF) and regional guideline for responsible fisheries in Southeast Asia are acceptable instruments to enable sustaining fisheries resource management and development with genuine practice of rights-based fisheries, community-based management and co-management approaches. Nevertheless, the CCRF should comprise human rights principles in order to fulfill social dimension in accordance with propose of COFI, Rome, Italy, 2011. Good practice and lesson learned concerned applying any approaches of responsible fisheries management should be seriously promoted on economic points of view: benefit, cost and increase of job opportunities to secure means of livelihood and poverty reduction. As a result, vulnerable and poor small-scale fishers themselves can initially access to social rights and social security program if they have the rights to access fishes and management to safeguard their source of employment.

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Annex 45

LIVELIHOOD AMONG FISHING COMMUNITIES AND PROSPECTS OF EMPLOYMENT IN FISHERIES-RELATED ACTIVITIES: OPTIONS FOR IMPROVEMENT AND MONITORING OF CHANGE

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Background

What could be the issues related to social rights and social security for the traditional small-scale fisheries? Before starting any discussion, would it be possible for us to identify the specific relevant social problems and the means that could address the issues on social rights and social security particularly for the traditional small-scale fisheries? If this is not possible, then discussion on these issues may only be futile to find the useful outputs from this Conference which could be used as bases for the appropriate recommendations and policy options, because eventually the issues would only be very generic. Nevertheless, it might be crucial to enhance the awareness of the public on the issues by simply discussing the social rights and social security status in fisheries during this Conference. Therefore, I would rather discuss the possible ways and means of mobilizing the systematic government support on the issues including the modes of supporting fisheries and the relevant stakeholders.

Issues

It should be noted that before and after the WWII, most fisheries-related agencies in the Southeast Asian region had established their structures based on external guidance from developed nations. In fact, the structures were formed in such a way that the fisheries-related agencies had evolved as technical and scientific institutions with the major function of mainly supporting the fisheries industries without any function on fisheries management. This was the very prominent scenario until the 1990s. Nevertheless, such situation is not specific to Southeast Asia only because it is a universal nature of the fisheries-related government agencies. With such recognition, it might be difficult to discuss the kind of social rights and social security issues because by the nature of their organization, these technical institutions had never accommodated the technical and scientific issues in their streamlining exercises.

When the global fisheries society including those from the Southeast Asian region gathered together at the FAO Headquarters and developed Code of Conduct for Responsible Fisheries (CCRF) in 1992~1995, they tried to identify the issues concerning the promotion of sustainable fisheries. In the series of discussions for the formulation of the CCRF, sufficient focus was given to "fisheries management" and its related activities such as "fishing operations" based on their concerns and those of the world on the unsustainable practices in fisheries. Although sustainable fisheries issues, particularly fisheries management, were presented for the first time in 1980s and increasingly expanded later in global agenda, still these issues remained very new. Despite such trend of the global focus, the agenda sufficiently provided a base for accommodating fisheries management issues into the policy framework in many countries. Nonetheless, there has been no clear indication so far on any progress achieved in sustainable fisheries through fisheries management interventions due to insufficient clarification on the globally accepted scenarios and the methodologies after which such progress could be derived from.

More specifically, the global focus has been directed to "resource management" issues which suggested that sustainable fisheries could be achieved through the management of fisheries resources as widely promoted through the global scenario and various instruments. Such global direction towards sustainable fisheries have succeeded to highlight the importance of scientific-based resource management, but the technical and scientific institutions failed to pay proper attention on the other social and economic factors related to fisheries management.

It could be gleaned that one of the constraints for the Southeast Asian region to aggressively promote management is the lack of recognition on the values of non-scientific factors in fisheries management such as the social and economic factors. However, if the target of management taken into consideration is offshore fisheries that involve small number of people, then the scientific scenario of "resource management" could be applicable. The question, however, would still remain as to how sustainable fisheries that target the multi-species and involve a large number of people in the order of hundreds of thousands to few millions should be dealt with. In general, fisheries-related agencies in the region had not formulated the appropriate policies on

fisheries management nor developed clear indications to support these fisheries that comprise large number of fishing units. Lack of proper perspective together with inadequate implementation plan only led to negative effects that diminished the scale of various support activities, particularly those planned for the small-scale capture fisheries sections of the fisheries-related agencies. As a result, the government agencies appear very remote and become unreachable by people scattered along the coasts, which is an unfortunate consequence of such constraints.

Although the specific regional fisheries policies indicating the need to "encourage effective management of fisheries through delegation of selected management functions to the local level" and "progressively introduce right-based fisheries including community fishing rights" which were adopted at the Millennium Conference in 2001 could be considered as possible options to manage a large number of fishing units, provisions for such management as well as the fishing rights for small-scale fisheries have not been effectively promoted so far in the Southeast Asian region. Considering that scientific related rights in the case of fisheries have not been promoted or even partly promoted, it would be more difficult to accommodate other social rights and security issues which had always been taken as more remote issues for the daily work of the technical and scientific institutions, especially the effective implementation of the required associated activities.

Furthermore, there are also other problems that could impede the efforts to address the aforementioned issues. When the word "poverty alleviation" is searched in the CCRF through any search engine as well as in the regional guidelines of CCRF, even one such word could not be found in the entire texts of such instruments. However, this does not mean that the fisheries-related agencies are not interested in "poverty alleviation" issues, only they are not generally mandated to address this particular issue in their daily work based on their mandate in the government structure. Such issue is highly perceived as the responsibility that could be delegated to other line agencies that concern with social welfare or development but not particularly for the fisheries-related agencies. In such a case, any social and economic support services intended for the small-scale fisheries could only be promoted through project basis but not appropriately accommodated as main activities of the fisheries-related agencies through their streamlining exercises.

Conclusion

Based on above understanding of the issues therefore, appropriate ways of accommodating the social and economic support services in the daily work of the fisheries-related agencies should be considered. As most of fisheries-related agencies in the region has already accommodated policy frameworks on the delegation of management functions to local resource users together with different levels of the co-management schemes based on the regional fisheries policy, such policy frameworks should first of all be vigorously pushed forward to appropriate action level within such agencies.

Firstly, delegation of day to day management functions to local user groups in co-management arrangement should be promoted although this would create new situation and mandates for the technical and scientific agencies. Considering the large population of fishers in the countries of the region, support services which are mandated to empower the fishers to manage their fisheries should be expanded but this effort could be achieved only when a wide range of technical support is provided by the relevant government agencies. In addition, promotion of co-management focusing on the provision of fishing rights to the great number of fisher groups would require nation-wide network and support services involving many people at central, provincial and local levels. Such nation-wide network support services, including institutional building exercises would require various kinds of social support by the concerned agencies.

Secondly, considering that over-capacity has been a serious management problem in the region, creating job opportunities and enhancing the livelihoods of the people could be considered as major activities to appropriately promote an "exit plan from coastal fisheries" in the fisheries communities and eventually promote fisheries management scheme. If the One Fisheries Product, One Village (FOVOP) is promoted as project base using external financial supports, the aforementioned required activities could be addressed but this would largely depend on the available financial resources. Therefore, it is necessary to establish a system with clear objective for an "exit plan from coastal fisheries" to be part of fisheries management program and maintain the activities irrespective of the situation with respect to the available external financial resources.

Finally, implementation of policies with clear perspectives of the specific regional and national fisheries situation would provide a great chance for the technical and scientific government institutions to regain their stature towards the required work along line with the promotion of sustainable fisheries. This way, a closer link should be established with the huge number of fishers who are currently becoming helpless from accessing most of the public services. Considering the many ad-hoc support that had been provided by

government agencies in the past, it would now be necessary for such agencies to elaborate the close links of the proposed activities with priority programs such as “support on fisheries management” to keep going the momentum of the implementation of the activities. Thus, support services which could include improving the social security of fishers which used to be considered as remote subjects from the daily services of the technical and scientific institutions, should be added as part of their priority services by thoroughly clarifying and subsequently streamlining their organizational structures.

Annex 46

ORIGINS OF RIGHTS AND SOCIAL SECURITY FOR FISHERS IN RELATION TO SUSTAINABLE DEVELOPMENT OF FISHERIES: INCLUDING MIGRATORY FISHERS AND LARGER VESSELS

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Introduction

This presentation overviews the requirements in rights and social security for fishers in Southeast Asian countries and their logical origins on the basis of some simplified models. The baseline is to achieve both rational utilization of fishery resources and contribution to food security through sustainability of fishing sector, therefore, this proposal is based on an idea to seek a balance between proper distribution of fishing effort (fishers) towards avoidance of excessive fishing effort and guarantee for fair access to resource use among people. It is also anticipated to provide an approach integrating biological resource management, technical management in capture fisheries and policy formulation and planning.

Background

Although sustainability of the fishing sector including fishery resource users is the key issue in fishery development and management, the rights and social status of fishers have been scarcely discussed historically.

UNCLOS: The United Nations Convention of the Law of the Sea (UNCLOS) does not include the matters of rights to access fishery resources for its users including fishers and people engaged in the fishery sector or their social status.

Code of Conduct: One of the general principles of the Code of Conduct for Responsible Fisheries is that all fishery-related activities should be conducted under safe, healthy and fair working and living conditions. Pursuant to the principle, the Code provides for that adoption of health and safety standards for employees in fishing operations is the duty of all states, including education and training programmes for enhancement of skills of fishers. Flag states should ensure compliance with appropriate safety requirements for fishing vessels and fishers. These provisions are based on a recognition that fishers over the world work under unsafe and unhealthy conditions. This is particularly truism in Asia including SEA countries. The Code does not prescribe on the rights and social security for fishers.

AECB: ASEAN Economic Community Blueprint (AECB) adopts 'free flow of skilled labour' as one of the policies. It prescribes about cooperation in facilitation of mobility of professionals and skilled labour. In parallel, it also describes the need in ensuring safety of food products from fisheries and promoting cooperation in the region, *e.g.* strengthening efforts to combat illegal fishing. It is noted that AECB does not recognize free flow of labour such as deckhand workers.

ASSCB: It is a basic recognition in the ASEAN Socio-Cultural Community Blueprint (ASCCB) that socio-economic disparities and poverty persist across the ASEAN region. A decent work principle is an important concept. Since fishers in many ASEAN countries are historically disadvantaged people living in inferior areas, there are many provisions applicable in fisheries. It prescribes social welfare and protection to be provided to enhance well-being and livelihood of the people toward poverty alleviation as: (1) provision to all people with safe environment, quality of life and social welfare by improving the quality, coverage and sustainability of social protection; (2) rights and welfare of disadvantaged and marginalised groups of people and (3) provision of adequate promotion of the rights for migrant workers. Although there are a very few provisions which specifically prescribe on fisheries, application of those principles to the fishery sector should be duly considered.

Theme 7 of the Conference: The Session recognises that the fishery sector is vital to provide sources of food protein to people and of generating income and employment to sustain livelihoods of resource users in accordance with AECB and ASCCB. In addition to the social, economic and human rights to access food, employment, education and health, the rights in fisheries include both the rights to access fishery resources and management.

Practical framework in fisheries should be formulated in order to ensure sustenance and diversification of livelihood for stakeholders, through which they can access fishery resources and increase their family income. First in this practice, they should both have decent work and safety and receive reasonable wage. Capacity building improves the capability of stakeholders to sustain both their livelihood and natural resources. It is emphasised in order to utilise the resources for generating additional/alternative incomes and, consequently, to contribute to poverty alleviation.

Migratory fishers and workers in the fishery sector should have rights to access social security equally with local people. Their representative, fishing boat owners and a government need to define activities to improve their accessibility to social security.

Issues

Origin of fishers' rights - Effects of fishing regulations: Satisfaction of both sound management of resources and sustainability of livelihood of the people is the goal of fisheries development. We consider the effect of fishing regulations which are unavoidable to soften resource decline and to promote its recovery (Fig.1a). There is a time lag between imposing regulations and starting of resource recovery (Samoilys *et al.* 2007 and Heikinheimo *et al.* 2006). The speed of recovery is ruled by the intensity of regulations (Boersma *et al*., 1999).

The catch C_t under a stock S_t at a certain time t is determined with a resource use ratio k_t which reflects both quality and quantity of fishing effort, where C_t is a multiplication of S_t and k_t (for simple illustration, the stock and catch before imposing a regulation are shown at the same level in Fig.1a). After imposing a regulation at a time t_0, k_t and, consequently, C_t declines (Heikinheimo *et al.*, 2006). The magnitude of the decline and consequences are different, reflecting the intensity of a regulation. The catch t-year after t_0 changes as C_{reg} (Fig. 1b). On the other hand, it could decline as C_{hyp} if a new regulation was not imposed (Heikinheimo *et al.* 2006). The difference between C_{reg} and C_{hyp} is fishers' loss due to the regulation. The loss changes with time and it would turn to gain at a certain time t_e when C_{reg} and C_{hyp} become equivalent. The positive effect for fishers in income appears after t_r when the $\sum$ of loss (left shaded area) and the $\sum$ of gain (right shaded area)

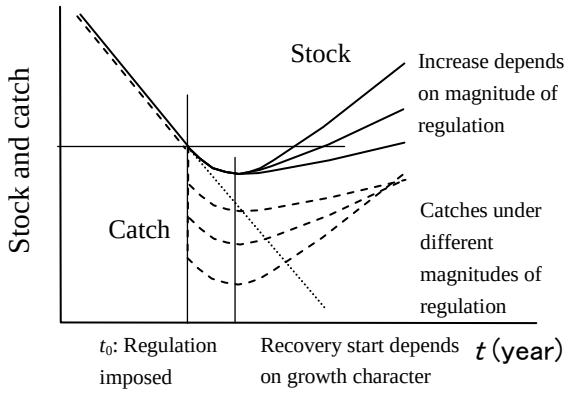

Figure 1a. Stock recovery and declined catch under different magnitude of regulation imposed

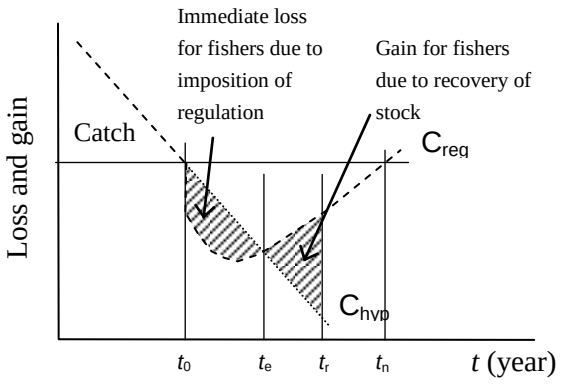

Figure 1b. Loss and gain for fishers after imposition of regulations and consequent stock recovery

become equivalent. If the time from t_0 to t_r is too long relative to a life span of fishers, the expectation for the future resource recovery is not adequate for fishers to accept the immediate loss.

The reduction of benefits for fishers from their environment due to regulations is removal of their livelihood wholly or in part. The magnitude of the removal must be decided with respect to the living individuals on their dependency on the resources and conservation of their livelihood (Francis *et al.*, 2004). This is the logical origin of rights of fishers in participation into management decision-making. The need of cooperation of fishers to resource recovery is not a logically adequate reason of the participatory approach.

Removal of a livelihood must be compensated (Gustavson *et al*., 2009). There are direct and indirect ways, *e.g.* cash compensation (Hollup *et al*., 2000), creation of other income sources, public investment to support

the affected sectors *etc*. With respect to a public character of sustainable use of fishery resources in food security and contribution in foreign exchange earning and supply of import substitutes by fisheries(Johannes, 1998), it is not appropriate to force fishers accept the loss, only expecting their moral. The logic is the same to that we do not deny compensation to the people losing their life base due to public interests, such as construction of dams, roads and airports.

Origin of social security - Poverty alleviation in inferior areas: The super goal of fisheries development is poverty alleviation through enhancement of livelihood and well-being of the people engaged in fisheries. Many fishery managers deplore that fishers do not understand the importance of resource management (Reis *et al.*, 2000). An immoral behavior that fishers are not compliant to fishing regulations is usually attributed to the low level of education. Consequently, it is followed by a conclusion that the difficulty of education is attributable to poverty. This is a paradox that unsuccessfulness in fisheries management toward poverty alleviation is attributed to poverty.

The presenter proposes a concept of 'inferior area'. We should understand that fishing villages are inhabited by historically disadvantaged and marginalized poor people (Kronen, 2004, Branch, 2006 and Sowman, 2006) and poverty is being reproduced through generations. The school attendance ratio and education level are low (Nunan, 2007). The hygiene and public health conditions are also low. Coastal aquatic environment is being degraded due to waste discharge from agriculture, forestry, land industries and urban human life, as eutrophication and contamination by chemicals, heavy metals, environmental hormone and other substances widely occur. Fish caught under such an inferior environment are not only consumed by fishers but also sold at a nearby market. Distribution of fishery products with no safety guarantee is fed back as hazard to food security to the people in surrounding areas. These have caused a negative tradition of indecent work in all aspects in fisheries.

A policy to disrupt the inferior area issue must be established. There should be no hesitation to incorporate special considerations to historically poor fishers and poverty alleviation (Walmsley *et al*., 2006) in inferior areas into fisheries development and management planning. This is the baseline essential toward sustainability of fishery sector, which satisfies conservation of aquatic environment and resources, food security and social security.

Inequality in access to fishery resources - Mechanisms of convergence of fishing effort and migratory fishers: Markets for catches are available mainly in urban areas where cash-income earners buy fish (Bell *et al.*, 2009). It is the most profitable that fishers living in the vicinity of a market operate in a nearby fishing ground (Figure 2). This is because the cost, *e.g.* for fuel, increases with a distance between the market and fishing ground, on the other hand, the genuine fishing effort, consequently, a catch, then earning, decreases with a distance (Ochiewo, 2004) because a work time devoted to a fishing operation decreases. This results in convergence of fishing effort around a fishing ground nearby an urban area (Brewer *et al*., 2009 and Hunt, 2003).

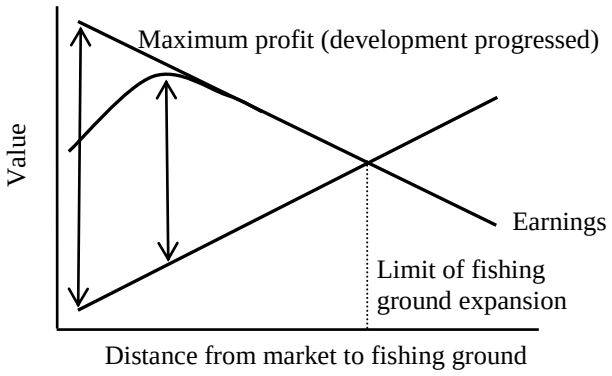

Figure 2. Mechanism of limitation of fishing ground with distance from market to fishing ground

The above market is no more functional for fishers inhabiting further than the end point where the cost and earning would be the same (Figure 2) and business-oriented fishing activities cease. This model explains the mechanism that excessive fishing likely occur around a market area locally even in a country where overall resources are not fully utilized. It proves unfairness among people in accessing fishery resource use. It also induces increasing participation of nearby fishers and migration of fishers from other areas.

Fishing effort diversification for sustainable fisheries - Providing opportunities in resource use for people in remote areas: An initiative to promote accessing fishery resource use in remote areas beyond the end point above is needed to prevent excessive fishing effort around a market including migration of fishers. A popular method is construction of landing stations facilitated to enhance preservation of catches, value addition and transportation in remote areas (Wagenaar *et al.*, 2007). Landing stations are usually constructed with public

investment, which appeared as the methodology in 'coastal fisheries development plans' in developing countries during the 1960's. This suggests that the first priority to secure sustainability of fishery resources and fishery sector is to support the right of the people in remote areas to access fishery resource use through development of infrastructure. This initiative also promote rational utilization of small-scale local resources which is virtually needed nowadays when food supply from fisheries is not adequate to meet the demand from the increasing population, as proposed in the Kyoto Declaration and Plan of Actions.

Function of development of industrial fishery - Conversion of fishing effort to off-shore waters and providing job opportunities: One of the methods to avoid excessive concentration of fishing effort in coastal waters is to divert it toward off-shore (Pomeroy, 1995). This method is applicable only where resources which have a capacity to adopt new fishing effort exist in off-shore waters. For this approach, fishing gear and vessels capable in the depths and distances to a new fishing ground are necessary. New fishing machines and navigation devices may also be needed.

If there are such a resource and a policy to provide job opportunities through development of industrial fisheries, it should be supported to overcome the technical requirements. In the case of demersal resources, needs for conversion to new fishing technology is large; *e.g.* new types of fishing gear is required due to species change and a machinery is also needed against larger depths. For pelagic resources, changes in species due to distance are less, therefore, needs for conversion to stronger fishing gear and methods may be less important. As this model, initiatives to encourage enlarging fishing vessels are popularly practiced (Adam, 1998). This is a justification of a strategy to encourage industrial fisheries to convert fishing effort, in other words, fishers and potential fishers. Such an initiative enables avoiding migration of people and new participation in small-scale fisheries.

Safe and healthy work environment on fishing vessels: It is widely known that the environment on fishing vessels in Asian countries is much worse to the international standards. Safety of fishing vessels are provided in the International Convention for the Safety of Life at Sea (SOLAS) and the Torremolinos International Convention for the Safety of Fishing Vessels (Torremolinos Convention), which deal with mainly fishing vessels greater than 24m or more in length. However, more than 90% of world fishers are working on fishing vessels smaller than the above. The most comprehensive and unanimously supported international standard for safety of fishers is the Work in Fishing Recommendation (WFR) adopted at the International Labour Organization (ILO) in 2007. At first in WFR, there is recognition that fishing should be improved to decent work. Fishing vessels, safety and protection of fishers onboard and their social security are dealt in this regard in WFR.

There are provisions related to design and construction of fishing vessels to protect fishers on board. Technical specifications of fishing vessels are addressed as: (1) seaworthiness and stability; (2) safety and health in living quarters; (3) temperature, ventilation and lighting, noise and vibration in work areas; (4) fire-fighting and lifesaving; (5) machinery safety; (6) equipment and procedures of fishing and post-catch activities; (7) radio communications (8) mitigation of the slipperiness of deck surfaces *etc.*

Regarding work environment for safety and health of fishers on board fishing vessels, the prescribed issues are: (1) protection of young persons including training and limitation to work hours; (2) medical examination to determine fitness to on-board work; (3) training and competencies of fishers; (4) provision of record of service in contract; (5) minimum payment; (6) properly prepared food *etc*. Medical care and health protection should be provided, taking into consideration of: (1) medical supplies and equipment together with training in basic first aid; (2) occupational safety and health management systems; (3) risk evaluation and management in relation to fishing; (4) laws and regulations to improve occupational safety and health as well as occupational diseases, including safety and health policy and programme *etc*. Social security should be extended to all fishers.

With regard to safety and health on board fishing vessel, since the compliance largely depends on the capacity of a captain, education for manpower production for seaman and ship' officer is important. Such education should be conducted in accordance with Quality Standard System (QSS) on the basis of ISO 9001 which is the international standard for quality of products and services.

Migratory fishers should be given safety and health protection and social security equally with local people.

Supports in fishery development and management: Direct subsidies such as funding for modernization of fishing vessels for conversion of fishing grounds etc. are applied in fishery management. We consider an appropriate level of subsidy.

The situation (A) in Figure 3 represents an underdeveloped fishery where a resource is not fully utilized. The cost is too large and the fishing effort is limited before MSY. Provided subsidies proportional to fishing effort, the cost line moves downwards as (B) or (C). It encourages participation of fishers to the sector. If subsidy is too large, an excess fishing effort is provoked as (C). The ideal subsidy is as the cost line becomes that through the MSY point in Figure 3. The total amount of subsidy to cause an ideal situation is the length of line C_b'- C_b. This is a model to limit a fishing effort from exceeding the intensity, E_b corresponding to MSY and to estimate the total amount of subsidy budget to promote a fishing sector to a rational level. The total amount of subsidy C_c'-C_c is too large and provokes excess fishing effort, E_c. This situation is as criticized (Grynberg, 2003) as 'subsidized fisheries threat the sustainability of fisheries', which must be avoided and is avoidable.

According to this model, an appropriately planned subsidy is one of the interventions to satisfy both development and management of a fishery. Promotion of exploitation of under-utilized resources with subsidy is acceptable, within the range that there are exploitable capacity of resources, a possible effect to fishing effort is pre-examined and an appropriate amount of subsidy is assessed as discussed here.

Together with subsidies, capacity building for fishers is also one of the popular support programmes (Mow *et al*., 2007 and Hauck, 2001). A variety of training is provided. Techniques such as maintenance of engines, handling of new fishing gear, use of navigation and safety instruments such as GPS, entrepreneurship skill (Brinson *et al.*, 2009) *etc*. are preferred by fishers, on the other hands, the public sector and NGOs traditionally try education on conservation and management of environment and resources (Jorge, 1997). The difference in functions of the two categories of training and education must be recognized.

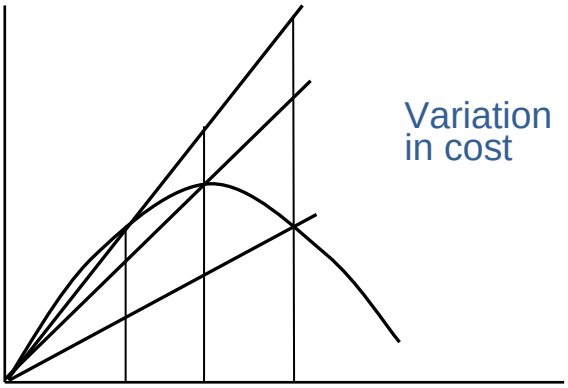

Figure 3. Various magnitudes of subsidy to promote development of fisheries to which the cost is too large for fishers

Recommendations

- Application of provisions of ASCCB to the fishery sector should be studied and promoted.
- The right of fishers to access resource use and management should be promoted and removal of their livelihood due to management should be compensated.
- A policy to support historically disadvantage and marginalized people in coastal inferior areas should be incorporated in fishery development and management planning.
- Construction of infrastructure in remote areas should be promoted for both resource management and the right of fair access fishery resource use for all people.
- Off-shore industrial fishery development should be supported to provide employment and income opportunity for people within a range of sustainability in resource use.
- Fishing vessel regulations to secure safety and decent work conditions should be established for recognition of fishery sector as a neat industry.
- The coverage by social security for fishers should be promoted and monitored
- When granting licenses for large fishing vessels, compliance with the provisions of WFR should be taken into consideration.
- Social rights and security of the same level with local people should be guaranteed for migratory fishers and fishery employees.
- Subsidization for exploitation of under-utilized resources should be managed.
- If trans-boundary mobilization in utilization of fishery resources is considered, the capacity of resources in the region to absorb increasing labour should be carefully studied.

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Annex 47

IMPACT OF FISHERIES MANAGEMENT IN IMPROVING SAFETY AT SEA MEASURES: A CASE STUDY IN THAILAND

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This article is based on a case study conducted by the SEAFDEC Training Department to assess the impact of effective fisheries management approaches on the improvement of safety at sea measures for trawlers and purse seiners in Thailand. The study focused on the fishing boat conditions, navigation and safety equipment, the crew and their competency, working conditions, weather forecasting systems, etc., and was carried out in four areas, namely: the central, eastern and southern parts of the Gulf of Thailand, and the Andaman Sea. The data collected through the survey were backed up by interviews with boat owners, crew and other stakeholders concerned. The results of the study could be used as reference for the other countries in the Southeast Asian region in their efforts to improve safety at sea measures and promote fisheries management.

Thailand is a peninsular country with an area of approximately 514,000 km^2 and a coastline of 2,614 km. The country's marine fisheries are operated in two major fishing areas, viz. the Gulf of Thailand and the Andaman Sea off the west coast of Thailand. The Gulf of Thailand is a semi-enclosed sea that covers an area of about 320,000 km^2 and being part of the Sunda continental shelf in the South China Sea, the Gulf is rather shallow with an average depth of about 45 m. On the other side, the Andaman Sea is deeper with an area of about 126,000 km^2 having the features of oceanic waters. Thailand's Exclusive Economic Zone (EEZ) covers 420,280 km^2 of which 304,000 km^2 is in the Gulf of Thailand and the other 116,280 km^2 in the Andaman Sea.

Fishing has a long history in Thailand and it is especially important for the people in the coastal provinces who fish to feed their families and supply fish food to domestic and foreign markets. Of its total production of 4.16 million MT in 2006, Thailand exports about 1.7 million MT valued at 5.24 billion US Dollars (Table 1). Marine fisheries production comes from coastal aquaculture and marine capture fisheries both within the EEZ of Thailand and neighboring countries' waters.

Table 1. Fish production and trade of Thailand (1997-2006)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total	3,442,715	3,524,933	3,646,070	3,735,279	3,648,095	3,797,124	3,914,133	4,099,595	4,118,483	4,162,096
Marine capture	2,699,227	2,729,639	2,745,468	2,795,719	2,631,474	2,643,728	2,651,277	2,636,412	2,615,523	2,579,025
Inland capture	203,671	200,715	206,840	201,405	202,500	198,700	198,447	203,200	198,747	197,270
Aquacul-ture	539,817	594,579	693,762	732,155	814,121	954,696	1,064,409	1,259,983	1,304,213	1,385,801
Total Export (Q)	1,013,936	1,160,453	1,204,215	1,162,099	1,217,310	1,246,543	1,401,915	1,395,531	1,527,659	1,700,160
Total Export (V)	4,334,222	4,038,054	4,122,627	4,384,437	4,054,130	3,692,158	3,919,824	4,053,938	4,474,405	5,244,879
Total Import (Q)	701,113	716,304	913,316	813,789	977,350	1,006,011	1,078,620	1,240,181	1,444,911	1,470,203
Total Import (V)	897,715	864,580	868,077	826,699	1,072,467	1,079,379	1,133,815	1,254,617	1,457,125	1,573,144

Source: FAO FishStat Plus 2008
Note: Quantity (Q) in metric tons (MT); Value (V) in thousand US dollars

Trawling and Purse Seining in Thailand

Otter-board trawls were introduced in Thailand in the 1960s, from which the beam trawl was developed for catching shrimps, and became a popular gear among the Thai fishers along with the otter - board trawl. As a result, the total number of registered trawlers increased from 99 units in 1960 to 11,000 in 1989 but decreased to 8,008 in 2000 and then to 4,806 in 2007.

Another effective gear is the purse seine also well known as the pelagic fish hunter. After the Chinese purse seine was introduced in 1925 for the chub mackerel fishery in the Gulf of Thailand, many Chinese purse seines were modified into Thai purse seines after World War II, using 2.5 cm mesh size. Later, the mackerel encircling gill nets or green purse seines using 4.7 cm mesh size were also introduced, and in 1973, several luring techniques were introduced one of which is the payao constructed using coconut leaves. Pelagic fishes are mainly caught by purse seines that make up about 82-85% of all gears used in Thailand, and the number of registered purse seiners increased from 585 units in 1979 to 1,504 in 2000 but decreased to 1,140 in 2007.

Moreover, the information from the Department of Fisheries (DOF) of Thailand indicated that fishing boats registered under "less than 5 GT" category decreased from 3,257 units in 1999 to 2,160 in 2003 while fishing boats registered under "more than 5 GT" category increased from 13,664 in 1999 to 13,823 units in 2003 but started to decrease to 11,824 in 2005 (Table 2). The number of registered fishing boats by type of fishing gears in 2003 comprised mainly the trawl fishing boats (Figure 1).

With the development of more efficient gears, the total fisheries production of Thailand increased but this also led to over exploitation of the fishery resources. In this regard, many fisheries management approaches and methods were adopted and used in order to address such concern. However, the aspect of safety at sea has always been overlooked even considering that fishing is among the most dangerous occupations pursued by man. The fishermen depend on their vessels for their survival, and when a vessel is lost at sea, it is probable that some or all of the crew also lost their lives. Generally, the most common fishing vessel casualties are due to vessel capsizing, poor vessel structure, fire/explosion, and collision.

Table 2. Number of registered fishing boats in Thailand (by gross tonnage (GT))

Year	Less than 5 GT (Units)	More than 5 GT (Units)
1999	3,257	13,664
2000	2,786	14,509
2001	3,329	12,616
2002	2,517	13,407
2003	2,160	13,823
2004	2,751	13,681
2005	2,160	11,824

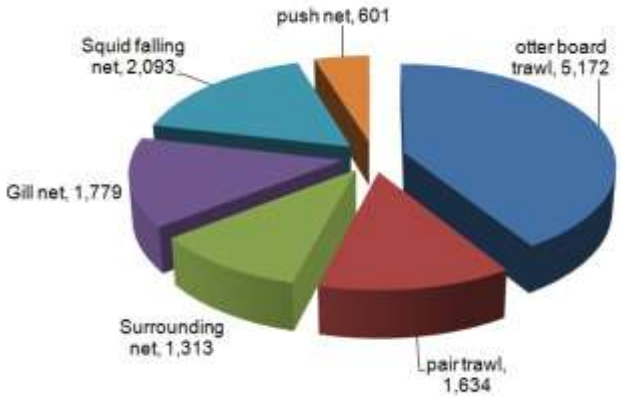

Figure 1. Number of fishing boats registered by type of fishing method in Thailand (2003)

Fisheries Management Policies of Thailand Concerning Safety at Sea

With the aim of controlling the fishery activities of Thailand, Fisheries Act. B.E. 2490 (1947) provides that fishing operations are subject to various regulations (revision of the Act is ongoing). As the lead national agency for fisheries policy development in Thailand, DOF promoted the National Fisheries Development Policies that include the Policy on Management of Fisheries Resources and Environment, of which fisheries management policies are covered specifically those that relate to safety at sea such as appropriate vessel registration and fishing licensing; closed area and closed season; promotion of offshore fisheries and joint ventures; and employment of foreign labor for fishing vessels.

Vessel Registration and Fishing Licensing

While the DOF of Thailand issues licenses for fishing gears such as trawls, purse seines and gill nets, the country's Marine Department has been legally mandated to register all vessels including fishing vessels. The divided tasks of licensing fishing vessels and fishing gear by two Departments could have led to the incomplete and ineffective control of all fishing operations in the country. To solve this problem, the DOF enacted a new regulation in 1979 prescribing that applications for fishing gear licenses must attach the certificate of vessel and the license to use such vessel. This regulation, however, caused another problem since many fishing vessels, less than 14 meters in length are unable to register and acquire the necessary certificate of vessel registration. This subsequently leads to the problem of issuing a license to fish when the certificate of vessel registration is unavailable. Thus, the DOF recently enacted an additional regulation to register fishing operators with fishing vessels smaller than 14 meters in length. Such certification can be used in lieu of the required certificate of vessel registration issued by the Marine Department.

Closed Area and Closed Season

During the spawning season of the Indo-Pacific Mackerel, certain areas in the Gulf of Thailand and in the Andaman Sea are closed for three months annually. From 15 February to15 May each year, approximately 26,400 km2 in the Gulf of Thailand is considered a conservation area to protect several commercially exploited demersal and pelagic fish species during their spawning and breeding seasons.

Fishing by all types and sizes of trawlers (with the exception of beam trawlers) as well as all types of purse seiners (except for anchovy purse seiners operating in the daytime from February 15 to March 31 only) is prohibited specifically along the coastline of Prachuap Khirikhan, Chumphon and Surat Thani Provinces as well as in the Khanom District of Nakhon Sri Thammarat Province in the Gulf of Thailand. Around the Andaman Sea, an area of approximately 1,800 km2 at Phangnga and Krabi is declared as a conservation zone where selectively controlled fishing (closed season) and/or prohibition of selected fishing gear is imposed from 15 April to 15 June of each year. These approaches allow the fishery resources to recover for another round of recruitment.

Promotion of Offshore Fisheries and Joint Ventures

Recognizing that the inshore resources of the country are already over-fished, Thailand had promoted offshore fisheries while some Thai commercial-scale fishing vessels mostly trawlers, continue to fish outside Thailand's waters. Many Thai fishers have entered into joint venture fishing agreements with Bangladesh and India to fish in Myanmar waters, and also with other countries such as Indonesia, Malaysia, Myanmar, Somalia and Madagascar with the arrangement to share local crew onboard as well as landings in their respective coastal states. This has led to an exchange in the access to fisheries resources and enhancing the capacity of the fishing vessel crew.

However in many cases, many fishers are unfamiliar with offshore fisheries where fishing trips could last for several days, regardless of the fact that most vessels have been constructed to fish near-shore and suitable for a few days trip only. In addition, many fishing vessels have limited space for carrying safety equipment, spare parts for engine repairs, or even heavy fishing gears commonly used, posing considerable risks to the crew. There have also been instances where fishers acquire second hand fishing boats from neighboring countries that are quite old with outdated safety equipments. Many such small fishing boats or old boats sail farther out to sea beyond their designed capacity and construction. Nonetheless, the country's policy on the promotion of offshore fisheries and joint ventures could still have positive effects on improved standards and capacity of trawlers and purse seiners, as this includes regulations on the size of boats as well as the communication, navigation and safety equipments to be carried onboard.

Employment of Foreign Labor

While Thailand has shifted from an agriculture-based economy to a more industrial one, many fishers have left the fishing industry which has led to the employment of foreign labor from Cambodia and Myanmar as members of the fishing vessel crew. It was only after Typhoon Gay in 1989 and the 2004 Asian Tsunami that hit Thailand that Thai fishing vessel crew were trained on the basics of safety at sea. On the other hand, while it would take some time for foreign crew to be familiar with fishing operations, minimum attention is usually given by fishing operators to the aspects of safety. This has been cited often as one of the causes of accidents during fishing operations.

Effects of Natural Disasters on the Improvement of Safety at Sea Measures in Thailand

Besides the various fisheries management approaches, the massive natural disasters which affected Thailand in a way, led to the improvement in the safety at sea measures for the country's trawlers and purse seiners.

Typhoon Gay

Typhoon Gay in November 1989 caused significant damages to the Gulf of Thailand, especially in Chumpon Province. It was a unique full typhoon (wind speed was 120 mph at landfall), that claimed the lives of more than 600 fishers who were reported missing while two hundred fishing vessels were lost at sea. After the typhoon, the Thai Government intensified its program in improving the safety at sea measures and established the Fishermen Training Center in Chumpon Province to provide training on fishing and safety at sea onboard, boat building and weather forecasting. Moreover, early warning systems were also improved in many fishing communities along the coastal areas of the Gulf of Thailand.

Asian Tsunami 2004

The 2004 Asian Tsunami damaged many communities around the Indian Ocean including 422 fishing villages in the country's six provinces (Ranong, Phangnga, Krabi, Phuket, Trang and Satun) along the Andaman Sea coast of Thailand. In terms of fisheries, about 700 fishers died, 6,100 fishing boats were damaged and many kinds of fishing gear valued at Thai Baht 160 million were lost. After this experience, the Thai Government with the assistance from the European Union (EU) and other international organizations provided immediate rehabilitation plans (short-term and medium term/long-term) that include training in natural disasters and sea safety for fishing communities, boat building and repair under the medium- and long-term plans.

The Case Study

Considering the various fisheries management approaches and capacity building measures on safety at sea promoted by the Government of Thailand, the case study was conducted with support from the Food and Agriculture Organization (FAO) of the United Nations to assess the current situation of safety at sea on trawlers and purse seiners in Thailand as well as evaluate the improvements resulting from the promotion of effective fisheries management measures and the lessons learned from the impact of natural disasters on the fishing communities in Thailand.

The study was carried out in four areas, namely: the central part of Thailand (Samut Prakan, Samut Sakorn, and Samut Songkram Provinces), the eastern part of Thailand (Chonburi, Trat, Chantaburi, and Rayong Provinces), the southern part of the Gulf of Thailand (Songkha, Chumporn, Nakorn Srithammaraj, and Surat Thani Provinces) and the southern part in the Andaman Sea area (Phuket, Ranong, Phangnga, and Satun Provinces) as shown in Figure 2.

Results of the Case Study

The results indicated different conditions of the safety at sea measures for trawlers and purse seiners in Thailand, varying in terms of the size of the fishing boats. On the average however, safety conditions of about 50% of fishing boats met the standard set by the Marine Department and the DOF.

Figure 2. Study areas in the central, eastern, southern parts in the Gulf of Thailand and the Andaman Sea

Hull and Engine of Vessels

The regulation on vessel inspection of the Marine Department of Thailand provides that inspection of fishing boats including inspection of the hull, engine and firefighting equipment as well as safety equipment onboard should be done every year while docking inspection is done every two years. Annual inspection is done when a fishing boat is afloat so that both the hull and all engines could be visually inspected for their conditions as well as for its performance. The results of the study indicated that only around 50% of boats from the central part of the Gulf of Thailand and about 65% in the Andaman Sea were checked by authorized officers annually. Furthermore, in the eastern and southern parts of the Gulf of Thailand only about 65% follow the regulations of docking within two years for overhauling the hull and other parts while only 39% of the fishing boats in the southern part of the Gulf of Thailand perform routine hull maintenance. As for navigational equipment, most fishing vessels conduct good maintenance of their equipment specifically the RADAR, GPS and Echo sounders. Special attention has always been given to Echo sounders, since these are used for navigation as well as for successful fishing operations.

Safety Equipment

In accordance with the regulation of the Marine Department, life rafts, life rings and life jackets must be carried onboard by all fishing boats regardless of size. However, most Thai fishing boats do not have any life rafts carried onboard. In fact, less than 50% of fishing boats in the central part of the Gulf of Thailand and in the Andaman Sea have life rings while in the eastern and southern parts of the Gulf of Thailand, only small number (0-4 boats) carried life rings, respectively. The respondents also confirmed some fishing boats use the fishing gear floats as substitutes for life jackets.

Safety of Vessel Crew

In the study area, a trawler (LOA less than 15 m) fishing in areas more than 12 nautical miles away from the shore, has about 15 crew members working onboard but without having life rafts, life rings and life jackets on board. On the other hand, purse seiners (LOA equal or more than 15 m) that fish more than 24 nautical miles away from the shore, carry onboard some safety equipment such as life rings and life jackets. However in general, many fishing boats do not install life rafts. Furthermore, considering that the distancetraveled by fishing boats from shore to the fishing grounds is directly related to the accidents due to bad weather conditions, alert methods employed by fishing boats should be assessed as the distance from the shore to the fishing grounds is critical during the search and rescue operations in case of accidents.

Competence of Vessel Crew

The number of crew onboard trawlers is not more than 20 persons, while that of purse seiners is about 20-40 persons. As shown in Figure 3, the highest percentage of crew working onboard Thai fishing boats are Burmese nationals (50.95%) followed by Thais (24.58%) and Cambodians (24.47%). There are no Cambodian crew onboard fishing boats in the Andaman Sea while there is less than 0.5% Burmese crew in the eastern part of the Gulf of Thailand.

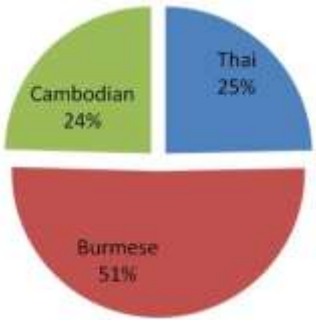

Figure 3. Nationalities of crew working onboard Thai fishing boats

Specifically, in the central part of the Gulf of Thailand, the vessel crew is also dominated by Burmese nationals (about 58%) followed by Thais (36%) and Cambodians about 6%. In the eastern part, the vessel crew is dominated by Cambodians (about 91%) while the Thai crew comprises only about 8%. In the southern part, most of the vessel crew comprises the Thais (49%) and Burmese (43%), and the remaining 8% are Cambodians. On the other hand, the crew of fishing vessels in the Andaman Sea is mostly Burmese and Thais, comprising 80% and 20%, respectively.

Working Periods Onboard Thai Fishing Vessels

The working hours and period of fishing operations are different in trawlers and purse seiners. Fishing operation time of trawlers starts before sunrise and is completed before midnight from net setting, net hauling until catch sorting. Normally fishing operation is done about 3 times a day, and takes about four hours for towing. During towing time, the crew sorts the fish to be kept in the fish hold. The total working time per day is 15 hours. On the other hand, purse seiners start fishing after sunset (about 22.00 hrs) and finish after sunrise, with a total working time of about 12 hours per day including time spent for net arrangement.

Weather Forecasting Facilities

The country's weather forecast services for fishing boats have been improved after Typhoon "Gay" hit Thailand in 1989. The services have been expanded to cover all fishing grounds up to 40 nautical miles in the Gulf of Thailand and up to 60 nautical miles in the Andaman Sea. Broadcasting is conducted through various media such as television and radio as well as through the coast and onshore radio station services for fishing boats. Results of the study indicated that all fishing boats sampled have communication systems onboard for receiving weather broadcasts in the fishing grounds. However, most fishing boats have no weather facsimile receivers installed.

Communication Systems

Most fishing boats use CB transceivers to communicate among ships and between ships as well as to the shore. In the eastern part of the Gulf of Thailand, more than 50% of fishing boats use SSB transceivers compared with the other areas where the use of SSBs was limited to few vessels only. However, the study also confirmed that many fishing boats usually do not use VHF transceivers because VHF radio signal could not be accessed from long distances, thus, CB transceivers have been most effectively used instead. Environmental Responsibility.

Almost all sampled fishing boats return to shore with waste materials generated during their fishing trips. The waste materials include inorganic garbage such as damaged buckets, damaged fishing gear, PE ropes, waste oil, etc., which are usually sold by the crew upon getting on shore.

Ship Facilities

The traditional Thai fishing boats have no toilets, bathrooms nor mess rooms. It was only recently that some fishing boats already have toilets or bath rooms. This means that the living quality of the crew in most Thai fishing boats is still low compared with other jobs on land. The respondents confirmed that in general, owners of fishing boats in Thailand do not pay considerable attention on safety issues and the quality of life of the crew working onboard.

Conclusion

Results from the study indicated that most Thai fishing boats (more than 70% of the fishing boats sampled) passed the annual inspection conducted by the Marine Department for docking and maintenance of engines with gear and navigational equipment installed onboard. However, life rings and life jackets are mostly not available onboard with less than 50% of fishing boats in the central part of the Gulf of Thailand and the Andaman Sea carrying these safety equipments and with corresponding very low percentages in the southern and eastern part of the Gulf of Thailand. This is in spite of the number of boat accidents at sea having been reported.

The number of vessel crew and their competence which are indicators of the safety conditions of fishing boats also varied in the areas surveyed. The number of crew in purse seiners is large compared with that of trawlers because of the differences in the fishing operation methods. There is a large number of foreign crew working onboard the fishing boats in the Andaman Sea, central and eastern parts but smaller in number in the southern part of the Gulf of Thailand, with competence not usually meeting the standard because many foreign crews did not receive any training on the basic sea safety measures. Lack of competence of the boat crew and the poor working conditions, long period of working hours may have contributed to more than 40% of fishing boats in Thailand meeting accidents at sea which is considerably high. With regards to weather forecasting system in Thai fishing grounds, it seems that this has been much improved after the catastrophic natural disasters that occurred in Thailand in 1989 and 2004.

Viewing the general picture of safety at sea for trawlers and purse seiners in Thailand, the various fisheries management measures still do not seem to promote improvements of the safety conditions of the fishermen. This may be because the responsibilities for boat registration including safety at sea promotion and fishing licensing

are done by various authorities. Good cooperation among responsible sectors should therefore be promoted in various aspects of safety including collection and sharing of data. Implementation of fisheries management plans will not be successful when safety aspects on the part of the fishers are overlooked. Strengthening safety at sea inspections and enhancing awareness of responsible officers are also needed in order to increase the efficiency of inspection and enforcement. Moreover, awareness building about safety at sea for vessel crew, owners and responsible officers should also be promoted while information on disastrous accidents at sea should be monitored and disseminated in order to discern how safety at sea could be improved.

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Annex 48

INTEGRATING INLAND FISHERIES MANAGEMENT IN SOUTHEAST ASIA TOWARDS 2020: ISSUES AND PERSPECTIVES

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Background

Comparing the programme of the last conference on "Fish for the People" in 2001 with the present one, we realize that fisheries have, apparently, become more complex, a complexity that was recognized by the 2011 SEAFDEC Conference. In 2001, there were four panels on more standard items, such as fisheries management, aquaculture and fish utilization. Now we have eight, adding to the standard topics a few more fashionable items, buzzwords really, of governance, ecosystem approach, climate change, and livelihoods. For us a major novelty is the separate panel on inland fisheries. Inland fisheries were not really given any prominence ten years ago, as they were almost of secondary consideration. One reason given then was the inadequate information on its real magnitude and importance in the region. The MRC Fisheries Programme has addressed this during the past decade, and other agencies as well. In fact, we are thrilled about this new emphasis on inland fisheries, and we are eager to share our experiences and insights with you.

I can assure you that today we have a much better picture of inland fisheries than we had last time, though there are still some gaps in our knowledge. Just let me say right at the beginning that for us at the MRC/FP 'inland fisheries' are made up of freshwater capture fisheries and aquaculture, and we like even to include the brackish water and marine fisheries off the Mekong delta in it. But I know that most of you may define inland fisheries differently, and so let me focus, in what I will be presenting, on inland fisheries in the stricter sense of the word, that is, its capture fisheries sub-sector.

I was asked to give a short keynote address to this panel, which has been organized, as you know, into four sub-themes, of which each is dealing with a specific issue impinging on the *integration of inland fisheries management in Southeast Asia*, which is the focus of my keynote. Let me quickly say a few words of why I think these issues were brought up, and why I think they are important indeed.

Small-scale inland fisheries are widely undervalued, and often written off. This is despite the fact that they are the single most important fisheries in developing countries in terms of participation and employment. In Southeast Asia as elsewhere, they are often said to be in decline, contributing little to social and economic development of the region. However, in one point most authors agree: the importance of inland fisheries for food security, and in particular of rural populations. But how does this look like? What does food security mean in different countries, and how is food security linked to the overall development of the region?

Over the past decade research into production and consumption from inland fisheries has indicated ever-increasing numbers. From an annual production of about 1 million tonnes of fish in Southeast Asian countries around the turn of the century to more than 2 million tonnes, or 20% of the world's total inland fisheries production in 2008. We now know that these are conservative figures, and the fisheries yield in the Lower Mekong Basin alone is more than that. Are these merely better statistics, or has the exploitation of inland fisheries really increased that much? And if so, what does this mean for the future of this regional resource? In other words, is further *sustainable development of Southeast Asian inland fisheries* at all possible?

'Management, or better management' is the general advice of the experts. But how to manage effectively the dispersed inland fisheries of Southeast Asia, in a situation where government funds are ever scarce? Bring in the communities; let the fishers take the burden! In fact, we know that, traditionally, many local fisheries were managed, and, particularly over the last decade, governments in practically all ASEAN countries have attempted to decentralize decision-making authority and functions and to establish *sustainable community-based inland fisheries management*. What have the results been so far, what the lessons learned?

It is general knowledge that, quite different from marine fisheries, threats to sustainable fisheries come, more often than not, from outside the sector. We in the Lower Mekong Basin are particularly confronted with issues of water infrastructure development, which may impede important fish migrations and have transboundary repercussions on this regional resource. The ongoing Xayaburi dam controversy is a case in point. Fisheries people have talked to fisheries people only for too long. *Integrating fisheries with other water uses* is a major decision factor for sustainable inland fisheries management and development.

I think we all agree that we are in a rapidly changing situation with regard to our environment, and what can be extracted from it to satisfy our needs, most prominently that of secure access to food.

Without wanting to anticipate some of the conclusions of our panel presenters, discussants and members of the plenary on the implications of these issues for sustainable fisheries management and development in Southeast Asia region, let me share with you a few thoughts and perspectives on them.

Issues

Safeguarding Food Security

Fish is the most important source of animal protein worldwide. While this has been estimated as more than 35 percent globally, inland fisheries in the Lower Mekong Basin supply about 60 percent of animal protein, and important vitamins and minerals in a diet otherwise deficient in micronutrients, such as calcium. This has led to fish being called the "milk of Southeast Asia". But how does fish contribute to food security, which has been defined as enough and good food to all people at all times? Despite being a highly seasonal product, fish provides needed protein to consumers through a multitude of traditional products and preparations. In my home country, this is the famous *padek*, fermented fish, which already impressed early travelers to the country as "supplying the Lao fish without end". The subsistence use of a large portion of the inland fisheries yield, and the fact that women and children play an important role not only in processing but also in catching it, guarantees the supply of essential food to otherwise frequently food insecure groups, such as rural populations in remote areas in general, and women and children in particular.

Inland fisheries contribute to food security in a very direct way. But there is also an indirect contribution. In Laos for example, food security is defined as rice-sufficiency. Here, fish sales enable people to purchase rice, and to cope with periods of bad harvests. It is clear that fish is not only a vital food item in itself, but also a source of work and money for millions of people around the globe, including money to attain family food security. Recently, the FAO estimated that about 37 million men and women worldwide were gaining an income from fisheries. In the Mekong basin for example, this accounts for 20-50 percent of household incomes. Again, if we are looking at the situation in Southeast Asia, we may easily have this number here alone. In Laos, 70 percent of agricultural holdings engage in inland fisheries, a figure that may be comparable in the other countries of the Mekong Basin with its population of 60 million people, and, who knows, elsewhere in the region.

Food security as such, and the contribution of inland fisheries to it, is frequently traded-off for supposedly more tangible benefits from economic and social development. In fact, food security, and inland fisheries as a major provider directly impinges on overall social and economic development of many Southeast Asian countries. It is important for policy-makers to recognize its multiple benefits for overall social and economic development have to be recognized. Good nutrition, food security and inland fisheries as an important contributor to it have to be accepted as *important elements in an integrated approach to poverty reduction and overall human, social and economic development.*

Sustainable Development of Inland Fisheries

Inland fisheries are often narrowly defined and badly understood in their complexity. They comprise a multitude of aquatic animals, from fish to shellfish, amphibians such as frogs, insects and reptiles (such as the water snakes fished from Tonle Sap lake in Cambodia). Very importantly, they comprise a multitude of habitats, from creeks, streams, rivers and their rapid and deep pools, to swamps, natural and artificial lakes, ponds and rice-fields. The Lao language knows more than 25 words for different fisheries habitats, including the *boak*, a pool for buffaloes to cool off in. Furthermore, they comprise several types of user communities with diversified, but integrated livelihood strategies, for whom inland fisheries are extremely important.

Despite a steady increase in production figures over the last ten years for example, most inland capture fisheries are at their upper limits. While overall sustainability of the resource seems not to be threatened, substantial changes in catch composition have taken place, with quality of fish shifting towards low-value species that are consumed locally.

With growing populations in Southeast Asia, demand for fish also increases, which will not be possible to be satisfied by aquaculture. This means that it will not only be important to maintain the contributions of inland capture fisheries to food security, but also to increase its regional yield. Yet, inland capture fisheries are

frequently looked upon not only as in full decline due to human impacts, but also as an 'extractive resource', which is, differently from 'productive' aquaculture, seen as a 'given' and not amenable to 'growth' and thus 'development'.

If appropriate action is not taken, demand for fish will remain unfilled, an important resource for national societies and economies will be neglected and the sector will become irrelevant. Inland fisheries, which have been important as an essential and largely irreplaceable source of food, and a heaven of aquatic biodiversity, will vanish. Lack of attention to inland fisheries is a major threat to its sustainability.

The importance of fisheries statistics and information has been discussed *ad infinitum*, that is, again and again in the same way. While we have made some leeway during the last decade, I think we have not sufficiently shown the 'productive' potential of inland fisheries, and its possible contribution to national and regional growth and development.

Indeed, there are possibilities to 'develop' inland fisheries. One way I see is a possible, albeit limited, expansion of the sector. This may be horizontally, that is in area, by taking a ride with the development of rice farming and both irrigation and hydropower reservoirs. Or it may be vertically, through fisheries enhancement, which may hark back to the age-old practice of trap ponds (what we call *nong sa* in my country) to present-day culture-based fisheries. Another way would be to 'modernize' inland fisheries in line with established government policies and strategies: In Laos for example, we have three main policy priorities for alleviation of rural poverty, namely, environmental management and protection, human resources development and people's participation. More specifically, for inland fisheries this means: improvement of equipments and techniques; protection of critical habitats; implementation of community-based approaches; and awareness creation. Thus, integration for sustainable inland fisheries development means both *integration of production systems in multiple ways, and integration of inland fisheries in national development plans and programmes*.

Towards Sustainable Community-based Inland Fisheries Resources Management

The 2001 conference recognized the fact that governments in the ASEAN region had taken steps to decentralize fisheries management functions to local governments and user groups in an attempt to substitute centralized management by the state, which have been largely ineffective due to "open-access" and great complexity, particularly in inland fisheries. Constraints for sustainable fisheries from "open-access" led to attempts to limit entry by allocating exclusive fishing rights using licensing and involving local communities through community-based- or co-management.

Let us look at two words in more detail, 'community-based management' and 'sustainable'. Different from community management, community-based management *is* co-management. The many examples of it, which have sprung up all over the region, are a proof of this. More than in developed fisheries, co-management in ASEAN countries is community-based and not mainstreamed parallel to the administrative hierarchy in federated systems, for example. A major implication of this has been a heavier management burden for communities. Instead of 'more government' support for local fisheries, co-management has frequently resulted in substantial investment of time and labor by communities in management, which are ultimately hampered in fully taking the necessary action. 'Sustainability' of community-based management may refer to two aspects; one, the longevity of the arrangement; and two, the improvement it brings to management outcomes. The MRC/FP has supported formalized community-based arrangements for well over a decade now in four countries of the Lower Mekong Basin. I am sure, there are similar long-enduring examples in some of the other ASEAN member countries. Better outcomes in terms of increased catches, incomes and stronger livelihoods are more difficult to prove, although information from some countries point to it. Apart from community-based action as a means, there is also community or public participation as an end. In fact, it is one of the three elements of the very concept of 'sustainable development', which is made up of 'environment, local people, and future'; it is one of the pillars of the concept of Integrated Water Resources Management; and a regional and global principle of human rights and good governance.

In the times to come, stronger financial, legal and technical support by governments will be necessary to maintain and sustain these supposedly joint arrangements, which so fare have rested largely on the shoulders of vulnerable and poor populations. Integration towards sustainable community-based inland fisheries management is predominantly an *institutional integration, which may aim at scaling up of community-representation and –participation in decision-making from local to provincial and even national and possibly regional levels; it may aim at integration of fisheries into rural development in local planning and delivery mechanisms, and finally at sectoral integration of community-based initiatives and action*.

Integrating Fisheries with Multiple Inland Water Resources Use

Inland fisheries are subject to both internal and external drivers, which include both, threats and opportunities. Internally, over-exploitation and illegal fishing methods are of concern. This may be less a concern for the sustainability of the fisheries as such, which has proven to be highly resilient, but for the diversity of its aquatic fauna and livelihoods of the many people benefitting in multiple ways from it. Externally, the activities of other water users for purposes such as navigation and transportation; industrial and domestic water consumption; energy generation and a host of other land-based activities in watersheds and basins, which impact on the aquatic resources through destruction of important habitats or barriers to movement of water and fish in the region. We have recently talked a lot about dams, which are expected to have major impacts on river-floodplain fisheries, but much less direct impact on rain-fed habitats, and will usually add to reservoir catches. It may be worthwhile to remember that agriculture is *the* most important land-use in the basin, so as a sector it is probably far more significant for fisheries, posing threats and opportunities in many ways throughout the landscape.

As mentioned above, inland fisheries get frequently discounted and traded-off when competing with other uses of aquatic resources. Explaining the complexity of inland fisheries to outsiders is extremely difficult. Development of realistic assessments of multiple use impacts, including mitigation of adverse effects as well as identification and realization of opportunities and benefits is an important prerequisite for better communication with other water resources stakeholders. Participation of the different interest groups in the decision-making process on water uses is important to allow for transparency and legitimacy. And finally, information for decision-making has to be formulated adequately for effective communication. *Integration here may aim at communicating and agreeing on language and mindsets and societal values and goals*.

Recommendations

While we have tried to highlight four issues proposed by the organizers as sub-themes for our panel, and to provide some perspectives from the point of view of 'integration', let me come back to the title of my keynote and summarize what I see as possible directions and recommendations for integration of inland fisheries management in Southeast Asia.

Integration of inland fisheries management in Southeast Asia will have to occur on multiple levels, from local to national and regional. It will have to dealt with as a multi-facetted undertaking, and attempting to bringing together several dimensions of integration, such as the recognition of integrated purposes; integration of productive systems; organizational and institutional integration; and communicative integration, integrating language, mindsets and attitudes.

- Suitable recommendations for implementation at local to national levels may include:
    - Promotion of inland fisheries as part of multiple-use and multi-purpose frame- and networks, and facilitation of development and uptake of suitable inter-sectoral and integrated management approaches;
    - Inclusion of inland fisheries management and development into overall rural development planning and implementation;
    - Identification of opportunities for dealing with inland fisheries as part of Integrated Water Resources Management (IWRM) at several levels, and development of suitable proposals (Example: Implementation of 'localized' IWRM in Soc Trang province, Mekong delta, Viet Nam, by MRC/FP);
    - Coordination and facilitation of concerted action by inland fisheries-relevant agencies and organizations on a regular level.
- Suitable recommendations for implementation at regional levels may include:
    - Promotion of cross-border cooperation in harmonizing inland fisheries in locations where the issues are transboundary in nature, such as the Mekong River Basin (Example: Pilot Project on Transboundary Fisheries Management by neighboring Provinces in Cambodia and Viet Nam);
    - Inland fisheries as part of regional IWRM (Example: Mekong Basin Integrated Water resources Management [M-IWRM] by MRC);
    - Development and drafting of a regional (*basin-wide*) fisheries management and development framework and plan (major output of MRC Fisheries Programme 2011-2015);
    - Promotion of integration of inland fisheries into an ASEAN Fisheries Management Mechanism (under SEAFDEC).

Annex 49

SAFEGUARDING FOOD SECURITY

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Background

The World Food Summit in 1996 agreed that food security exists when all people, at all times, have physical and economic access to sufficiently safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life. In more recent years, food security or insecurity is increasingly becoming and now fully recognized as a non-traditional security threat affecting many poor/developing countries in Asia. This is further exacerbated by climate change effects on capacities to produce food thus discussions on how to safeguard food security is not only relevant it is of utmost urgency.

The Millennium Development Goals (MDG) Report 2010 for example showed that progress towards achieving the target of halving the proportion of people in Asia and the Pacific suffering from hunger by 2015 has declined. This was due to a number of factors that together worsened food situation in many developing countries not just Asia and the Pacific. Not properly addressed new forms and levels of vulnerability to food insecurity will emerge especially as natural resources are degraded and fishing rights taken out of the hands of local communities through privatization in efforts to improve efficiency in production.

The bottom line is that our food and natural resource problems are also becoming more and more complex, with highly interconnected ramifications. Solutions to these problems will require more encompassing global/regional perspectives and analyses. For example, studies have shown that majority of poor people especially from already vulnerable communities depend on fish to meet their protein requirement. Declining supply and access to this will not only lead to hunger per se but nutrition issues as well. This could also result to a number of social and political unrests that could become unwieldy to local and national governments already weakened by the social pressure.

Although the immediate issues on food, water, energy and environmental security are how to best manage these resources in combination and how to coordinate their development policies, the food security challenge of the coming decades-the ultimate constraint of future food production-has to be fully analyzed and understood.

As indicated in the background paper for this subtheme the importance of inland fisheries to food security is recognized but not fully appreciated due primarily to the absence of adequate data and information about the relative importance of freshwater fish in food supplies. This results to underestimation of the value and thus impact of the sector in providing or addressing food security concerns. In a purely economic perspective this could result to less than optimal investments on inland fisheries development as society in general and policy makers in particular will not have a fuller appreciation of what the sector could contribute and what should be done to generate these benefits.

For this paper therefore discussions on safeguarding food security will address issues on availability, accessibility, affordability, and distribution efficiency especially in the light of the relative importance of freshwater fish in food supplies and food security.

Although current efforts at the national and regional level have provided natural safeguarding especially for protected inland resources, multiple factors such as water resource use conflicts, environmental degradation, pollution and population increase could also result to negative impacts on food security. Some of the more important emerging challenges that could impact on inland fisheries include the following:

1. The population, food production, and natural resource nexus - The population of the region and the world is expected to almost double by 2050. This simply means an increase in total food demand given increasingly deteriorating natural resource base. With poor communities reporting higher dependence on inland fisheries for their protein needs and income sources this means greater pressure that are not often recognized in national and regional data generated to describe the status of the sector.

2. Climate change effects - Scientists in general agree that climate change will significantly affect fisheries and aquaculture and associated effects have to be fully addressed if food security is to be maintained.

3. Food price increases, economic recession and their effect on consumers especially the poor - Price increases could further make life of the poor more difficult than what it is now considering that majority spend 50–70% of their income on food. This means further reduction in their purchasing power through the loss of jobs and even remittances from relatives working abroad.

4. Higher and more volatile energy prices. This will put increased pressure to inland fisheries as fishers could no longer fish farther from the shore due to high fuel prices. The effect will thus be felt also in terms of frequency and therefore total production. On the other end law enforcers ensuring that natural habitats are protected will also be faced with problems of monitoring and enforcement especially for poor communities.

5. Need for a more comprehensive and integrated models for sustainable production and growth. New policy frameworks, such as a more comprehensive post-Kyoto agreement on climate change, are essential for agriculture including fisheries to cope with the multiple challenges the sectors face due to climate change effects. However if farmers and small scale fishers, especially the poor, are to benefit from such initiatives, they need ***new knowledge and methods that are science based***. Only then can small scale inland fisheries and aquaculture become part of the solution to climate change, water scarcity, conservation of natural genetic resources, and protection of the environment, not just part of the problem.

6. Public-private partnership in research and development. In the region, research and associated programs of formal and informal education and delivery of technologies are in general still provided by the public sector. Stronger public-private partnerships will be needed to provide technical assistance and business orientation in the development of the fisheries sector. As resources are limited, aligning the responsibilities and initiatives of public and private organizations becomes essential. The institutional and financial support of NGOs and the private sector along with official development assistance from traditional donor agencies will thus be critical.

Issues

Availability issues

1. Production becoming less sufficient to meet local demands due to increasing population, declining resources available and degraded habitats reducing levels of production and productivity. This means business as usual cannot be sustainable. Modern technologies and science based techniques have to be introduced to increase or sustain yield while at the same time protecting the environment.

2. Implications of maintaining fish stocks at levels that will allow better access to food especially for the poor. As small scale fisheries (SSF) more directly provide fish products at the local level, there should be greater awareness and appreciation of the local stakeholders especially when seasonal banning of fishing is to be pursued to allow fish stocks to be rehabilitated. This could only be possible if local stakeholders understand the value of these policies vis-à-vis their own individual welfare. Ecosystem based management of small scale fisheries should thus be promoted to increase appreciation by local stakeholders.

3. Management plans for inland fisheries to ensure sustainability and address negative environmental changes including water resource use conflicts are essential. Given increasing demand for alternative water use there should be a clear articulation of the value of SSF benefits so that a more economically efficient allocation of water resources could be pursued.

4. In the coming decade, food security needs to be increased by scientific and local knowledge about resources and environments, for proper management and sustainable inland fisheries development. Given limited resources, increasing demand and unpredictable climatic conditions the challenge is to enhance the science foundation for SSF management and utilization.

5. Increasingly unpredictable growing conditions due to climate change impacts requires more scientific knowledge on fisheries biology, migration, recruitment and spawning habits to sustain productivity at the local level. This means higher investments in R & D is essential.

6. Over-exploitation of fish stocks further exacerbated by illegal fishing activities driven by increasingly high prices for fish products. A well managed community based management of fisheries resources could

provide the incentives to erode if not totally eradicate illegal fishing and capacitate local stakeholders to manage resources more efficiently.

7. Deteriorating quality of river ecosystems as a result of pollution, agricultural run-off and physical infrastructure (*e.g.* dam construction)

8. A general reduction and/or insufficiency of government and donor investments in fisheries and aquaculture research and development activities. While renewed interest in developing and investing in fisheries is growing, serious cutbacks in the past have delayed development of new technologies, management systems and techniques that could increase production, improve fish stocks, cope with changing climate conditions, battle new pests and diseases, and make food more nutritious at the scale needed to address food security concerns.

Affordability issues

1. Volatility and increasing prices could pose critical risks to food security as poor consumers with declining income will have lower purchasing powers for even basic food commodities

2. Contraction/reduction of household income as a result of slowing global economy and loss of jobs

3. Volatility of markets for food commodities in general and fisheries in particular - time horizon, postharvest processing implications, inadequacy of marketing infrastructure.

Accessibility/Distribution Efficiency

1. Availability does not assure access as the distribution of available food is critical. With limited or less developed marketing and distribution infrastructure, supply of fish both from the wild and aquaculture will even be more skewed as production are unable to reach consumers efficiently. Food shortages can result not only from curtailed total production but also from constrained distribution of existing supply

2. Increased demand from a growing middle class which are generally in urban centers quite a distance from actual production areas pose pressure on the reliability of food distribution systems that will protect the consumers while at the same time allowing fishers to benefit from the price increase.

Recommendations

Preamble: Achieving food security is about providing immediate remedial support to alleviate hunger and restore livelihoods, increasing capacity of communities and governments to anticipate food uncertainties and strengthening their resilience to the impacts of food disasters. The contribution of sustainable fisheries especially subsistence fishing to food security undeniably could be substantial and needs to be enhanced primarily because this is the most accessible for poor vulnerable communities.

The specific recommendations made during the regional technical consultations sponsored by SEAFDEC regarding this subject are therefore being reiterated with some modifications:

a. Recognition of the importance of inland fisheries for food security, and in particular of subsistence fisheries, in sector planning and policy implementation. Where appropriate, subsistence fisheries should be protected and/or receive priority consideration.
b. Identify and implement appropriate management strategies for inland fisheries development that are aligned or consistent with national poverty alleviation strategies.
c. To be able to do the above the collection of more comprehensive information/statistics on inland fisheries should be sustained and modified to include fish consumption data. Research on valuation of subsistence fisheries should be conducted to also facilitate monitoring of the sub-sector's performance.
d. The impact competing water use such as but not limited to alteration of water ways, conversion of catchment areas for agriculture and other uses, water regulation infrastructures and other infrastructure development on inland fisheries should be fully recognized. Member Countries should make a concerted effort to consult with concerned agencies to maintain the ecological health of water bodies and the connectivity of the habitats.
e. Alternative livelihood should be promoted especially during seasonal flooding/drought considering the migratory and non-homogenous nature of the resources. In addition, food supply should be safeguarded

during off season by developing post-harvest and processing techniques to maintain the food quality and safety of the fish and fish products.

f. Sustained investments of governments and international donors in fisheries education, research and extension, as well as infrastructure development.
g. Enhanced support of local and national governments for credit and market development especially for small scale fisheries outputs/products to improve marketing/distribution efficiencies and optimize income for small scale/subsistence fishers. The idea is to seek efficiency in food systems management and delivery through the introduction of post harvest and even cold storage facilities.
h. More strategic policy response to address the following (1) increasing the resilience and sustainability of agriculture and fisheries productivity; (2) improving disaster risk management (3) enhancing social protection schemes especially for the poor and vulnerable groups and (4) strengthening community based development
i. Empowerment of the vulnerable groups through human capacity building (taking into consideration the role of women and indigenous peoples) in sustainable small scale fisheries development and management.
j. Avoid fragmentation and maintain coherence of regional responses for action - Regional food security frameworks should start not with the questions on how to define food security or insecurity but who the food insecure are and what food insecurity actually means to them. The challenge however is not just identifying who the most vulnerable are but to recognize that vulnerability can take multiple forms and may require different responses.
k. Regional food security frameworks should recognize and facilitate community based responses to the challenges associated with food insecurities - recognize a more realistic analysis of the people's livelihood strategies and provide an adequate understanding of how they live and make a living at the local household and individual level.
l. Regional food security policies and programs should be sensitive to equity concerns at national and local levels that will address not only issues of availability but also issues on accessibility and affordability.
m. Regional food security frameworks should recognize the environmental dimensions of food security – sustainability of natural resources and ecosystem inputs to food production and diminishing environmental externalities including those which create negative feedback loops.
n. Institute governance arrangements that are transparent and accountable and appreciated by the constituents as contributing to addressing concerns on food security not simply regulatory bodies that could even restrict the own ability to adjust to food insecurity.

Annex 50

STATUS AND TRENDS OF SUSTAINABLE INLAND FISHERIES DEVELOPMENT IN SOUTHEAST ASIA

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General Description

In Southeast Asia, inland fisheries stand as a major source of animal protein, employment and generating income. Statistics in 2008 have estimated the region's population was about 568 million and demand of food fish for them was about 15.5 million metric tons. According to the FAO in 2008, landing from the inland fisheries was 2.38 million metric tons. But described its contribution more or less 15.3% of fish food needs in the region, even the relevant composition in overall fisheries landing was low (Mahyan Mohd, Abu Talib, Abdul Razak Mazalina Ali and Virgilla T.Sulit, 2011). The statistics has described the region's declining trends of fish production from inland capture fisheries, such trends does not predictably indicate the decline of resources. In fact countries in the region have exposed a gradual increasing trend of production from inland capture fisheries.

Table 1: Production from inland capture fisheries in Southeast Asia (in metric tons)

Countries	2004	2005	2006	2007	2008
Brunei Darussalam	0	10	10	0	0
Cambodia	250,000	444,000	559,642	420,000	430,600
Indonesia	330,880	297,370	293,921	310,457	497,740
Lao PDR	29,800	29,800	29,800	80,597	81,387
Malaysia	4,119	4,583	4,164	4,283	4,353
Myanmar	502,550	631,120	718,000	717,640	816,050
Philippines	142,018	143,806	165,081	168,311	179,491
Thialand	199,600	198,800	214,000	225,600	228,600
Vietnam	146,054	138,800	153,325	133,600	144,800
Total SEA	1,605,021	1,888,289	2,136,943	2,060,488	2,383,021
World total production from inland capture fisheries	8,613,912	9,396,013	9,799,740	10,034,692	na
% of SEA's production to World's total production from inland capture fisheries	18.6	20.1	21.8	20	na
% of SEA's production to World's total production from fisheries and aquaculture	1.1	1.2	1.4	1.3	na

Source: Mahyan Mohd, Abu Talib, Abdul Razak Mazalina Ali and Virgilla T.Sulit, 2011: *Sustainable development of inland fisheries in Southeast Asia.* Fish for the People Vol. 9, No 1, 2011

Background

In the region traditionally, almost all households of rural poor in spite of crop farmers or fishers engage in fishing day to day or some time of the years for consumption or livelihood purposes. A figure from such fishing has never or seldom composed in landing statistics. This situation is one of the main reasons in difficulties to obtain accurate landing figures for inland fisheries statistics. Some authors predict that the landing figure may be 2-3 times more than that of official reports if the statistics may base on the figures of household utilization instead of currently applied means of data gathering. Coates (2002) also has explained that existing production data from inland capture fisheries was under-reporting by a factor of between 2.5 and 3.6 to that of official statistics in general.

Potential resources, trends of producing and threats

In recent years produces from inland capture fisheries shared about 20% to overall fisheries and aquaculture produced in Southeast Asia. Naturally, freshwater bodies that include rivers, courses, lakes, ponds, and reservoirs and seasonal flood plains are grounds for inland fisheries. In fact annual variation of rainfall and flood in monsoon has influenced the fluctuation of the fish hosted in different water bodies that determine

landing from the fisheries. In Southeast Asia, huge inland freshwater ecosystem with high potential of fisheries resources in the six major inland capture fisheries producing countries. In respect of currently produced from inland capture fisheries in Southeast Asia, Myanmar stands top of the list by contributing about 34% followed by Indonesia with 21%, Cambodia with 18 % and Thailand with about 10%.

Myanmar has profound inland fisheries water bodies centered to the river systems of Ayeyarwady, Chindwin, Sittaung and Thanlwin Rivers. Ayeyarwady River which is 2170 km long is originated from the northern most of the country and flows transversely the entire length of the country and reached into the Andaman Sea in the Bay of Bengal. All along these river basins are networks of river let, streams and courses, natural lakes, reservoir, and seasonal flood plains that serving as the main sources of inland capture fisheries. In terms of fisheries water, permanent water body over the country has estimated 1.2 million hectares (12000 km^2) excluding recently constructed dam and reservoirs. The coverage of seasonal flood plains has estimated 6 million hectares (60000 km^2). Moreover, as a temporal habitat for inland fish resources there are millions of paddy rice growing fields over the country. In general, the existing fresh water ecosystem has estimated about 21.35 million hectare (213,500 km^2) over the country (DOF, Myanmar 2010).

The legal frame for the management of inland fisheries has legislated since the early of 20^{th} century. The 1905 Fisheries Law is the earliest law enacted for the management of especially inland capture fisheries. This law was amended in 1945 and applied as a fisheries manual until the existing freshwater fisheries law has promulgate in 1991, with objectives to secure fisheries resources and rational uses of it in sustainable manner.

Generally, inland fisheries have two categories in operation such as leasable fisheries and open fisheries. Leasable fisheries is defined an area in fishery water in where the right to be fishing is granted by leased license obtainable by annual based public auction. Over the country there are 3451 designated leasable fisheries areas were allotted to operate in 2009-2010. Other than leasable fisheries is open fisheries water allowable by license to operate fishing with gears and methods prescribed in fisheries law and the directives of the Department of Fisheries.

Statistics from the Department of Fisheries has indicated the landing in 2000-2001 was only 238.21 metric tons, but increase about 4 times in 10 years as it produced 1 million metric tons in 2009-2010. The volume of which was 26% of the country's total produced of fish including aquaculture. It is worth mentioning that the country's efforts to improve aquatic resources management such as restoration of habitats, restocking in natural waters and reservoirs, extends of "culture based capture fisheries" as well as "capture based cultured fisheries" and enhance motivation in fisheries governance.

However, as a matter of fact, there are challenges in sustainability of inland capture fisheries. Demand to adequate supply of food fish for ever increasing populations and utilization for value added preservations are main drivers to increase fishing pressures also in the inland waters. In the contrary degradation of mangrove has impacting the loss of habitat to spawn, nurse and grow. Extends of rural development, constructions of dams for irrigation and hydro power are mainly hazardous for natural recruitment and biological process of several aquatic resources in all inland fisheries water, particularly along the river basins, delta and coastal areas.

Relatively high composition of undersize and scare of quality fish from inland fisheries indicates the need to enhance awareness on responsible fishing to encounter the state of resources threatening. The extensive uses of fertilizers and pesticides in high yields paddy rice growing program on the other hand has impacted on degradation of fisheries habitat and directly affect the survive of fish. Actually, the rural poor commonly engage fishing by any mean for daily consumption or income in the scarcity condition for alternative livelihood options. In this situation therefore, inputs and empowerment of sustainable fisheries management along with responsible fisheries practice may less effective (Khin Maung Soe, 2011).

The impact of climatic changes has irritated fisheries environment to deviate from normal structure. The obviously shrink and retreat of water bodies in the Ayeyarwady River and Inlay Lake in fact may suffer inland fisheries by deterioration of habitat. In this context, the existing efforts of fishing and resources status are needed to clarify so as to established sustainable fish production from inland fisheries. Meanwhile, the creation and searching of alternative livelihood options is necessary to improve livelihoods of the rural poor and users of the fisheries resources.

Indonesia embraces huge areas of open inland waters with 55 million hectares (550,000 km^2) including 1.8 million hectares (18,000 km^2) of lakes. These water bodies favor prime habitat for freshwater fisheries resources and thus stand as a sources of country's freshwater fish production. Also, there are water bodies of

50,000 hectare (500 km^2) in reservoirs with multi-purposes design for flood control, irrigation, industries and domestic uses. On the other hand all of these water bodies are standing resources for inland fisheries. The landing reports indicated slightly declined during 2004 - 2007, however abrupt increased to about 0.5 million metric tons in 2008, which is 1.5 times more than that produced in 2007.

Cambodia's inland fisheries are said to be mainly depend on the Tonle Sap Great Lake, a natural flood reservoir of the Mekong River that supports the country's major inland fisheries. The wide range of seasonal water body fluctuations has hosting variety of fish and several of fisheries resources. In the flood season water area of the Lake covered about 10,000 and retreat to about 3000 km^2 in the dry season. During the monsoon, the Lake expends to more than 6000 km^2 inside inundated forest and creates fertile grounds for breeding, spawning and nursing of various freshwater fishes and aquatic lives. On the other hand, such seasonal flood plains serve as productive inland fishery areas that contributed almost 60% of the country's fisheries production (Serywuth and Vann, 2009). The landing statics has described increasing trends in recent years as In particular it was produced 0.25 million metric tons in 2004, but increased to 0.56 million metric tons in 2006. The production was seemed to be plateau by 0.42 and 0.43 million metric tons in 2007 and 2008 respectively.

The Philippine's inland fisheries extends in freshwater lakes, rivers and other water bodies such as Laguna de Bay watershed that covering 292,000 hectares 2920 km^2 as a sources for inland fisheries. However, sustainability of the fish production had been constrained by various factors that include technical, social, environment and institutional problems (Israel, 2009). The Lake Lanao with 340 km^2 of water surface located near Marawi City in central Mindanao has community small-scale fisheries and recreational activities such as sport fishing, boating and swimming. However the sustainability of these fisheries activities has been threatened. The constructions of hydro power plants in the Lake change the fluctuation of the water level that affect local peoples who are depending lake fisheries for their food and livelihoods (Boransing and Sulit, 2009). Even in this situation, produced of inland fisheries in the Philippines has steadily increased. Production in 2004 was only 0.14 million metric tons, but it was increased to about 0.18 million metric tons in 2008 was reported.

Thailand holds freshwater swamps and lakes that covering water surface of about 30,000 hectares (300 km^2). The country also has huge areas of reservoirs in Southeast Asia that may cover more than 300,000 hectares (3000 km^2), which is probably the largest total area of reservoir in the Southeast Asia. The promotion of co-management and right based management in reservoir fisheries have enable additional income for the fishers to manage their livelihood sustainably. The reports indicate increasing trends of fish produced from inland fisheries in recent years (Siriputinibondh and Ekmaharaj, 2008). In particular in 2004 it was produced only about 0.2 million metric tons, but increased to about 0.23 million metric tons in 2008.

Vietnam naturally has large areas of inland freshwater ecosystem that cover more than one million hectare (10,000 km^2) as a source of inland fisheries. Of which about 39% (397,500 ha) are water bodies of medium and large scale reservoirs, about 55% (550,000 ha)) are paddy fields while small lakes and ponds covered about 6% (58,000 ha) of the total freshwater fisheries areas (Petr, 1995).

Issues encounter in sustainable development of inland fisheries

Considering the role of inland fisheries in food fish security and sustainable development of the fishery, efforts to avoid possible decline in fish production from inland ecosystem is deemed fundamental. The discussions have painted the aspects not only in production but also the threats relevant to inland freshwater management, heavily exploit of resources and suffered from environment pressures. The consideration includes deterioration of inland water quality, degradation of fisheries habitats, responsibilities of fisheries stake holders at all levels, interactions with expanding agriculture and competition of resources users in sharing of limited resources, and users' participation in the governance of fisheries.

In order to examine the status of inland fisheries in the region, information gathering has undertaken on four major aspects such as (1) factors that affect the status of inland fisheries production; (2) ways to enhance production from inland fisheries; (3) mechanisms for sustainable management of inland fisheries; and (4) strategies to improve sustainable management of inland fisheries. Through these, common cross cutting issues could have been extracted as the following.

Factors that affect the status of inland fisheries production:

i. Structure of fisheries, seasonality, and livelihood approaches for the fishers.
ii. Ecosystem degradation, conservation and management
iii. Supports from government and NGOs
iv. Implementation of MCS, climatic change, environment flow modification, population pressure and invasive alien species
v. Capacity building, infrastructure and facilities

Ways to enhance production from inland fisheries:

i. Adequate and effective MCS system
ii. Strengthen restocking program
iii. Regular meeting to discuss fisheries related issues, including non fisheries institutions
iv. Proper and effective infrastructure and facilities
v. Strengthen cooperation in information gathering and conduct research and development
vi. Compliance with regional and global instruments and agreements.
vii. Integrated approach in the management of water uses
viii.

Mechanisms for sustainable management of inland fisheries

i. Extend conservation and management measures
ii. Seasonal closure of fishing
iii. Promotion of trade and market, creating alternative livelihoods and micro finance.
iv. Capacity building for appropriate technologies and innovation
v. Transparencies in decision making on management issues.
vi.

Strategies to improve sustainable management of inland fisheries.

i. Improve management in capture fisheries and limit to access resources only to those authorized to fish
ii. Improve documentation, research & development, and knowledge management
iii. Establish community funds for inland fisheries development
iv. Seasonal closure to protect critical life cycle of freshwater species.
v. Support to develop sustainable community-based natural resources management
vi. Capacity building of appropriate technologies and innovations
vii. Promote participatory approaches in analyses, research and development activities, and decision making
viii. Improve processing and preservation as well as promotion of marketing and trading of fisheries products

Recommendations

Contribution of inland fisheries to food fish security, livelihoods and incomes is much more than that of gross national production figures as the bulk of production is generated by small-scale or subsistence activities. It is generally expressed that inland fisheries in developing countries have been heavily exploited and trended declined however, inaccurate production statistics and information remains a main constraint to assess inland fish stock in the region. Also it is uncertain to identify in which extent that is an effect of increasing fishing pressure, or the loss of fisheries resources due to habitat degradation or changing water flow system of the rivers and courses due to the construction of dams and diversion.

Nevertheless, inland fisheries in the region may have considerable impact from loss and degradation of habitat and overfished due to lack of protection and appropriate management measures. Considering such situations, recommendations shall be made for the member countries to exert following efforts for the "Sustainable Development of Inland Fisheries in the Region"

i. More emphasis on enhancing awareness of local ecological knowledge, species conservation and the impacts of introducing of alien species and aquaculture technology.
ii. Reactivate fisheries extension and/or develop to enhance knowledge-based information and management.
iii. Regular assessment and evaluation of manmade harness activities and pollutants from land based activities that may impact the health of freshwater ecosystem.
iv. Strengthen the collection, compilation, analysis and dissemination of scientific and statistical data and information so as to increase visibility of inland fisheries as one of the economic sectors.

v. Consideration the use of indigenous species and local population in restocking program to maintain and secure genetic structure of the species in particular environment, and that introduction of alien species should be avoided.

vi. Creation and searching of alternative livelihood options to improve livelihoods of the rural poor and users of the fisheries resources so as the effectively empowerment of fisheries management to take place.

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Annex 51

TOWARDS SUSTAINABLE COMMUNITY-BASED MANAGEMENT IN INLAND FISHERIES

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Background

In 2001, at the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security in the New Millennium Conference, the discussions on fisheries management were dominated by two different, but closely linked issues: decentralization, and rights-based fisheries (SEAFDEC 2002). While it was recognized at the conference that decentralization of fisheries management had been initiated in many if not most ASEAN countries, the establishment of rights-based fisheries, which was expected to be a remedy to unsustainable fisheries, was considered new and untried. In most small-scale fisheries, and in particular in inland waters, the rights-based approach would be through fisheries co-management. Fisheries co-management is a general term, and includes many forms and labels of user involvement, such as 'joint management' with government agencies, to 'community-based management' and even 'self-governance', which are frequently taken as likely requirements for effective management of inland fisheries.

Let us take this moment to have a closer look at our title, 'Toward Sustainable Community-based Management in Inland Fisheries'. What does 'sustainable' mean here? Does it relate to a persistence of the management arrangements or to the qualitative effects from this form of management on fish resources and fishing communities? And what are the differences between community-based- and co-management?[1]

In fact, the early years of the last decade were special for participatory management of Southeast Asian inland fisheries. In mid-2000, the Technical Advisory Body on Fisheries Management, a regional fisheries body established with the support of the Mekong River Commission, had made co-management one of three main themes of its work in the four countries of the Lower Mekong Basin. In the same year, the Cambodian Department of Fisheries embarked on its fisheries management reform, which foresaw the establishment of 'community fisheries' all over the country. And similar moves were underway elsewhere in the ASEAN region.

Today, ten years on, we may be in a position to answer some of the questions poised above, may have learned some lessons on how to establish and support community-based and co-management in inland fisheries, and may be able to raise ideas on how to sustain user involvement in fisheries governance.

As part of the preparation for this Conference, a Regional Technical Consultation on Sustainable Fisheries Management was held in Samut Prakan, Thailand, in October 2010. Fisheries stakeholders from five ASEAN countries provided information on major aspects relevant to community-based management in inland fisheries. These aspects were: 1) what is the status of community-based inland fisheries management? 2) What are the levels of indigenous capacity and knowledge in inland fisheries management, and the willingness of government to share power? And 3) what are the factors for successful implementation of community-based inland fisheries management? We will organize our paper and presentation around these three key questions, and, in doing so, keep in mind the two issues, which dominated the 2001 conference: decentralization and fishing rights.

Issues

Status of community-based inland fishery resources management

In preparing for this conference, representatives of national fisheries agencies in the ASEAN countries were interviewed on the 'Status of community-based inland fisheries resources management' in their respective

[1] Community management - communities have full and generally autonomous responsibility for the protection and use of natural resources. Community-based management - communities as a focus and foundation for assessing natural resource uses, potentials, problems and opportunities, and for taking action to deal with adverse practices and dynamics [which] is done not in isolation but with cooperation and support from other actors, both from other communities (horizontal linkages) and from higher-level or external entities (vertical linkages); these higher-level actors can be: local or district governments, regional bodies, government agencies, NGOs, universities, or any other institutions that have an interest in resource conservation and management. Thus, community-based management *is* co-management.

countries. Interestingly, only seven countries responded, of which only four provided information (of which three are countries in the Mekong basin, and Malaysia). Though they have extensive inland fisheries, Myanmar and Indonesia did not provide information on community-based management.

The 'Status of community-based inland fisheries management' was characterized in the following way:

- there are supportive government policies and legal frameworks;
- there is involvement of non-governmental organizations;
- there is a need for local community fishers association to be set up; and
- stakeholder participation in management should be strengthened.

Decentralization and community participation in natural resources management has long been identified as an important element of sustainable natural resources development. The 2001 Conference expressively recognized the fact that governments in practically all ASEAN countries had taken steps to decentralize fisheries management functions to local units of government agencies and involve user groups in an attempt to improve centralized management by the state. This approach was particularly recommended for inland fisheries, and more so for the fisheries of the Lower Mekong Basin. Indeed, decentralisation and community participation in management are not new in Mekong fisheries.

Since 2000, in *Cambodia*, the establishment of Community Fisheries, a particular form of community-based co-management has aimed at strengthening so far non-licensed open-access family-scale and rice field fisheries. Necessary elements for *devolution* of management responsibilities to user communities are present in the legislation. The policy of the Fisheries Administration aims at encouraging the integration of fisheries management with overall rural development and extending responsibilities of fisheries management to fishing communities. Several projects of participatory management have been supported by national and international NGOs and donor organizations, with a focus on community organization, action research into resource management issues, and legal and policy reform.

Since the late 1980s, in *Lao PDR*, decision-making in natural resource management has been decentralized to provincial and district levels, and villages have been given responsibilities of management implementation. This is reflected in Government policies, which include measures aiming at community management of natural resources, and a "bottom up" approach through the existing mechanisms of local administration. Thus, villages are allowed to make certain regulations regarding local issues, provided they do not conflict with national laws. Local resource ownership, though, is not founded on legal title, but on the acceptance by the government of factual rights of management by local people, and the central state's awareness of its own limited capacity to manage at the local level. Most local management is grounded on traditional practices, which are highly specific for different fishing habitats and seasons.

Government support of participatory fisheries management expresses itself in the close working relationships between district authorities and communities, and the approval of locally established organizational structures by district governments, which has been an important factor for its success. Community participation in fisheries management has been legally sanctioned in the new fisheries law of the Lao PDR, which was endorsed by the Lao national assembly in 2009. The part dealing with community management was based on the experiences made by implementing two 'models' of fisheries 'co-management', namely the *Nam Houm* and the *WWF* models. In 2009, the *Nam Houm model* was replicated in the establishment of fisheries co-management in the newly formed reservoir of the Nam Theun 2 hydropower project.

In *Thailand*, initiatives such as the Village Fisheries Program, a collaborative undertaking of the government and local users for fishpond rehabilitation, have been going on in the country's Northeast and elsewhere for more than thirty years. More recently, the conservation unit of the Department of Fisheries has trained village representatives as conservation volunteers to support the agency's enforcement efforts. However, there are still some barriers to full co-management in fisheries. On the Government's side these are related to a hitherto highly centralized system of administration and, at times, lack of easy communication with user communities. On the users' side traditional forms of mutual assistance and co-operation, once so typical of Thai villages, are said to be in decline. Today the lack of efficient village organizations is considered a weak point in community-based management. Consequently, Thailand's constitution of 1997 emphasizes *decentralization* of management rights and responsibilities to sub-district administration authorities, or *Or-Bor-Tors*. The OBT provides a platform for communities to "participate in the management, maintenance, preservation and exploitation of natural resources and the environment in a balanced fashion and persistently as provided by law" (Hartmann 2000).

In *Vietnam*, there is *decentralization* of decision-making through various levels of government. Accordingly, current fisheries policies assign communities an active role in fisheries management, an equitable share in resource property rights, and a sharing of responsibilities for conservation and management. Yet, there is little experience available on how this sharing of management is to take place, and what kind of support should communities in a co-management process expect from government agencies concerned.

Today, significant progress has been made in popularizing community-based fisheries co-management in the Mekong region: In 2010, there were about 470 *Community Fisheries*, with about 230,000 members spread across 130,000 households of which, due to the importance of inland fisheries in Cambodia, about 90% are in that sector; in Lao PDR, a preliminary count gives us about 200 co-management initiatives run by river and reservoir fisheries management committees; in Thailand's Songkhram River Basin, the MRC in cooperation with the Thai DOF support more than 90 fisher groups; in the province of Daklak in Viet Nam's Central Highlands, we know of at least ten decade-long co-management arrangement, while in the Mekong delta co-management focuses on water management by more than 40 user organizations, from *farmer clubs* to *cooperatives*. Also, in the Mekong delta the first transboundary, or better, cross-boundary fisheries management by community groups and local government agencies in Cambodia and Viet Nam has been initiated.

However, the 2001 conference made it clear that decentralization was a 'complementary activity' only to the implementation of rights-based fisheries, which was its main recommendation. The conference strongly recommended the establishment and promotion of *fishing rights* to overcome the constraints and weaknesses inherent in a perceived open-access regime, which, apparently, is the root cause for inefficient management and unsustainable fisheries utilization.

In fact, we know that in most Southeast Asian countries, many local fisheries, and particularly so inland waters, were and often still are managed under diverse property rights systems, that is, far from being 'open access'[2].

A case in point are river fisheries in Northeastern *Thailand*, which are managed under a complex and dynamic multiple-rights property regime, where individual, common, and state rights may overlap, adjust or conflict. This is also reflected in constantly changing institutional arrangements in fisheries. Although the Thai constitution supports natural resources management by communities, there are neither guidelines for practical implementation nor clearly defined roles and responsibilities. For example, national law may grant communities *de jure* rights of access and withdrawal, while reserving for government the formal rights of management, exclusion and alienation. Yet concurrently the communities hold *de facto* rights to manage fisheries within their boundaries. Thus there is duplication and mismatch between local and state institutional arrangements for fisheries management.

Since colonial times, rich large-scale fisheries of *Cambodia* are characterized by exclusive fishing rights periodically auctioned off by the government to individuals or firms or through frequently complex systems of intermediaries, for commercial exploitation of these so-called 'fishing lots'. A practice, which was common in Thailand too, and is still widespread in Myanmar. Since 2000, the Cambodian government has released 56% of the area covered by state-owned fishing lots, or more than half a million hectares of fishing lot areas for the benefit of local communities across the country.

A legal framework in form of a sub-decree governing *Community Fisheries* was put in place and signed by Prime Minister Hun Sen in 2005. According to it, communities have management rights, once they have demarcated, elaborated a map and a management plan, for a given area. This is a lengthy process, requiring a lot of consultations and negotiations. So far, about half of all Community Fisheries are fully accredited. Fishing rights are management rights in Cambodia. No other fishers can be excluded from access to fishing areas, which are not defined and registered as fish conservation areas.

In *Lao PDR*, for the first time a Fisheries Law was passed by the National Assembly in July 2009. It took into account the experiences from the MRC/Fisheries Programme, which has promoted community-based management since 1997. Starting in reservoir fisheries, the work was later expanded to community

[2] Property rights include *use rights* (usually understood as rights of access to and withdrawal from the resource), and *control* or *decision-making rights*, such as rights to management; exclusion, and alienation [that is, to rent out, sell, give away, and pass on] (Hartmann 2003; Meinzen-Dick, Pradhan, & Di Gregorio 2004). Property rights are often thought of in a narrow sense as ownership-the right to completely and exclusively control a resource. But property rights are better understood as over- lapping "bundles" of rights. There are many combinations of such rights, but they can often be grouped as *use* rights, such as the right to access the resource (for example, to walk across a field), withdraw from a resource (pick some wild plants), or exploit a resource for economic benefit; and *control* or *decision-making* rights, such as the rights to management (plant a crop), exclusion (prevent others from accessing the field), and alienation (rent out, sell, or give away the rights).

management of critical habitats along the Mekong River in Southern Laos. 'Community fisheries' are covered in Articles 50 to 54 in Chapter VII of the new law, which specifies the right of local communities to manage and utilize their resources. In addition, the law empowers communities to establish their own fisheries management committees for defined water-bodies. It also covers community roles and responsibilities in establishing protected areas (conservation zones) and community ponds, as well as the formulation of village fishing regulations.

In the reservoir fisheries of *Viet Nam*'s Central Highlands, people's committees have subcontracted fishing rights to private individuals. In one reservoir, fishing rights are subcontracted to an agricultural co-operative, in another managed by a people's commune, and in a third subcontracted to an intermediate management board. All management decisions are taken and management functions executed by the lessees within the framework of existing resource use legislation. Management functions are stocking, licensing of fishers and enforcement. The lessees exploit the fishery through a sharing arrangement with fishing teams equipped by them, or licensing arrangements with individual independent fishers against payment of a percentage of the catch value. In addition, a great number of non-licensed subsistence fishers either fish illegally or are tolerated by the lessees.

Concluding this chapter, we may say that decentralization of fisheries management is widely practiced in the four countries looked at more closely; fisheries co-management has become the fisheries management policy in all of them; fishing rights exist, but they are mainly management rights, while access rights are not exclusive to individuals, at least not on a longer-term basis, but are the privilege of citizens as members of the national community.

Level of local capacity, knowledge in fishery resources management and willingness of government to share power

On the level of local capacity for user involvement in management and willingness of governments to share power, the stakeholder interviews carried out in preparation of this conference was assessed as:

- the capacity and knowledge of the communities on management is low, and so is the level of diversity in fishery communities;
- the willingness of management authorities to share power is moderate; and
- so is the willingness of communities to accept management responsibilities

'Capacity' of people is often understood as being embedded in the skills and knowledge of individuals. But, in fact, 'capacity' is a multi-facetted phenomenon, comprising several dimensions, from individual technical capacity to organizational, institutional, communicative and financial capacities.

Local capacity and *knowledge* to manage fisheries goes back hundreds, if not thousands of years in most Southeast Asian countries. In fact, we know that in Laos, important fisheries, like that of the Mekong giant catfish, have been *managed* for more than 2,500 years. In 2000, 52% of villages surveyed in Luang Prabang province had some form of local management system, mainly focusing on protection of critical habitats (in particular so called 'deep pools') and spawning migrations of fish. In 2001, the MRC Fisheries Programme published the seminal report 'Local knowledge in the Study of River Fish Biology', which became a milestone in the acceptance of user expertise in fisheries management in the Mekong region.

Self-organization of users is a prerequisite for them to become partners to a highly organized group of stakeholders – the government. The MRC Fisheries Programme has supported the establishment and operation of more than 250 user *organizations* over the last decade. However, user organizations are largely community-based. And fisheries 'co-management' is indeed a community affair for most of the time. In fisheries as in other sectors, governance reforms have aimed at downward decentralization, increasingly involving local levels in decision-making. To a much lesser extent attempts have been made to out- and upscale community based management, involving users at different scales and levels in a multi-layered and overlapping undertaking that may reach from the local to the provincial, national and ultimately global. In fact, some attempts were undertaken to upscale Community Fisheries into federations in Cambodia, and to organize fishers into a national Fishers Association. Such attempts will have to be strengthened in the future.

However, organizing users is not enough. Many organizations are 'empty shells'. What is important too are agreed on by-laws and regulations – which are part of an invisible, but essential *institutional* framework for management. The most important 'institution' for local participation is a management plan. It is the basic concept for management planning, management monitoring, and further development of the management

system. Developing and implementing a Community Fisheries management plan is an essential condition for the legal accreditation of this form of co-management in Cambodia.

While there is a general willingness by governments in the region to share responsibilities, there is less willingness to share funds and to compensate communities for their management services.

But lack of funding is a major constraint for effective community participation in management, and a major threat to its sustainability. It has become clear that the development of financial capacity is an important condition for the implementation of many, but not all, activities, which are contained in the management plans. This should be emphasized: Not all activities need funding (at least not in monetary terms), and it's usually not at the beginning that the funding question kicks in. *Financial capacity* means two things: 1) the user groups must be able to monitor finances and account for them; however, 2) they also must have access to funding. This is a difficult question in some of the Mekong countries. Part of the 'co-management promise' is, for Governments, to economize on management expenditure by bringing in communities to perform certain management tasks. This includes investigations into possibilities of self-financing by community organizations. Three mechanisms have been tried out in co-management initiatives supported by the MRC: 1) credit and saving schemes, through which, among other purposes, the implementation of management measures by users have been supported (particularly in Viet Nam); 2) development of alternative, or supplementary economic activities, promoted by management organizations, which, among other purposes, contributed to the funding of that organization (particularly in Cambodia); and 3) taxation for the benefit of management organizations through levying of taxes on the local fishery as such (in Viet Nam), or on fish marketing (Lao PDR). The different dimensions of fisher management capacity building are interconnected, as, for example, the creation of financial capacity through institutional development.

Factors for successful implementation of community-based management

In preparing for this conference, interviewed stakeholders identified the following factors for successful community-based management:

- sharing of management power between government and communities;
- active participation of authorities in community-based management;
- stakeholder involvement in management arrangements and in decision-making;
- recognition and addressing the diversity in inland fishery communities; and the
- use of a property rights approach.

Fisheries co-management has been looked upon by some as a kind of "soft management", related to, at times, little tangible concepts and fuzzy objectives. Far from it in the Mekong Basin! Several co-management initiatives were surveyed and analyzed by the author. The analysis revealed the following:

- The main *problems* addressed through co-management are: declining fish abundance and over-fishing, unemployment (!), destructive practices in key habitats and resource conservation;
- Important co-management *measures* focus on: habitat and resource protection and enhancement, resource and management system research and resource use co-ordination between competing users;
- Co-management *activities* undertaken to obtain the desired results are: stock and habitat enhancement; resource and management system research; fishery regulation; technology development and credit; licensing and access restriction; and awareness creation; typically, co-management initiatives combine two or more areas of activities;
- While all examples report positive *outcomes*, the following *results* are most frequently mentioned: increased fish production and enhanced stocks; improved information on the state of the resource and its management; improved awareness, stewardship and management capabilities of users; and increased income, particularly of entire villages.

What are measures for success in community-based management? 'Sustainability' of community-based management may refer to two aspects; one, the longevity of the arrangement; and two, the improvement it brings to management outcomes. The MRC/FP has supported formalized community-based arrangements for well over a decade now in four countries of the Lower Mekong Basin. There may be similar long-enduring examples in some of the other ASEAN member countries.

Better outcomes in terms of increased catches, incomes and stronger livelihoods are more difficult to prove, although information from some countries point to it (Viet Nam's Central Highlands; Lao PDR); most

stakeholders however are in agreement on the positive results from community-based management on their relations with government entities, and their citizenship. It has been suggested that Thailand's increasing trend of production from inland capture fisheries could be a result of the country's efforts in sustainable management of reservoirs and lake fisheries through the adoption of co-management and rights-based reservoir fisheries management. Similarly, Myanmar's increasing fish landings could be due to improved aquatic resources management such as environmental restoration and rehabilitation, restocking of flood plains and improved governance (Fish for the People, Vol. 9, No. 1, 2011).

Apart from community-based action as a means, there is also community or public participation as an end. In fact, it is one of the three elements of the very concept of 'sustainable development', which is made up of 'environment, local people, and future'; it is one of the pillars of the concept of Integrated Water Resources Management; and a regional and global principle of human rights and good governance.

What are the factors contributing to co-management success?

In recent years a number of survey were undertaken to study the (institutional) factors that con- tribute to the effectiveness of natural resource user-managed systems. Screening approximately 1,000 cases of long-enduring local management systems from all over the world and analyzing 14 of them in more depth, Ostrom (1990; 1992) found 9 determining factors. Pomeroy (1998), based on 25 case studies from Asia, points out 26 conditions of high to medium importance for fisheries co-management success.

While some of Pomeroy's conditions can be met on the level of local communities and their organizations, others are strongly influenced if not completely dependent on external agency. Grouping the conditions identified by Pomeroy (1999) into 4 different categories, then

- 2 conditions can be considered resource attributes (appropriate scale; technology);
- 4 conditions relate to communities and their members (individual incentive structure; social preparation and value formation; networking and advocacy; fit with existing and traditional social and cultural institutions and structures of the community);
- 10 involve both communities and government (leadership; trust between partners; partnership and partner sense of ownership of the co-management process; conflict management mechanism; effective enforcement; accountability; stakeholder involvement; clear objectives from a well-defined set of issues; overlap of interests; flexibility); and
- 10 conditions are largely government responsibilities (empowerment; property rights; local political support; provision of forums for discussion; enabling policies and legislation; government agency support; coordinating body and agreements; external agents; legally established/legitimate organizations; adequate financial resources).

Thus, a great number of factors determining co-management success require government action either partially or totally. Categorizing further, these determinants can be attributed to four major, strongly interrelated subject matter areas, *i.e.* empowerment and devolution, property rights, stakeholder/resource user organization, and external support to the co-management process. The following paragraphs contain a number of considerations, which should be kept in mind when applying these categories for analysis.

"Same same, but different!" as people say in the region may also holds true for community-based management and co-management. The expectations are that it does most of what fisheries management does, but with a difference: acceptance of locally developed rules; better compliance; reduction of management costs; increased popular participation and sense of citizenship.

Recommendations

Preamble

A recent study undertaken in the Songkhram River Basin with the support of MRC/FP has identified four important steps to be taken to improve decentralized fisheries management. First, an alignment by government agencies and communities on the policy objectives of resource sustainability and livelihood enhancement; second, official recognition of the important role communities are playing, and delegation of authority to allocate local fishing rights should clearly be given to that level; this, third, requires a clear and appropriate legal framework, with specific mandates and responsibilities for fisheries management authorities at both central and local levels; finally, decentralization of fisheries management to local level must be implemented step-by-step, with the gradual transfer of the appropriate responsibility and authority for management, but with effective and guaranteed cooperation between central and local institutions.

Contrary to suggestions from interviewed stakeholders, who, one decade later, still seem to be focused on the requests limiting 'open access to inland fisheries through an appropriate legal framework of exclusive fishing rights', our recommendations go into the following directions:

- Out scaling (horizontally) and up-scaling (vertically) of community-based fisheries management;
- From a focus on community location to a community focus on all levels;
- Developing of organizational and institutional linkages with other sectors and their users; for example, bringing together (or better: merge) local fisher, forest user and irrigator organizations, in order to make use of synergies, and to economize on villagers' investment in time for community purposes;
- Apply supra-village area approaches to fisheries co-management, such as catchment and basin-wide approaches;
- Align organizational structure with that of overall decentralized rural administration, in order to benefit from funds made available at different levels;
- Promote, in policy development as well as in practice, a rights-based approach in fisheries that goes beyond mere access limits, basing development strategies on peoples' claims to their basic entitlements, such as enough food, decent work, freedom from oppression and the right to a dignified life (Allison *et al.* 2011);
- Promote women involvement in fisheries co-management;
- Governments should take a more active in fisheries co-management and effectively strengthen community-based organizations, including financially.

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Annex 52

INTEGRATING FISHERIES WITH MULTIPLE INLAND WATER RESOURCES USE

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Summary

The importance of inland fisheries is under-recognized by regional governments, who tend to promote development in other sectors that often have negative impacts on existing aquatic biodiversity and fisheries productivity. To meet the needs of an expanding population and to provide higher living standards there is a need to increase production of many goods and services, which requires increased use of water and land, as well as production of wastes. For fisheries to receive balanced consideration in development planning, their importance and potential of as an existing food production system within the landscape need to be properly understood and documented, the main messages related to inland fisheries need to be disseminated, there needs to be more effective engagement in existing institutions and processes by fisheries agencies, and more funding needs to be obtained to support these activities. This paper covers in more detail some of the steps which should be taken in this regard; these are presented as a basis for discussion.

1. Documenting the importance and potential of inland fisheries

- Document the size and value of fisheries, as well as participation rates and other key parameters through national household censuses.
- Study the basis of production and how to conserve and enhance fisheries.
- Understand the impacts from other sectors and how to mitigate or manage them.

2. Dissemination of important messages

- Promote clear messages on the importance of inland fisheries.
- Explain the importance of water and habitat and how to manage them to maximize benefits.
- Promote increased integration of fisheries with water resources and agriculture and promote mitigation of other sectors' impacts.
- Explain how general benefits will accrue from environmental protection.

3. Engaging more effectively in existing institutions and processes

- Fisheries agencies need to expand their scope to environmental management where possible and increase their inclusion in other agencies outside the fisheries sector.
- Work through existing systems such as EIA, but understand their shortcomings and try to improve them.
- Seek to include fisheries in Codes of Practice for other industries.
- Use other media to raise awareness of fisheries issues and the issues of food production and food safety.

4. Increasing funding for inland fisheries integration and development

- Seek donor funding in areas that will continue to attract support: integration between sectors, managing entire river basins and mitigating and adapting to climate change. Donors and banks need to get the message that inland fisheries are important.
- Fisheries agencies should press for national accounting systems to recognize informal elements of the economy (especially subsistence fisheries) and allocate resources to their integration and enhancement based on their value and potential.

Background

The importance of inland fisheries (*i.e.* capture fisheries) and the potential for increased production are not generally recognized by or are of limited interest to regional governments for various reasons, three of which are well-known. Firstly, the size and value of inland fisheries have only recently begun to be properly demonstrated, and there is still a long way to go to establish routine national data collection on fisheries and to disseminate this information. Secondly, inland fisheries are generally seen as a small-scale, low-value resource which has subsistence value only, and under the prevalent growth model, governments are interested in monetizing and intensifying production systems so they can be accounted for, taxed and managed to increase

national economic growth. Thirdly, the common-property nature of most inland fisheries makes their management particularly problematic.
Faced with demands for increased production of many goods and services, regional governments promote industries such as agriculture, manufacturing, mining, transportation and electricity generation, which compete directly for water with fisheries and which may generate wastes that impact the aquatic environment. With some industries there are limited opportunities for integrating fisheries; rather the approach is to mitigate their impacts as far as possible. However, fisheries are traditionally well-integrated in water supply and distribution, within the agricultural landscape, and in wastewater systems, and there is great potential to further integrate and enhance fisheries, as discussed below.

In this paper I present some ideas on what needs to be done to move forward in integrating inland fisheries with other sectors by 1) documenting the importance and potential of fisheries (mainly self-recruiting wild fisheries) as an existing food production system within the landscape 2) disseminating the important messages related to inland fisheries and interaction with other sectors, 3) engaging more effectively in existing institutions and processes, 4) obtaining more funding to support inland fisheries.

Issues

Documenting the importance and potential of inland fisheries

Size and value of fisheries

The size and value of inland capture fisheries production in Southeast Asia are grossly underestimated because official national statistics are not accurate (Coates 2003), as they are often just based on guesses by under-resourced fisheries agency staff, and these underestimates lead to a misconception of the importance of inland fisheries. Statistics cannot be improved using conventional 'fisheries' approaches, because over large scales it is not possible to collect accurate data on catches. Inland fisheries are dispersed through multiple environments in a complex landscape, most catches are made by small-scale, part-time or occasional fishers, data are highly skewed, and many people will not or cannot respond truthfully to interviews about catches. An alternative approach using household surveys in several countries from the 1990s demonstrated clearly that inland fish and OAA catches are much higher than official estimates.

More recently, national household censuses in some countries, including Laos and Thailand, have shown unequivocally that national fish and OAA production and consumption are much higher than indicated by official national figures, Therefore the importance of inland fisheries is becoming increasingly recognized within the sector, but has not been widely publicized, much less accepted by other sectors. The exception may be within the lower Mekong basin, where the size and value of capture fisheries, (at about 2.3 million tonnes in 2000; Hortle, 2007), is now so well-accepted that fisheries impacts have become a very high-profile issue in considerations of the negative impacts of hydroelectric dams.

Given this experience it is important to change our approach to data collection and dissemination. The most effective way to document the size and value of fisheries is via national censuses, because this is essentially a 'production-consumption' question, not a 'fisheries' question. National statistics agencies already carry out various censuses during which they survey thousands of households, so the role of fisheries agencies should not be to duplicate that effort, but to negotiate the inclusion of key questions in those censuses. These include 1) participation in fisheries as a secondary activity, 2) participation in fisheries-related industries (*e.g.* processing and marketing, boat-building, gear-making), 3) production and consumption, and purchase and selling of fisheries products. Such an approach also institutionalizes fisheries data within the main government data collection systems, where they cannot be readily ignored by policy makers.

Worldwide, there is no doubt an ongoing decline in diversity and productivity from **river** fisheries. However, production is increasing in some other inland habitats, such as reservoirs and rice-fields and associated artificial habitats, because their area is expanding and because they are increasingly managed. Despite many claims of an overall decline, where reliable data are available, for example from Thailand, Laos and Viet Nam, they indicate that inland fishery catches are stable or increasing (MRC 2010). Therefore, as well as the size and value of inland fisheries, it is important for us not to promote a message of 'doom and gloom', but to explain that there is a lot of available habitat, inland fisheries are resilient and can be managed, and food production from capture fisheries can be increased by management. There is of course the major and generic issue of alteration of habitats and loss of biodiversity, but in the context of food production- a primary concern of regional governments – it is the more positive messages that should be promoted by fisheries agencies.

The nature and basis of production in inland fisheries

As well as establishing the size and value of inland fisheries at a national level, we need to clarify the sources of production from different habits so that we can conserve and enhance fisheries and integrate with other sectors. Use of GIS allows the entire landscape within a country to be classified into 1) permanent water-bodies, 2) land within annual flood zones of rivers and 3) wetlands outside the main flood zones and permanent water-bodies-mainly 'rain-fed' rice-fields, which are the most extensive aquatic habitat in Southeast Asia. In the monsoonal tropics it is critical to understand that most aquatic habitat is highly seasonal, and as well as fish produces many kinds of other aquatic animals (OAAs) such as frogs, crabs and mollusks which are all part of the fishery. Fisheries agencies should complement such GIS-classifications by providing better information on yield per unit area from different kinds of habitats. Combining this with estimates of habitat area (from GIS) allows a cross-check on national data from household surveys and helps to prioritize management in the most important habitats.

Inland fisheries suffer everywhere from the 'common-property' dilemma; not only directly through over-exploitation, but also because the environment is used by others without accounting for the cost to fisheries; the other sectors are not integrated with fisheries. The solutions to this problem vary greatly depending upon particular circumstances, and need to be properly studied by fisheries agencies and the lessons synthesized.

As societies develop there is an increasing participation in recreational fisheries, which is becoming very evident around many of the larger Asian cities, where fishing ponds and guided fishing excursions are popular. Increasing public interest should lead to more support for integration of fisheries with and mitigation of the impacts of other sectors. Fisheries agencies should actively pursue relationships with the recreational fisheries industry, which can be an active collaborator and supporter of fisheries conservation and enhancement.

Impacts from other sectors and mitigation and management

Water use is increasing worldwide and the major users of water are in order: 1) agriculture, 2) domestic potable use and 3) other industries. A fishery is essentially a non-consumptive and non-harmful use of water to other users, so there are many opportunities to integrate fisheries production with other sectors, and in particular with the water management sector (which serves other industries, such as agriculture, potable water supply and so on). A multi-purpose approach to water resources management has long been applied in many countries, particularly in Thailand where there are thousands of reservoirs which are managed for fisheries production with other uses. All reservoirs and associated water distribution systems, whether for irrigation, potable supply or other uses offer opportunities for fisheries.

As mentioned above, in the monsoon tropics in the ASEAN region the largest area of aquatic habitat is rice-fields and associated water-bodies; these constructed wetlands are mostly 'rain-fed' and most have been developed on formerly forested land adjacent to rivers and floodplains. This vast new aquatic habitat supports much of the inland fisheries production and also offers the most potential for increasing production. Much literature deals with the application of 'rice-fish' systems within this landscape, but basic agro-ecological and socioeconomic issues should be properly understood in any given location before promoting any particular approach to integration to enhance fisheries production. For example, rather than promoting exotic species within specially designed rice-fish systems, there needs to be far more attention to the traditional role of indigenous fish and OAAs in rice-fields, and whether they can be made more effective to manage pests as an added incentive for maintaining fisheries and reducing pesticide use. We also need to study and promote ways to provide incentives for individual rice farmers to continue with traditional deep-water rice culture, to reduce pesticide use, and to construct and maintain refuge 'trap' ponds. The impediments to increasing fisheries production may not be 'technical', but may be because farmers do not benefit from fisheries production where it is common property.

As well as integrating with water management, and in particular in agricultural systems, fisheries can also be readily integrated with the wastewater sector. Sewage-fed fisheries, where nutrients are recycled, are the mainstay for production in many places in the region. In small-scale farmer managed aquatic systems (FMASs), use of household wastes to enrich ponds or ditches is a widespread practice, particularly in China and Vietnam. There is also a large amount of fisheries production from former floodplain wetlands which are used on a large-scale to treat human wastes from cities and towns throughout the region. These altered nutrient-rich systems are the most productive per unit area for self-recruiting aquatic species.

There may be limited opportunities for integrating fisheries with some other industries, moreover mitigating and managing their impacts is usually within the mandate of environmental or sectoral agencies. Fisheries are

affected by pollution and the disposal of wastes from various industries, including agro-processing, mining, manufacturing and transport. Any structures that create barriers, such as dams, water-gates, roads, culverts and bridges, may all affect fisheries. Mitigation of impacts can include measures to enhance fish passage, measures to maintain water quality, protection of riparian vegetation, catchment management and others. Fisheries agencies may take the lead, but typically play a secondary role in influencing environmental management that ultimately benefits fisheries.

Disseminating the important messages

Demonstrating the size and value of inland fisheries and their importance to many people will not alone provide any guarantee of their conservation or enhancement or integration with other sectors, unless messages are 1) disseminated effectively and 2) there are incentives for others to act.

Fisheries messages should be simple, and could cover the nature and importance of fisheries, the need for a clean environment and water to support sustainable fisheries, the basis for production and linkages with other water management and agriculture, the impacts of other sectors and how to mitigate them, the need to manage human activities in a sustainable way, proper disposal and use of wastes as resources, the need for habitats and refuges and so on.

Such messages need to be disseminated to target audiences, especially decision makers, including those in other sectors who cause negative impacts, those in environmental agencies who are responsible for mitigation and compliance with standards that ultimately protect fisheries, as well as those involved in agriculture and water management where integration with fisheries is likely to be mutually beneficial. As a minimum it is reasonable that basic and accurate information should be made readily available to those decision makers who need it.

With the great advances in electronic media it is relatively easy to get messages across via websites and in other ways. Given adequate resources, a more pro-active approach should be taken by fisheries agencies if they hope to fulfill their mandate to sustain and enhance fisheries.

Decision-makers may be informed regarding the benefits to fisheries of integration with other sectors, but that will not guarantee any positive result unless they have incentives to act. People respond to many kinds of incentives, and their actions are influenced by many factors and circumstances. This issue requires a great deal of consideration in each country, as it is absolutely critical to any improvement in the situation of inland fisheries relative to other sectors.

Positive incentives for inter-sectoral cooperation could be built into each agency's management system, but would require high-level commitment and adequate resourcing. Negative incentives often involve pressures from the public or those directly affected, particularly where they are well-informed. Such individuals may be more likely to understand for example that despite common property issues they can personally benefit from a clean, productive and sustainable environment which will continue to provide fisheries products, recreational fisheries, and other benefits, as well as water for other uses. Educating people through existing community-based systems and networks is likely to be very effective in rural areas in Southeast Asia where many people are very interested in fisheries. Informed and involved individuals tend to exert a lot of pressure on decision-makers to take other sectors into account, as has been seen recently in the debate over the proposed Xayaburi dam on the Mekong in Laos.

Engaging more effectively in existing institutions and processes

Fisheries agencies typically aim to promote sustainable utilization and development of fisheries, and in general are mandated to regulate the activities of fishers and to enhance fisheries by stocking. Fisheries agencies can also take the lead on certain environmental issues such as fish passage and maintenance of habitat where they have a mandate (as in Thailand and Cambodia respectively). However, management of inland fisheries depends heavily upon environmental management and upon integration with other sectors; we cannot manage the fishery without water and habitat. Therefore, to be effective, fisheries agencies need to expand their influence within agricultural, water management and environmental agencies, and there are various ways this might be achieved. This issue should be carefully reviewed in each country and useful recommendations synthesized.

If implemented properly, Environmental Impact Assessments (EIAs) are one possible way to improve management and mitigation of impacts and enhance mitigation as well as to integrate between sectors.

However, in the region EIAs do not have a good record because they usually fall far short of best practice. For example, instead of a full consideration of options, any particular project is usually pre-approved based on narrow criteria (for example the economics of electricity generation), so there is little scope for modification during the EIA which follows later. Technical content is often very limited, public participation may be poor, and the role of referral agencies, including fisheries agencies may be restricted or non-existent. Nevertheless, if EIA can be improved in line with best practice it is a useful process and fisheries interests should continue to press for such improvement.

EIA is however not applicable to the vast majority of projects or activities that modify the environment, because they are screened out below a certain size, so that only the largest projects undergo any environmental assessment. For example, the vast majority of the thousands of irrigation and water supply projects in Southeast Asia has received no EIA, but has completely transformed landscapes to enhance outputs from single sectors. There are many other kinds of developments which also are not subject to EIA, so other approaches are needed if there is to be any improvement in their implementation to integrate with other sectors. One approach is to work with engineers to develop Codes of Practice for structures such as dams, water-gates, canals, roads, culverts and bridges to make them more 'fish-friendly' as well as in all activities that impact the aquatic environment and fisheries. Requiring large organizations, including dam-building companies to implement environmental management systems (such as the ISO14001 system) can help to improve their environmental performance which has flow-on benefits to fisheries. Requiring all industries (including agriculture) to comply with water quality guidelines could lead to major improvements for fisheries. Other useful approaches are integrated water resources management and catchment management, which can all be applied over large scales to improve integration between sectors. In this regard, institutions that deal with entire river basins, particularly international rivers, as well as regional international organizations, may offer useful frameworks to promote integration between sectors.

Increasing funding for inland fisheries integration and development

Donor support has been crucial for the fisheries survey activities and for many other fisheries initiatives that have been raising the profile of fisheries in several ASEAN countries. As economies mature, donor funding will decline and will increasingly be devoted to assisting with issues that cannot be readily dealt with by national systems. Integration between sectors, managing entire river basins, and mitigating and adapting to climate change, are issues that should continue to attract ongoing support, as these are problematic, requiring new institutions and processes to deal with conflicting interests, including fisheries. There needs however to be much more attention to increasing feedback on the importance of fisheries if the sector is to attract a fair share of ongoing support from donors.

Inland fisheries are large and valuable, but they are mostly within the informal economy, so there is very limited accounting of their benefits (for example in official GDP figures) and also very limited direct expenditure to support their conservation and enhancement. Similarly, the actual losses to fisheries are not accounted for (internalized) in the costs of other projects. Fisheries agencies should provide and encourage the use of equivalent monetary valuations for informal elements in national accounts and in evaluation of projects; *i.e.* informal non-monetized production and consumption (as applies especially to subsistence fisheries) should be recognized explicitly and given an equivalent monetary value. This would immediately cause a large increase in the stated value of fisheries in estimates of real GDP (*i.e.* including informal elements), and would justify a much greater effort and expenditure to support inland fisheries and to integrate them with other sectors. Fisheries agencies should also push for some reasonable return from fisheries and from other sectors to be reinvested in fisheries through whatever means are appropriate and based on their relative value and potential.

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